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The Impact of Technology Integration on Secondary Student Learning

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THE IMPACT OF TECHNOLOGY INTEGRATION ON SECONDARY STUDENT LEARNING

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Abstract

In a world that is ever advancing in technology, we too must grow along with it. Technology has, especially in recent years, been integrated into education. It is a tool that provides a means to student learning. For many, the integration of technology within the classroom has presented both positive and negative effects on student learning. By conducting a literature review, this thesis will address the impact of technology on student learning within the secondary classroom as well as the tradeoffs that technology integration presents. Furthermore, technology presents two roles to observe: as a tool and as the teacher. Finally, it is important to understand the outside factors such as distractions, social media, and teacher attitudes that impact the secondary classroom.

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CHAPTER I: INTRODUCTION

Technology has found commonality with the air we breathe in that it is everywhere we look. From the devices in our hands to the devices that are in our homes and workplaces, it has become a part of daily life in American society and throughout the world. According to Yilmaz, "Today, the use of technology has become a necessity, not a privilege. Because technology is included in every area of our life, mobile phones, cars, apps, computers, smart homes, and many things we cannot here count constitute the abundance of examples" (2021, p. 164). The need to interact with technology is inevitable, and as a result we must seek to understand how it affects our daily lives. Questions begin to circulate about our dependence on technology and how it affects our relationships with others. Researchers have focused on this interdependence throughout the years and as more and more technology is embedded within the classroom ask a further question: How does increased dependence on technology affect the learning process of students?

According to Yilmaz's (2021) research, 59% of the world population are internet users, 49% are social media users, and 67% are mobile users. In other words, technology is wide-spread and an impactful piece of people's lives. Raza's (2020) research further notes that in 2015, 90% of American users between 18 and 29 years of age were using social media. In contrast, in 2005, this same measurement found a mere 12% in this age group reported using social media, amplifying the rise in technology's presence. Another example of the rise of technology comes from Kozakowski (2019) who reported that in 2013, at least one-third of the undergraduate student body was taking an online course. We now live in an era where we are dependent on technology for numerous needs.

In the same way that technology has become interwoven into our surrounding environment, technology has been integrated into education in the hopes of enhancing learning to the student body. Sherry Turkle (2015), author of *Reclaiming Conversation*, mentioned that we have the option to either change our students to fit the educational environment, or to change the educational environment to fit our students' needs. Most educational systems have the mindset to change the environment by creating one that is technology-infused. This is done in order to reflect the society we live in and, thereby, to raise good citizens who are capable of handling that technology-infused society. Technology is both directly and indirectly impacting education. As a result, it is important that teachers adapt along with these changes in order to provide the best learning environment for their students within the world we live in.

In 2019, the COVID-19 virus unleashed a worldwide epidemic causing nations across the globe to shut down by springtime of 2020. Everyone had to scramble as schools, businesses, churches, and families were all forced to find ways to connect virtually with almost no time to prepare or plan. Decisions were made to teach students in the best way possible under the new circumstances that the world faced. Teachers and students alike needed to adjust as they learned how to function with the online setting. Classrooms became either completely virtual or of a hybrid setup. Within the hybrid classroom, half of the student body would be in person while the other half "tuned in" via an online platform. Today, although most students and teachers have returned primarily to face-to-face learning as COVID-19 exposures have declined in numbers, technology has not moved out. In fact, technology is now continually built into the curriculum in part to proactively prepare in case students are faced with a similar circumstance and need to learn from home again. Therefore, devices such as tablets, Chromebooks, mobile phones, and

others have become a regular part of today's classroom. Education must be accessible and flexible for all individuals.

Guiding Question

The breadth of technology's presence within the classroom begs us to also understand how this consistent presence impacts our students as learners. As I have both taught and observed within the classroom at the secondary level, it is evident through my eyes how technology can seem to have a controlling effect on students. Students are often distracted with the games and apps that are offered to them, and require additional monitoring due to off-task behavior. Even if students are participating in activities such as emailing their classmates or working on an assignment for another class, it continually takes their attention and focus away from the present circumstances.

I have noticed, particularly in my undergraduate years, how face to face communication has changed. Whether babysitting my younger cousin or working with college students, I have observed an increase in "awkward" circumstances. For example, some people I have interacted with have had trouble maintaining eye contact, and silence was considered frightening. Any conversation that had a lull was labeled awkward, and as a result, I have begun to notice how more and more people prefer to text, message, or email one another instead of talking face to face. Confrontation has often been difficult for many, but now it's practically anxiety inducing. According to Šerić (2020), 90% of the communication process is nonverbal. However, with technology becoming more infused in our lives, communication has also found a new platform in the online realm.

Online communication is full of its own benefits as explained through this literature review, but along the way of this technology transition, face-to-face interaction is declining. As

communication changes within our world, it is important to better understand how the communication skills of students have changed within the technology integrated classroom. After all, the education environment is meant to help students prepare for the world around them. For this literature review, I read and came to understand answers to the question: *How has technology integration impacted secondary students' learning?*

By understanding technology's impact on secondary students' learning, teachers can be given the means to make positive changes within the classroom environment and curriculum. Though technology is everywhere, as humans we get to decide whether we will manipulate it for our good or whether it, in return, manipulates us. The integration of technology often requires a tradeoff. For example, though a virtual classroom may increase someone's accessibility to a learning opportunity, they also lose the face to face interactions with instructors and peers.

Definition of Terms

As the topic of technology's impact is explored, it is helpful to understand some key terms and definitions. There are several pedagogies and curricula that various research presents. Most are defined within context, however, the following specific terms are helpful to understand beforehand. First, in the research of Hegedus et al. (2015), SimCalc curriculum is used in order to understand technology's impact. This curriculum is a learning environment software. It provides students the ability to create, manipulate, and run simulations of mathematical functions. Along the same lines, Geometer's Sketchpad, used by Wong et al. (2020), is a geometrical software. Its purpose is to encourage the use of technology in learning mathematics, and it allows students to create and explore mathematical concepts. Within Sims's work of *Disruptive Fixation* (2017), the gamification pedagogy is presented. This is a curriculum that

centers student learning around game-centered apps. The idea is to provide a sense of engagement and entertainment to the consumers.

There are also various classroom models mentioned in the research at hand. Gioiosa et al. (2019) and Baytiyeh (2017) explored the active learning environment. Active learning "is a process that engages the student during the learning process while in the classroom" (Gioiosa et al., 2019, p. 561). This model is used in cohorts with technology infusion. Moreover, Baytiyeh presented what is known as the flipped classroom model. The flipped classroom is one structured on student-centered learning. In other words, the teacher acts as a guide rather than a lecturer, references m-learning (mobile learning) or e-learning (electronic learning) within the classroom, and acknowledges m-learning and/or e-learning methods. As multiple technological devices are being used within the classroom, these terms are used in order to address the "how" of student learning.

Finally, there are several definitions to understand when it comes to technology overall. Digital literacy and digital competence are mentioned often by several researchers. Both of these terms are relatively the same in that they express a person's fluency and ability to use technology for its purpose (Casañ-Pitarch et al., 2021). They further emphasize language development and communication skills obtained for the online setting. For example, a student's ability to understand the functions of an electronic device for a peer review process could be considered digital literacy or competence. Telecollaboration is used in tandem with these words as it refers to the educational practice of virtual exchange. Telecollaboration, or developing the ability to communicate via an online system such as Google Meets or Zoom, is a prominent feature in today's classrooms.

Information and Communication Technologies, or ICTs, are commonly used throughout studies regarding technology's impact (Deaney & Hennessy, 2007; Ferreira, 2016; Furman, 2019; Makhlouf & Bensaf, 2021). ICTs are simply the means or tools by which students and teachers are communicating and learning via technology (i.e. Tablets, mobile devices, etc.). Other acronyms include SITs, referring to socially interactive technologies such as social media, and TPD, an acronym used in a quote meaning teacher professional development.

Two conditions mentioned that students are facing within the classroom include technostress and media multitasking. Technostress is simply stress caused by technology, more often by the platform of social media (Raza, 2020). As Raza mentioned, "Students are also using social media during the school time, which could also lead to technostress and other adverse outcomes that ultimately reduced performance" (2020, p. 1). This leads into media multitasking which is the action of multitasking between social media, apps, school work, and devices in general (Raza, 2020). Understanding these key definitions and terms will better illustrate the research being presented.

CHAPTER II: LITERATURE REVIEW

Literature Search Procedures

The process of reviewing literature included delving into the subject of technology's impact on secondary students' learning process as well as the tradeoffs presented with technology integration in the classroom. The search engines Academic Search Premier, ERIC, and Google Scholar, as well as books found in Bethel University's physical library aided in the process of this literature search. While using these services, results were filtered to only those articles and other materials that were peer reviewed and published from 2015 to 2021. Keywords "technology in the classroom", "impact/importance of technology", "communication skills", "communication in the classroom", "digital learning", "virtual learning", and "soft skills" were used to narrow my search. This chapter reviews the impact of technology in the classroom and the learning skills affected, and is broken down into three subtopics: Integrating Technology into the Classroom, Teacher Impacts on a Technology Integrated Classroom, and Outside Technological Factors Impacting the Classroom.

Integrating Technology into the Classroom

The reality of our ever advancing world is that we must go along with its advances in order to keep moving forward. It is rare to look around today and not see someone on their phone, social media, laptop, or other technological device. Technology is simply another part of us and how we live our lives. In fact, with the onset of the COVID-19 pandemic, technology including tablets and Chromebooks became a necessity for students and teachers who needed to shift to a virtual learning environment. Technology can provide an excellent resource to learn from regardless of the location of the student or the teacher. However, this resource also has the potential to be incredibly distracting and can deter students from the learning and development

process. Research has found positive and negative impacts of technology within the environment of the classroom. As with any form of technology advancement, there are also tradeoffs where the positive and negative balance each other out creating no difference in terms of impact.

Positive Impact of Technology on Learning in the Classroom

Technology has been described as innovative, creative, and even a fun tool that can open the doors of our students' imaginations. As listed in the studies within this section, researchers described and analyzed the positive effects of technology in the classroom including, but not limited to, enhanced engagement, motivation, and opportunities.

When something new is incorporated into the classroom, it can affect everything from the students' routines to the learning environment. As part of the FATIH project conducted by Durak and Saritepeci (2017), the incorporation of technology in the classroom displayed its positive impact on students and teachers alike. The FATIH project was created for secondary classroom studies in order to "investigate the effect of technology used in education on classroom management" (Durak & Saritepeci, 2017, p. 441). Durak and Saritepeci (2017) predicted that the structure and rules of classroom management would be affected as technical issues can cause disruptions and spur on negative student behaviors. Through observation and analysis, Durak and Saritepeci (2017) noted that technology's impact was moderate overall, but teachers with four to six years of experience in the classroom tended to have a stronger positive reaction in accordance with their management, especially when used for five to seven hours daily.

When looking at technology's impact more specifically, Hegedus et al. (2015) analyzed the impact of technology use within a high school algebra classroom. According to their research, high school algebra is a significant indicator of college success (Hegedus et al., 2015). In fact, it correlates with graduation rates, especially those students of ethnic minorities and/or

low soco-economic status (Hegedus et al., 2015). By incorporating a Sim Calc curriculum and technology tools into the experimental and randomized research classroom, Hegedus et al. (2015) were able to observe dynamic representations (creating multiple perspectives on mathematical ideas) and classroom connectivity. Findings indicate that this classroom environment "offers affordances that nullify some of the advantages of being in an honors class for the not honor student" (Hegedus et al., 2015, p. 222). In other words, the integration of technology engages students in meaningful forms of communication. By creating meaningful communication, students were able to facilitate power over their own learning. The meaningful communication observed from this study further emphasizes technology's positive effect on learning in the classroom as well as instructional practice.

A recurring theme in research includes the idea of "technology infusion." Technology continues to advance rapidly over time, and as such, education must rapidly advance with it. When observing technology infusion in K-12 schools, Ross (2020) made predictions that this infusion would increase student-centered learning activities, students' increased confidence in technology usage, and students' overall accessibility to technology. His hypothesis was not far off as data displayed both an increase in accessibility to technology and a positive impact on the learning process. When looking at comparisons of the fourth through eighth graders to neighboring school districts, the students' scores in mathematics showed a significant difference in improvement. Ross (2020) went on to explain how technology should continually be assessed in classrooms and used in professional development as it will continue to be a part of our educational system.

Google Classroom is one example of how technology has been incorporated into the modern day classroom. Many classrooms have moved to virtual settings whether out of need or

as a means to a new opportunity. In Mollov's (2019) research, it is understood that education has a big impact in shaping the personality of a student, and as such, it is significant as to how teachers present education to their students. Both Mollov (2019) and Ross (2020) found that as information technologies continue to develop teachers will need to integrate that technology into their classrooms. Mollov (2019) hoped to understand how Google Classroom specifically impacted the learning environment for students. Within a two year span, 117 students and 29 teachers were observed and surveyed. Students appeared to be highly motivated under the circumstances of the Google Classroom setting. The system was used for their learning, materials, and as a test of self-control and their ability to communicate. Using this system was reportedly not difficult for these students and resulted in positive attitudes in regards to teaching and learning but not testing. Mollov concludes, "This type of training helps to improve the learning of the subject matter in different subjects, enhance a student's motivation, and improve the communication between the participants" (2019, p. 314). There were even 15% of students who would have preferred to only use Google Classroom as they found it to be highly effective.

Other technological tools in the classroom may include educational games to assess student knowledge such as Kahoot, Blooket, and WordCraft. Jabali and Walker (2021) further support the idea that understanding technology is mandatory for students in the age that they live in. By integrating technology into the classroom, students are being prepared to live in a world that includes both multitasking and technology-driven protocols. The integration of educational games into student learning has been coined the term "gamification." Gamification is a system designed to engage students with a fun activity amidst the learning process. Jabali and Walker (2021) concluded that gamification had shown an increase of motivation, engagement, and positivity. In their particular design, FlipQuiz was integrated into the experimental group in

secondary schools to learn English vocabulary. This game system included students' verbal participation as well. After administering a written pre-test to both the control and experimental groups, the experimental group was then given a curriculum that was infused with technology equipment and the use of FlipQuiz. The traditional classroom used primarily paper materials such as flashcards. Once the post-test was completed, it was found that statistically there was no significant difference between the two groups. However, 96% of the experimental group reported a positive relationship with using technology and 88% were happy with the use of technology within the curriculum. The attitudes that students presented were the most impactful difference. Jabali and Walker (2021) continued to emphasize the increase in student motivation and engagement when gamification is used in the classroom. For students, it provided a fun atmosphere for learning which increased engagement as a result.

Just as technology is effective at the secondary level, it continues to be effective as students move into their college years as well. A study conducted by Gioiosa and Kinkela (2019) found that technology had a significantly positive impact on student learning while in an active learning environment at the undergraduate level. In this case, Twitter was used as an active learning tool within an accounting class. Throughout their study, students were expected to implement the skills needed to learn about internet-based research sources while simultaneously learning about those sources. In other words, both learning and using new technology were a part of the research (Gioiosa & Kinkela, 2019). By the end of the course, students noted that technology contributed to their successful completion of the course because of their ability to use the internet for real-life examples. Furthermore, the students found themselves to be more comfortable with technology and their communication skills than before starting the course, and thought that this way of learning should be implemented in other classes.

Casañ-Pitarch and Candel-Mora's (2021) research further adds to this positive impact of technology at the college level. Their research focused on the development of digital literacy (the location and consumption of digital content) and oral skills for English Language Learners using a form of virtual exchange (Google Meet, Zoom, etc.). Casañ-Pitarch and Candel-Mora (2021) found that with this virtual exchange, the students tended to increase in motivation and oral skills. The researchers also wanted to further understand the ability to use telecollaboration with this study group. Telecollaboration focuses on the development of foreign language competence, intercultural communicative competence, and digital competence. The virtual exchanges were concluded to be helpful because they improved pronunciation, speaking fluency, and raised confidence in students. This research pointed back to digital literacy, the creation of digital content, and communication used in the digital world. Through this process, students were able to develop their digital literacy by combining language, content, and digital tools through a telecollaborative project. Using instruments such as Google Classroom, Hangouts, Drive, and Docs, results showed that the experimental group (technology enhanced) performed better than the control group: a percentage variation of 18.56% (Casañ-Pitarch & Candel-Mora, 2021). As Casañ-Pitarch and Candel-Mora note, "Both experimental and control groups had similar degrees of confidence when participating in the target professional acts before the equipment. It was after the experiment when the difference between the two groups was more significant" (2021, p. 40). Overall, students performed higher on their language tests and gained more knowledge using the telecollaborative projects, thereby, advancing noticeably.

Whether in the various types of secondary classrooms or through the lens of a college course, technology provides positive outcomes for both students and teachers. Each of these studies noted how the virtual classroom, technology-infused classrooms, gamification education

platforms, and even social media impacted students by increasing connectivity, knowledge acquisition, creativity, motivation, engagement, and independence. Furthermore, stronger class management, improved communication skills, and opportunities for real-world examples were evident. These increased outcomes are also evident for teachers. Lesson planning, teaching, and classroom management are all being shaped by the opportunities technology provides.

Negative Impact of Technology on Learning in the Classroom

Technology has provided numerous advances to our society including the rapid acquisition of information at our fingertips. While instant access to information can be positive, many studies have also shown the use of technology to have a negative impact, especially in the classroom. Technology poses a threat to student concentration, motivation, and retention of information.

Writing is a subject of high importance that prepares students for what is classified as the "real world." According to Mizusawa and Kiss (2020, p. 193), "young people will require a range of habits of mind and a great number of complex skills if they are to have any meaningful job opportunities in a day of closing doors." As our society progresses in technology, Mizusawa and Kiss (2020) explored how writing was impacted by communication mediated by technology. The class that was selected for observation sought to integrate technology into the lesson plans. Visual media was used often to grab the attention of students. Though the media certainly hooked students in, it was observed that their attention did not last long. There was a significant lack of attention to writing practices. Because students were only required to find key information from a written source, interest was lost quickly. To express their concern, Mizusawa and Kiss stated, "When efficiency is confused with effectiveness and student compliance with student understanding, over-instruction and transformed practice become impossible to actualize,

for too much of classroom practice is invested in maintaining the status quo of testing protocols" (2020, p. 207). Technology integration in this case provided no positive effects because the way it was incorporated was not sustainable. Plus, a lack of focus on the ultimate goal of writing evidently needed refocus.

In order to succeed in the school environment, there is a great need for communication skills as well as adaptability and flexibility. Based on observations of lessons and interviews within the secondary environment, it is evident that the development of written communication is viewed more as a choice rather than a prerequisite within the curriculum. This becomes an issue as all learners are affected as a result of this set up.

Not only is the impact of technology on subject matter within a classroom something to be considered, but the classroom environment and the communication of its students deserves a focus as well. Many classrooms involve information communication technologies, or ICTs. ICTs, like most technology, are a resource that is always available to students, providing information instantly. This opens the gateway to learning, however, it also comes with the social aspect. Ferreira (2016) took an approach regarding how the environment of the secondary classroom is impacted by technology:

> The classroom is not merely a place for learning school subjects. It is also a place of socialization with its norms and rules and a means of communication and interaction with less explicit negotiation procedures: basically, it is like a game of strength (2016, p. 434).

For example, with the increase of accessibility to information as noted by Ferreira (2016), students are more likely to plagiarize and look to the internet for easy answers to their homework. Furthermore, one of the most challenging factors at the secondary level is the use of

mobile phones. Phones are a part of most teenager's culture. There is also a social dynamic present for students to fit in and establish friends or groups. For students at this age, it often feels like it is important that they are "always available" to whoever needs them at that exact moment. If they're not connected, they're stressed. Students are used to a life of interruption, and this lifestyle bleeds into the classroom environment. With the availability of either mobile phones, tablets, or Chromebooks for use in the classroom, students fall prey to its distraction capabilities. ICTs in the classroom present an intense merge of students' worlds.

In her book, *Reclaiming Conversation*, Sherry Turkle (2015) further emphasized this "always available" mindset as she delved into the psychology of communication in today's day and age. While conducting multiple interviews, Turkle found that teachers often mentioned the attention span of their students. Students were unable to concentrate, "don't have down time, and can't tolerate downtime when they have it" (Turkle, 2015, p. 164). To put it simply, students are trained to always be "on" which prevents them from focusing. Turkle (2015) mentioned how students as young as sixth grade come to school with smartphones, tablets or any other device that demands their attention. Texting becomes a distraction issue in class, social media is a release from boredom, and overall, students find it difficult to concentrate when the device they are using for learning is also a device that gives access to games and messaging.

Turkle continued to discuss how students at the secondary level (as well as other levels) have changed. It is implied that "Children who begin school with an iPad won't know that you can 'force' a state of greater concentration by using media that allow you to do only one thing at a time" (Turkle, 2015, p. 217). According to Turkle's observations, students have become "grazers", picking up pieces of information here and there, but primarily from the sources at their fingertips that provide instant answers. In fact, one of the interviewees remarked on how teachers

have even had to try to defend memorization of people, places, events, etc. when the information is so easily attainable. Technology integration, therefore, has been picking away at students' ability to concentrate in the classroom, and as a result has affected their learning over time.

As the world is progressing, schools have been making adjustments in order to prepare students to succeed in the advancing world we live in. However, a study by Sims (2017) found that integration of technology into an entire school ended up resulting in negative outcomes. In Sims's book *Disruptive Fixation* (2017), the Downtown School is the main subject of observation and research. With the belief that students needed to be molded to fit the tech-savvy, creative, and entrepreneurial aspects of society, the Downtown School was created. The founders wanted to provide a space that branched away from the "boring" traditional classroom and learning styles. In the creation of the school, classrooms were designed to be student centered with new media technologies available. This environment was created with the intention of students connecting with life outside of school as well as preparing them for an "information-rich and globally connected adult world" (Sims, 2017, p. 48).

The design of the Downtown School further included a gamification pedagogy in order to develop problem solving, creativity, systems thinking, and design thinking while also meeting the state mandates for a STEM focus. However, this game design ended up providing oppositional results as Sims observed multiple classrooms and worked with multiple focus groups. Many initial hooks with the gamification pedagogy were successful for the beginning of the lessons, but students' behavior eventually became fleeting and negligible to the daily routine. As Sims (2017) put it, "The labels had changed, but the underlying practices had not" (2017, p. 92). Rather than engaging beyond the text, students used Google Docs to simply transfer information over. Creativity and agency was observed, but not as anticipated or desired. Students

were taking advantage of the classroom setting to fulfill their own interests. Urgency and competition, as seen in traditional settings, was still evident in these secondary classrooms. Although the emotion of collaboration was enhanced, the specifics of the information learned decreased. Even with an environment founded on technology, the students were not advancing any more than those in a traditional classroom setting. Furthermore, despite goals to provide the most optimized, student-centered learning environment, Sims (2017) noticed developing communication behaviors that were unexpected. For example, it was observed that students were more often talking back to their teachers, making fun of class curriculum, or ignored direction from the teacher. A tension between students and authority was apparent. Sims also observed a lack of social etiquette.

Negative impacts of technology continue to be evident in higher education as most students need to use a laptop to access class material. Zaza and Neiterman (2019) conducted a survey of 478 undergraduate students and 36 instructors to get a better understanding of the perceptions of technology use in the classroom. The researchers found that technology's downfall was its ability to distract. Their data determined that seeing class related material on other screens was "somewhat distracting" for 9% of students. On the other hand, 49% of students affirmed that seeing unrelated classroom material on screens was "somewhat or very distracting". As class sizes increased, the affirmation of these distractions also increased (Zaza & Neiterman, 2019, p. 385). One particular student noted, "It makes no difference to me if students are on their laptops, looking at the course's slides and taking notes. But it is distracting when I see them looking at non-school related content" (Zaza & Neiterman, 2019, p. 387). In this survey, students pointed out the benefits of technology for note-taking. However, with the

increase of technology as a means to alleviate boredom it also became a distraction to not only the student, but also to the students within the surrounding area (Zaza & Neiterman, 2019)

Technology can be extremely beneficial to students in the classroom, but it can be extremely detrimental as well. Technology can decrease student interaction and engagement as it poses a means to distract students. Student concentration and motivation is decreasing with increased access to technology both inside and outside of the classroom setting. Instead of retaining information, students' behavior has shifted as they expect to be instantly gratified with near instant accessibility to information via their devices. As shown by the gamification pedagogy (Sims, 2017), the use of mobile devices, and the integration of other ICTs in classrooms, these studies provide insight into the negative impact of technology.

The Importance of Technology Integration

Lastly, technology in the classroom also presents tradeoffs. In other words, with technology's use, the positive impacts balance out with the negative. Rather, technology is a tool, one that we may use in both positive and negative ways depending on how it is integrated. The majority of research in this area points to the idea that the use of technology is more impactful than technology itself. Factors such as teacher guidance of technology in the classroom can have an impact on the students that inhabit that classroom.

In an embedded technology learning environment, students are most likely to have access to a tablet, Chromebook, or some other device in order to fulfill class assignments. In some cases, mobile devices have been incorporated into the technology-driven classroom. Burke et al. (2022) explored the mobile learning experiences at the secondary level in regards to math and science units. Though the educational uses of mobile devices is somewhat limited, Burke et al. (2022) was curious to understand how it impacted the learning process. The framework

surrounding mobile learning, or m-learning, was centered around the idea that learning is impacted by social circumstances (interactions and conversations). Mobile devices are the medium to which this socialization happens. Furthermore, the researchers focused on the two-way dynamic of mobile technology as a tool. Student learning is affected by the use of mobile devices, but the mobile devices also have the ability to be modified to learning needs.

According to the students observed, it was apparent how mobile devices could potentially be distractions from learning. Students were prone to check their phones continually, but overall Burke et al. (2022) found that the mobile devices provided an incentive to learn in the classroom. In this specific pedagogy, mobile devices were used as a tool to access learning apps for classroom engagement. As mobile devices were embedded into the pedagogy of the classrooms, Burke et al. (2022) noticed the enhancement of student motivation, confidence, empowerment, and enjoyment. Students expressed the increase of their learning whereas others noted that the use of these tools did not encourage collaborative learning. Burke et al. (2022) observed the personalization, collaboration, and authenticity factors that were affected by the use of mobile devices. Their conclusions led to the understanding that the teachers needed to be more selective about tasks and apps that were included in their pedagogy. The technology used didn't necessarily have either a positive or a negative impact on student learning, but instead how the technology was used impacted the student learning.

Zhai et al. (2019) also examined the effects of mobile learning based on the amount of its integration in the classroom. As stated by the researchers, "Sometimes mobile devices are simply used to replace the traditional instructional methods without adding function improvement" (2019, p. 751). Zhai et al. (2019) observed that technology was being used as a substitution, but

when redesigned for conventional instructional practices, they hypothesized that the higher level of integration would lead to greater student achievement.

Zhai et al. (2019) incorporated a pedagogy into a set of classes known as Substitution, Augmentation, Modification, and Redefinition, or SAMR. This model was designed in order to use technology to the best of its ability within the classroom. Integrating technology into the classroom was difficult though, and students sometimes would fall into performance mode, waiting to be told what to do. As mobile technology was introduced, the researchers varied the frequency of use in their first study before examining the four types of uses of mobile learning. In the substitution category of the SAMR, no improvement was noted, however, the augmentation category provided improvement. The devices were also prone to be distracting to students and even had a negative correlation with student achievement in the classroom. The devices provided students the opportunity to be involved with class activities. However, student learning did not necessarily increase. In other circumstances, such as with the after-school remediating activities, the impact of technology displayed positive outcomes. Zhai et al. concluded that “despite a general assumption that a higher level of technology integration would result in greater student achievement, there’s a lack of empirical evidence to support this assumption with mobile technology” (2019, p. 762). Mobile technology's impact on student learning truly depends on how it is involved in the pedagogy.

In a study conducted by Erkan (2019), the perspectives of teachers and students’ use of technology and its effect on communication/interaction was observed. Erkan notes that “as of 2015, a SMART Board was established in 432,000,288 classrooms in 45,000,653 schools throughout Turkey” (2019, p. 31). With this statistic in mind, it was evident that technology

integration was being widely used, and as a result, Erkan aimed to understand the students and teachers' perception of the integration.

Upon interviewing a sampling of 18 secondary school teachers and 77 secondary students, data was collected and coded to understand technology's impact. An analysis of this data showed that the motivation of student and teacher-student communication increased with the implementation of the SMART boards. On the other hand, contrasting data pointed to student boredom with the technology presented which caused a decrease in communication with the teacher. Students in this scenario reported that they felt that their communication decreased with the use of technology while their teachers reported they felt communication had increased.

Erkan (2019) also pointed out an overall positive outlook on technology from both teachers and students, and students found technology to be positively effective. Similar to Zhai et al.'s (2019) research, the amount of technology in the classroom doesn't necessarily guarantee an increase in learning and communication. It is also interesting to note that Erkan's results in Turkey were similar to those reported by researchers whose studies have been conducted in the United States.

In another case, Wong and Wong (2021) wanted to understand how students' motivation was impacted with the use of technology in the classroom. When studying a secondary mathematics program, the two defined motivation as the force that directs student behavior. However, motivation produced by self-determination can either be extrinsic or intrinsic. Oftentimes, classrooms are not structured for intrinsically motivated students, or students who are motivated based on the learning activity rather than the learning tasks. In other words, Wong and Wong (2021) concluded that a lesson's content needs to be appealing and exciting in order for these particular students to learn. With the incorporation of the Geometer's Sketchpad (a

geometrical software), Wong and Wong (2021) hypothesized that the technology factor would increase stimulation and, therefore, motivate students in math class. Two random secondary math classes were selected as intervention participants. These classrooms were provided with a technology-enhanced environment including the Geometer's Sketchpad for geometry learning. When scores from tests were collected, motivation was improved. However, this improvement was not significant. Therefore, the use of technology to motivate students, once again, shows the importance of how technology is integrated.effective.

The tradeoffs of technology are further evident at the early stages of schooling, according to Domingo and Garganté (2016). This reiterates technology's strong presence in our lives. Domingo and Garganté (2016) researched the use of mobile technology in the classroom as well, but from a primary lens. They provided a questionnaire for teachers' perceptions of mobile technology and its impact in the classroom, particularly at the primary school age level. New technological devices had been incorporated into classrooms based on their usefulness, ease of use, personalization, and learning cost. The devices provided a means to promote knowledge, to create challenges for organizational learning, to share information with peers, to understand multiple perspectives, and to encourage a more meaningful use of technology in the learning environment (Domingo & Garganté, 2016). Upon collecting the 102 teacher questionnaires, and their perceptions of the 2,550 students, Domingo and Garganté determined that when technology was in the classroom, the teacher became more of a learning guide than an instructor. The teacher was tasked with connecting their students to the learning content using technology as the tool. As students used three content learning apps, two informational management apps, and one learning skill app, it was found that students were most highly impacted by the ease of information and the increase in engagement. Yet, Domingo and Garganté remind their readers that:

> Mobile technology cannot be seen as a single and homogeneous technology, but rather the set of technological devices that supports a large amount of Apps. For this reason, it is important not only to pay attention to mobile technology in general, but also to consider the design and content of Apps in order to clarify what instructional benefits the combination of mobile technology and Apps actually give (2016, p. 27).

Domingo and Garganté provide a reminder that it is how technology is used rather than the technology itself that is creating an impact. In their particular study, there were no positive effects of technology: "The data indicated no significant differences between the traditional and tablet-based courses on all but one objective learning outcome" (Domingo & Garganté, 2016, p. 69). Bagdasarov et al. (2017) confirmed that when incorporating tablets into the undergraduate classroom, there were no negative effects displayed. Data gathered by Bagdasarov et al. indicated that students found tablets to be helpful with immediate access to information and collaborative learning. The researchers concluded that limiting computer usage could enhance student learning but intensive use may create poorer student performance (Bagdasarov et al., 2016). Technology is a tool and can be adjusted to create either a positive or a negative learning atmosphere.

Furman et al. (2019) also observed the use of tablets as an educational tool in preschool science. According to their own studies, information and communication technologies (ICTs) could be used effectively in the classroom to enhance independent play-based learning. Despite this intriguing idea, for preschool children, this is not always the end result. These tools also have the potential to keep students distracted and approach their learning with passivity. In fact, some research has shown "that unless tests are carefully selected, increase in computer time can

lead to antisocial behavior in young children" (Furman et al., 2019, p. 6). For students even at different developing ages, whether preschool or middle schoolers, their behaviors can be affected.

Furman et al. (2019) helped others understand what technology can lead to based on their data analysis by incorporating ICT in educational institutions. Through this project, teachers would help identify high, middle, and low achievers to help the researchers understand their progress over time. When given a pretest, there were no significant differences between the control group and the group with tablets. Teachers highlighted how students were affected by tablet use: improvement in attitude, engagement in class, and observational skills were noticed. But upon receiving the posttest results, the data showed that both the intervention and control groups provided the same outcomes (Furman et al., 2019). The use of tablets certainly encouraged skills and learning in the classroom such as collaboration, autonomy, and motivation, but overall students had increased outcomes no matter the classroom or technology integration. Furman et al. (2019) noted that when ICT is introduced into the learning environment, the learning community itself is affected. How a teacher introduces technology into the classroom can affect how students approach technology.

Even at the college level students are affected by how technological tools are utilized within the classroom. Mehta (2020) analyzed the online classroom versus the physical classroom from an undergraduate perspective and drew a similar conclusion: both types of classes have their pros and cons. The online classroom had students watch online lectures and attend to homework and assessments at their own pace. The most impactful difference between the online classroom and the physical classroom was the interaction between student and teacher. The online classroom can be very flexible and learner-centered; but, it also requires much more effort

to encourage interaction and engagement with a community (Mehta, 2020). As far as secondary students are concerned, Durak and Saritepeci (2017) explained how a teacher's experience with technology is also a factor in the learning environment. Once again, these studies imply the impact of how technology is used rather than the technology itself. After observing classrooms with the integration of interactive boards and computer tablets, it was identified that teachers with four to six years of experience of internet use had the highest integration numbers as opposed to others with less experience using technology in the classroom. Furthermore, teachers with five to seven hours of daily internet use "had the highest classroom management affect level scores" (Durak & Saritepeci, 2017, p. 449). The impact of technology on student learning varied based on the teacher's familiarity with the technology being used. Just as in a traditional classroom, these technology-integrated classrooms brought their cons of distractions and time management as well as their pros of student engagement and a satisfactory learning experience as seen in the secondary classroom (Durak & Saritepeci, 2017). Within the secondary classroom, it is apparent that the teacher's understanding of technology has an effect on the students' learning.

In more recent years (2019-2021), the world faced a pandemic causing school to be held online for long periods of time. A majority of students in the United States have resumed classes with traditional in-person learning. However, the need to offer instruction in both a face-to-face and an online format remains. In a study conducted by Ba ̨czek et al. (2021), student perceptions of online learning were analyzed to understand technology's impact within the virtual classroom. Approximately 804 students participated in a questionnaire regarding the advantages and disadvantages of virtual learning. The questionnaire also asked students to compare online learning with face to face learning. Overall, the most prevalent advantages reported by students

included being able to stay at home, having continual access to materials online, learning at one's own pace, and having comfortable surroundings. Disadvantages included the lack of interaction with students and technological difficulties. As Ba ̨czek et al. noted, "self learning requires the student to maintain self-discipline, which can be difficult without direct supervision from the teacher" (2021, p. 3). Survey respondents reported that prior to 2020 and the beginning of the COVID-19 pandemic, they had not experienced any form of online learning before the pandemic, increasing the technological difficulties. Ba ̨czek et al. (2021) concluded after evaluating both the advantages and disadvantages presented, that in order to make online learning successful, classroom strategies should be thoughtful with an active approach such as determining if a curriculum is best taught as teacher-led or self-directed.

Despite all the pros and cons that the implementation of technology brings into the classroom, at this point, human beings are still required to run it. With human influence, technology is our tool, but how the tool is used can have a significant impact on the students' learning experience. Technology and its integration has the ability to provide positive and/or negative impact on student learning. Technology may be a gateway into opening opportunities for students to learn in ways they never expected. How it is used, however, can also harm the students' abilities to learn and grow. Whether at the primary, secondary, or even higher education level, the implementation of technology has a significant impact on student learning.

Teacher Impacts on a Technology Integrated Classroom

As introduced with the importance of technology integration, technology can either become the tool or the teacher. Not only are the students of the classroom affected, but the teachers are as well. In certain situations, teachers have become more of a guide to students who navigate their way through the use of technology. In other circumstances, teachers use

technology as a tool in order to teach. So, the question at hand becomes, when does technology become the tool and when does it take the place of the teacher? With this in mind, what does that impact look like on the classroom?

Technology as the Teacher: The Teacher as a Guide

In a teacher-centered approach, a dominant figure uses direct instructional strategies as a way to provide information to students about a specific topic. In a student-centered approach, the teacher becomes a guide encouraging students to perform their tasks and undergo a process of critical thinking about a specific topic (Yondler & Blau, 2021). Teachers use the digital environment in the classroom to "enable all aspects of the inquiry cycle of learning to ask, investigate, create, discuss, and reflect" (Yondler & Blau, 2021, p. 4).

One particular study, conducted by Baytiyeh (2017), created what was called a "flipped classroom." A flipped model is "an interactive teaching method with a student-centered approach that flips the traditional classroom by moving information transfer out and moving information assimilation into the classroom" (Baytiyeh, 2017, p. 52). In other words, online materials were provided for the students, and the teacher acted as a guide in this student-centered approach. Because materials were posted online, students had to develop or acquire self-starting and self-motivating skills. Baytiyeh (2017) noted that all students received satisfactory grades whether they were a part of the flipped classroom model or the traditional classroom model. The traditional classroom had a higher performance level, however, than the first section of the flipped classroom. Baytiyeh theorized this was primarily because it was a new set up for both students and the teacher. However, after further observation, Baytiyeh determined there was no difference between the flipped classroom and the traditional classroom (2017).

Though the data shows little difference in grades with the flipped classroom and traditional classroom, according to the surveys, students found the flipped classroom to be very beneficial. Students reported that the flipped classroom model encouraged self-regulated learning, problem solving skills, and teamwork and communication skills (Baytiyeh, 2017). In situations where the teacher is the guide and the student becomes the forerunner, students are able to build their skills sets just the same as a traditional classroom while also developing digital literacy skills. Technology is constantly changing and students need to be able to adapt to their advancing world.

Yondler and Blau (2021) recognize six thinking skills they believe to be suitable to a knowledge economy: photo visual thinking, reproduction thinking, branching thinking, information thinking, socio-emotional thinking, and real-time thinking. They further break digital literacy into five core competencies that are essential to both effective teaching and learning in a technology infused environment. In order to effectively learn, students need to develop communication, collaboration, critical thinking, creativity, and complex problem solving. Baytiyeh's (2017) study supported the idea that a student-centered classroom (flipped classroom model) develops the skills Yondler and Blau (2021) recognize. Yondler and Blau's study confirmed that teachers acting as guides reported the highest measure of e-communication with classmates and teachers. Being a guide also resulted in a higher frequency of collaboration between students.

Teachers' perceptions of technology are another factor in technology's overall impact on the classroom. The incorporation of technology into a classroom has the ability to promote learning. It allows students to further their skills and learning paths in an engaging way with a range of ways to learn (Domingo & Garganté, 2016). Domingo and Garganté (2016) observed

the impact of mobile technology with the use of specific applications. With this technology integration, the learning became student-centered and the teacher became a guide. The researchers noted that "the teacher becomes a learning guide who helps students to adapt and connect reality to the learning content, as soon as they become the constructors of their own knowledge" (Domingo & Garganté, 2016, p. 27). This study reported the students' ability to learn was neutrally impacted. In contrast, however, Yondler and Blau (2016) reported that teachers value technology when it aligns with their pedagogical approaches. If the technology being integrated meets the teachers' needs to address their learning agenda, it will be valued, and as a result, be effective.

Though technology as the teacher can certainly encourage collaboration and critical thinking skills, Sims (2017) provides a counter perspective on this application. In the setup of the Downtown School, a school designed on a gamification pedagogy, the intent was for students to experience a student-centered learning environment. This environment would have "cutting edge educational interventions" and new technologies embedded everywhere in order for students to connect to the real world and develop skills such as problem solving and creativity (Sims, 2017, p. 32). Despite excellent intentions, the student-centered, technology-infused approach brought unexpected behaviors. Sims expressed:

> Not long after the school opened, it became evident that the school's gamelike pedagogy did not have the motivational powers that the school's designers had hoped. Almost immediately after the school opened, many school leaders, teachers, and parents worried that students were out of control (2017, p. 94).

A lack of social etiquette and respect was noticeable among the student population. Sims (2017) further concluded that the gamelike schooling problematized the vision of learning and identity

formation. In other words, identity transformation became reducible to knowledge acquisition. The sample, therefore, demonstrates that there may also be negative consequences when giving technology the position of teacher.

Technology as a Tool

Technology is continually evolving as a part of everyday life, and continues to evolve as it is implemented into the classroom. It is not going away any time soon. Just as society must advance with technology, so the education system must too. However, this does not mean that technology should be the driving force of the classroom. As the research of many has shown, technology does not have to be limited to having either a positive or a negative impact on students. Rather, technology has trade-offs that must be weighed when considering the best possible options for the classroom. Technology is a tool teachers can use to teach their students based on the society they live within.

Nicolas (2018) cautioned that technology could be experienced as a replacement: "When technology is used to simply provide an alternative way to achieve the same instructional goal…this is defined as technology as a replacement" (p. 432). The use of whiteboards and other interactive boards have replaced the use of traditional chalkboards for many teachers. Technology is seen as a supplement to teaching, but it is the teacher who must maintain "primary control over the management of their classes" (Nicolas, 2018, p. 434). According to Nicolas's (2018) research, students cannot advance with technology alone. Teachers are needed for the students in order for them to progress.

With the world advancing, students need to be prepared with specific skills to succeed. Margolin et al. (2019), identified four essential skills for 21st century success: collaboration, communication, creativity, and critical thinking. In their research, they identified that technology

has the ability to connect students with learning opportunities to grow these skills, and rightfully so. If the 21st century is filled with advanced technology, then advanced technology should be the tool students use to develop these four skills which have been encouraged for years in the education field. As Margolin et al. (2019) found, their experimental set up encouraged teachers to use technology and student-centered practices as tools in the classroom. Based on responses to the surveys given, the majority of teachers were in agreement that technology enhanced student learning, and that they have an understanding of how to use technology to enhance the classroom. Margolin et al. (2019) concluded that technology should be used as a tool based on the current society students live in.

Technology as a tool may also have the ability to enhance student communication skills. Erkan (2019) explored the integration of technology into the classroom and its effect on communication skills. Erkan completed one-on-one interviews with 18 secondary school teachers and 77 students. Overall, teachers reported that their communication and interaction with students was divided between positive and negative experiences, with the positive experiences slightly outweighing the negative ones. Of the students that were interviewed, 64.7% agreed that technology had a positive effect on their communication skills. Student communication was observed to have the ability to be enhanced, if technology was correctly integrated into the classroom. Erkan (2019) concluded, “The research showed that even when teachers and students have adequate technology to enhance communication/interaction, it is still not a guarantee that they would learn successfully” (p. 38). Technology, therefore, has the ability to change and develop the communication skills of students, but must be done so both skillfully and intentionally in order to be successful.

Despite technology's opportunities for advancement in the classroom, this tool is not always properly used. Margolin et al. (2019) suggested that even with technical implementation, the teacher's use of the tool had an impact on the classroom. According to the survey given, teachers who had 20 or more years of teaching experience were less likely to agree that they had the ability to integrate technology into the classroom. Nicolas (2018) came to a similar conclusion with 27% of teachers unsure of how to integrate technology into the classroom. In other words, if technology as a tool is not understood, then it is not helping the students advance and better understand the advanced world they live in. This does not mean that technology should not be used or should be used in place of a traditional teacher, but in order for students to be prepared for their advancing world, teachers need to be informed of the benefits, disadvantages, and tradeoffs with technology as well.

Technology will continue to be integrated into the classroom. As Yoo (2021) notes, teachers are expected to integrate technology into their pedagogy. Technology needs to be incorporated into the curriculum because it develops 21st century skills such as technology literacy, critical thinking, and problem solving. When looking at integrating technology into the music classroom, Yoo (2021) came to the conclusion that playing in an ensemble developed these skills without the use of technology, even if technology could be a benefit to the classroom. Technology brings both benefits and challenges, but how it is integrated impacts the students, their success in learning, and their ability to communicate.

Ukah (2020) emphasizes the importance of training teachers to understand the technology at hand. Many school systems switched to different forms of e-learning, prompted by the COVID-19 pandemic. Teachers were able to be extremely effective and efficient when they were competent with the technology being used. However, Ukah found that providing the resources to

aid in teacher's competency was hindered by cost of resources and connectivity. Ukah noted the importance, and even necessity, of the world's growth in e-learning for students, and the challenges of bringing this to third world countries. The potential of technology as a tool can be summed up with the statement that "successfully implementing online learning into the curriculum requires a well-thought-out strategy" as well as an active approach (Ba ̨czek et al., 2021, p. 5).

Each of these studies recognizes that technology is impactful on students' learning opportunities, but more specifically by how the technology is used within the classroom. In addition, not only does integration of technology in the classroom impact the way students learn, but how they develop skills such as critical thinking and communication.

Outside Technological Factors Impacting the Classroom

Tablets, Chromebooks, and Google Drive are all forms of technology typically used within the modern 21st century classroom. The use of technology within the classroom presents positive and negative impacts as well as tradeoffs on student learning. Moreover, technology in conjunction with the teacher's role in the classroom plays a factor in the student learning process. One more facet of technology to recognize is that the impact of using technology outside of the classroom can affect learning and communication inside of the classroom as well.

Technology as a Distraction

One of the biggest outside factors impacting learning inside of the classroom is the presence of the mobile device. When students are given responsibility for technology (Chromebooks, tablets, etc.), it can become a distraction and have a negative impact on their learning. For example, in research conducted by Ferreira (2016) within the secondary classroom, the mobile phone was found to be the most distracting feature of the included ICTs within the

classroom. Attitudes towards technological discipline in the classroom have shifted and have been tested. Ferreira (2016) noted the increase of plagiarism in the classroom due to the use of mobile devices and their unlimited access to information. In addition, school is not only an educational setting, but a social setting as well. Phones are a big part of many teenager's social culture. Ferreira commented, "There's a kind of availability loyalty in the fear of failing to meet, on an urgent basis" (2016, p. 435). Students in the secondary grade levels are used to near-constant interruption and availability, and as a result, are continually distracted in the classroom. With a lack of attention, students' abilities to focus and learn are greatly diminished.

Burke et al. (2022) supported the notion that mobile devices negatively impact the classroom due to the distraction that they bring. In a study conducted by Burke and colleagues, students used mobile devices for classroom specific purposes by first understanding that learning requires socialization. Mobile learning has the potential to advance learning, but how to implement it most effectively has yet to be discovered. After gathering and studying collected data, Burke et al. (2022) found that mobile devices were not used in collaborative ways as hoped for, and provided a limited use for educational purposes.

Looking towards the future of secondary students, Santos et al. (2021) observed the use of cellphones in the college classroom. More than half of the students observed brought smartphones to class. In this setting where cellphones were allowed, Santos et al. (2021) found there was a negative impact of learning and student performance. They determined it was due to the use of cell phones for non-academic purposes during class including texting/messaging and scrolling through social media. Not only did this end up distracting students from their work, but it also distracted the students around them.

A similar conclusion could be drawn about students who browsed websites unrelated to the topic being taught during class time. The students who were surveyed even admitted the distractions they were facing and suggested methods as to how to deal with the circumstances such as coming to an agreement with the professor about a device policy. Santos et al. (2021) further noted that students who attended class where mobile phones were prohibited, reported that they ended up having more positive interactions with their teachers than in classes where mobile phones were allowed. The implementation of technology in the classroom can be beneficial, but its ability to distract requires a transformation of student habits.

Social Media's Presence

The presence of mobile devices both inside and outside of the classroom also brings the presence of social media into the classroom learning environment. In a study conducted by Williams (2021), an analysis of data found that the presence and use of social media was affecting the cognitive development of students in the secondary setting. Similar to Ferriera's (2016) work, Williams (2021) pulled from Vygotsky's theory that learning outside the school impacts the learning inside school and vice versa, and culture impacts the cognitive development of children. Vygotsky's theory encompasses the idea that children learn based on their socialization. Therefore, when the outside environment includes the constantly active and distracting use of social media, students' learning in the classroom is affected.

According to Williams (2021), 95% of teenagers in the United States have access to cell phones and 81% of those students also are connected to a social media platform. Williams acknowledges that previous research has led people to understand that social media and social interactive technology increases communication skills. Social media has an impact on one's behavior and cognitive development. After conducting interviews, observations, and focus

groups, Williams (2021) found that social media use increases the need for instant gratification, creates distraction in the classroom, and develops conflict in the classroom environment. Interestingly, in regards to instant gratification, Williams mentions, “I think students are losing their patience in finding answers. Technological progress, social media included, has enabled our students to become lazy. They don’t have to think" (2021, p. 116). The attention span of students is shortening as students focus more on comments within social media and less on classroom learning. Writing and spelling skills have decreased with the use of texting language and the need to respond instantly (Williams, 2021).

To understand the growing impact of social media throughout a student’s life, Šerić (2020) sought to better understand the impact of social media on college students. Data was collected from 303 students analyzing the impact of social media on nonverbal communication, expertise, clarity, perceived value, and cognitive learning. The results displayed that social media had a negative effect on cognitive learning. Moreover, the teacher’s ability to provide clear instruction was another aspect that suffered due to the influence of social media. The only positive impact noted was social media’s influence regarding the value and perception of the class. Although social media may have increased interest, its negative impacts outweighed the positive. Therefore, teachers are encouraged to use caution when integrating social media into the classroom environment.

Not only does social media provide a means of distraction, but it also opens the doorway to cyberbullying and technostress, further impacting student learning. Raza et al. (2020) defined technostress as “a new disease of adaptation produced by a failure to manage with the modern technologies in a healthy way” (p. 3). While students struggle to adapt, they are also developing the skill to multitask which can have a negative impact on learning. After collecting data from

secondary schools, Raza et al. (2020) concluded that technostress, cyberbullying, and media multitasking were all factors in negative academic performance for students. When students used technology in class for nonacademic performances, grade point averages (GPA) dropped. As cyberbullying increased, behavior was negatively impacted. Raza et al. (2020) recognized the benefits of social media to create better communication, improve cooperation, and increase access to information. But despite social media's possible benefits, its negative impacts need to be addressed as students' learning in the classroom will continue to decline until then.

Teacher Attitudes

The distractions of mobile devices and social media are certainly obstacles in the process of integrating technology into the classroom. Attitudes toward technology also play a role in students' learning. In a study conducted by Alswilem (2019), the need to integrate technology into the classroom is emphasized, especially in the secondary classroom, to succeed in what Alswilem terms the "Internet Era". In order for students to receive an education with successful technology integration, however, teachers need to be fully invested in the implementation of technology. According to Alswilem's research, "attitudes in teaching and learning are an essential element for technology integration and often play a vital role in the achievement of educational aims" (2019, p. 170). A lack of confidence, competence, time, effective training, and accessibility are all factors that tie into teacher attitudes in regards to technology. When teachers become resistant to change, student achievement is negatively affected. Even when teachers have positive attitudes towards technology, it is difficult to make sure that technology is being integrated well. To put it simply, the attitude of the teacher is the catalyst for student learning.

Makhlouf and Bensafi (2021) confirmed that the attitude of the teacher impacts student learning through their own study. After analyzing observations and data collection, Markhouf

and Bensafi determined results demonstrated that there was a positive correlation between teacher attitudes with ICT in education and their perception of computer attributes. In addition, teacher attitudes greatly influenced how technology was embedded within the classroom. In their survey of secondary teachers, 82% agreed that computer technology would improve education and 76% agreed that technology provided advantages over the traditional method of teaching. Yet overall, teacher perceptions fell in the neutral to positive category regarding the relevance of technology in the classroom. Technology was not prioritized in the practices of the classroom. Oftentimes, time and meeting the curriculum's standards were perceived to be large obstacles preventing this integration further.

Though technology has the potential to be beneficial for student learning, it must be properly embedded. There is not one perfect way to integrate technology into the classroom. However, Alswilem (2019), found that technology training tended to focus on using the equipment rather than integration within the curriculum. This led to a negative impact on student learning fueled by a lack of training and/or integration knowledge.

Mercer (2019) aimed to understand the pedagogy of digital learning as well as how language and cognitive development were impacted based on students' socializing. During his research, the participants of an experimental group were given a pedagogy surrounding socialization with the use of integrated technology. The students were required to talk, the activities were designed to encourage cooperation, and all needed to understand the point and purpose of the activity. Students were required to have an awareness for how talk could be used for sharing ideas and solving problems. With this language pedagogy set in place, computer-based, literacy-related activities were implemented within the classroom. In fact, technology played a key role in keeping students engaged. In the end, the experimental group

with the infusion of technology and language pedagogy had a positive learning outcome. The door to using technology for sharing, critiquing, and reformulating ideas was opened, and dialogue was mediated. Mercer declared that:

> In this technological age, the teacher's pedagogical stance and understanding of how best to exploit the affordances of digital technologies are critical in determining productive use of these tools in teaching and learning. Yet TPD is often focused primarily on developing technology skills, and the inadequacies of this focus are now well documented (2019, p. 195).

How teachers integrate and approach technology is incredibly impactful on students in the classroom. Through this study, Mercer found that infusing digital technologies with the language pedagogy provided a space for students to thrive in their learning environments. Once again, the technology is only the tool; it is the pedagogy, provided by the teacher, that has further impact.

In order for teachers to properly integrate technology into their pedagogy, training and competency is required. Deaney and Hennessy (2007) interviewed a series of secondary teachers who are a part of a school that is now one of 123 most outstanding secondary schools in England due to their information and communication technology (ICT) integration. Every department in the school has an ICT policy and ICT coordinator, ICT skills training is offered for staff (at all levels), and the school's departments have dedicated ICT rooms. All of this became possible due to the investment of the school in properly integrating the technology into their environment. After three years of integrated technology teaching, 16 teachers from the original research observation were interviewed. Upon interviewing them a second time, Deaney and Hennessy (2007) found that their ICT practices continued to grow and develop. Deaney and Hennessy shared, "Teachers and their colleagues highlighted the importance not only of developing

confidence and competence in the use of the technology, but also in the pedagogical approaches at the heart of each practice" (2007, p. 82). The competency and confidence of the teachers regarding technology integration became a big factor in the success of their school and the learning process of their students.

Technology is impactful on its own. How that technology is integrated into the classroom affects student learning even more so. Furthermore, teacher attitudes impact student learning because teacher attitudes affect how technology is used within the classroom. The pedagogy is just as, if not more, important than the tool that is technology. When teachers are competent and confident in their ability to use digital technology in their pedagogy, then students are able to experience a positive learning experience through the use of technology.

CHAPTER III: DISCUSSION AND CONCLUSION

Summary

This literature review was conducted in order to gain a better understanding of the impact of technology and technology integration on secondary student learning within the classroom. In today's world, technology is continually advancing and is becoming integrated into every part of daily life. In the same way, technology has been growing in its presence within the classroom. It's inescapable. The literature review supports evidence that technology has multiple facets when it comes to its impact on secondary students in the classroom.

Technology has the ability to impact student learning in a positive manner. It has displayed an increase in meaningful communication, critical thinking, creativity, and collaboration. There is evidence of an increase in student interest and engagement in the secondary classroom with technology paving fun educational paths by the ways technology can be integrated. This was further emphasized through a brief review of the impact of technology and its integration at the college level. Students are reacting positively to a tool that allows them to enhance their independence.

On the other hand, research has also shown that technology has the ability to negatively affect student learning in the classroom. Though motivation may improve, the data available noted that many of the classrooms observed did not improve in regards to scores and other measures of success in the classroom. Though creativity and collaboration have been evident in technology integrated classrooms, there is a lack of learning the core material itself. Furthermore, the way technology is integrated is not always sustainable for developing adolescent minds. One of technology's downfalls is that it can be a distraction, and therefore, decreases student

concentration and focus. At the secondary level, students' brains are at a critical point of development, and when specific skills are not taught, then those skills become underdeveloped.

The use of technology in the secondary classroom can also have tradeoffs (neither positive nor negative). In this case, technology is perceived as a tool that has the ability to provide either a positive or negative impact on student learning based on how it is used. Technology was noted to be a distraction, but also a way to increase student collaboration when teachers were more selective about tasks or apps used. When considering mobile technology specifically, researchers noted that it had the ability to increase student achievement, but using mobile technology within the classroom is a realm that is still being explored. Overall, the literature review concluded that students and teachers alike have positive views towards technology, but the learning in the classroom hasn't necessarily improved. It's just different.

As technology is integrated into the secondary classroom, it has the ability to take on its own role: as the teacher or as the tool. In some scenarios such as the flipped classroom noted in the study of Baytiyeh et al. (2017), technology has become the teacher with the teacher presenting themselves as the guide. This setting of self-directed online learning provides opportunities for students to learn more independently and to develop the capacity to be digitally literate. With a student-centered approach via the method addressed, students may experience both positive and negative impacts from the learning process. On the other hand, technology may take on the role of a tool. Depending on its use, technology can positively or negatively impact student learning. Though our society advances, technology is merely a replacement for old ways. The learning process isn't changing, but the tool is. Current research has also emphasized that students still need human interaction in order to properly understand the advanced world around

them. Teachers need to be knowledgeable in the realm of technology and how to balance it with face-to-face interactions and learning opportunities for students

Understanding the impact of technology in the classroom is important, but not the only factor to consider. It is also important to understand how outside factors related to technology impact the classroom as well. Technology is now a part of daily life, and its factors outside of the classroom also impact those within the classroom in accordance with Vygotsky's theory. The most prominent outside influence includes technology's distraction factor. Whether students are using tablets, Chromebooks, mobile devices, or otherwise for classroom work, technology is strongly pulling student focus with its temptation to distract. When students go home and spend time invested in technology, it continues to affect how they relate to others in the classroom.

Social media is yet another factor that impacts student learning within the classroom. With teenagers' minds focused on the ability to "connect" with others and constantly be available, distraction as well as anxiety increase. Social media has an incredible impact on the social belonging and skills of teenagers, and when their social circles are suffering, other areas of their lives decline as well. As a result, learning is negatively impacted.

The attitudes of teachers and how they integrate technology within their pedagogy are also impactful on student learning and communication. When teachers have experience with technology and a positive attitude towards the use of it, the way it is integrated tends to have a more positive impact on student learning. The teacher's approach to integrating technology within the classroom impacts the attitudes of the students as well. Furthermore, technology is a tool and when it is not used for its intended purpose, students don't gain anything from it. For example, a Google slidedeck simply becomes a replacement for the chalkboard when it might in fact have the ability to be more interactive and engaging with the classroom via programming

tools such as PearDeck. Technology integration and use needs to be both intentional and purposeful in order to positively impact student learning.

Professional Application

With the expanse of research provided, application is needed in order to further provide the best education possible within the secondary classroom. First, both teachers and students need to be made aware of the impact that technology has on both learning and communication skills. Without an understanding of how something affects us, we cannot hope to grow and change. In order to allow the positive impacts of technology in the classroom to thrive, the negative impacts must also be understood.

Not only does there need to be an awareness of technology's impact, but action must be taken in order to adhere to its positive impact. Teachers need to be trained in the practices of technology, whether devices, programs, or softwares are used in the school's system. When teachers have a better understanding of how to use the technology, the students benefit as a result. However, teachers should not only be trained on how to use the technology, but also on how it can be best integrated into the curriculum. For example, even though a teacher may understand how to use the program PearDeck (an interactive slideshow), they still need an understanding of how the program can be best integrated to help students gain the most out of the lesson. Technology is a tool; how it is used within the curriculum has an incredible impact on student learning.

Lastly, this research can be applied with the encouragement of socialization. After all, these students are human beings and need to be reminded that they are more than the words they type behind a screen or the pictures they post on social media. As a result, implementing time throughout the school day that is device-free will aid in helping students fully develop their

communication skills. Students need time to speak with their classmates face to face and to practice showing empathy for one another. Whether this is apparent in classroom discussions, device-free lunchtime, or breaks from devices in general, students need time to not depend on the technology in front of them. In fact, to keep students further from distraction, it would help for teachers to block sites that are not needed for class time such as messaging platforms.

Limitations of the Research

Originally, when beginning this research process, I wanted to better understand how technology impacts our humanity - what makes us human. Though this is a fascinating topic, it is more of a philosophical one, and as a result, there was not much research to pull from, and it is also too broad of a topic for a literature review thesis. Furthermore, with planning to research technology's impact on learning and communication skills, I hoped to understand whether theatre arts could be used as a means to redevelop lost skills for students. With a background in theatre arts, I personally have witnessed the development of various skills for people of all different backgrounds who walk onto the stage. Unfortunately, once again, there was not much research to review and learn from. Therefore, I chose the route of seeking to understand how technology impacts student learning in the classroom. The range of P-12 continued to be too broad as students' development varies within that span of time. So, I narrowed my focus to the secondary level. Though there are primary and college-focused perspectives sprinkled in, the majority of the research reviewed comes from the secondary level lens. The last limitation to note is that this research is still developing as technology gradually becomes more integrated into the education system. Technology in the classroom continues to be developed and observed.

Implications for Future Research

It is evident in our society that technology will continue to advance and be a part of daily life. Future research is needed in order to understand how best to implement technology into the classroom. There certainly is research available, but more often than not, teachers are made aware of how to use technology but not how to integrate it in the best way possible. Understanding technology tools' specific purposes must be further researched in order to enhance student learning within the classroom. Since experiencing the COVID-19 pandemic, it will be interesting to see what research says on how technology has affected students within this time period. Research is further encouraged in regards to those that have experienced underdevelopment in skills. It is apparent that technology has negatively impacted students in their development of communication skills. Though it is a skill that has lacked development, the brain still has the ability to gain that skill with practice. Further research is needed in order to understand the practices needed to recover these skills for our students.

Conclusion

Education is an essential part of how we learn and grow in regard to ourselves and the world around us. Personally, as I come into my classroom, I hope to be giving my students a new perspective each day about the people around them. With the world ever growing and advancing in technology, it is important that I continue to reflect on how this technology impacts my students and their learning process in the classroom. Not only that, but we might understand how it affects teachers as well.

From personal experience, I have seen an increase in underdeveloped communication skills. I see students unable to make eye contact or to hold a conversation because it's "too awkward." With the increase of technology in their lives such as with phones, tablets, social media, and Chromebooks, there is a decrease in attention span, focus, and understanding the

content of various subjects. It's simply easier to "Google" the answer. However, I've also seen the beauty of advanced technology. For example, some students have created incredible projects to showcase their learning while other students have used a plethora of databases to help in their research papers. With these observations in mind, I wanted to better understand technology's capabilities because, like most teachers, I hope to provide the best learning experience for students that I can.

As a result of this literature review, it can be concluded that technology impacts the learning of students at the secondary level in positive and negative ways while also being subject to tradeoffs. How that technology is integrated is even more impactful as it has the potential to be either the teacher of the class or the tool to enhance the teaching. Outside factors of distraction, social media, and teacher attitudes play a part in student learning with the integration of technology as well. Technology is indeed impactful on student learning, but the answer of "how" is not simply black and white.

Knowing that technology integration sometimes comes with a tradeoff, and has the potential to either positively or negatively impact students' learning should prompt educators to invest in pedagogical technology training. It is my hope that we make efforts to integrate technology to the best of its ability in order to help our students thrive rather than fall behind. Furthermore, I believe that we as teachers need to take it upon ourselves to intentionally connect with our students. As human beings, we need human connection that extends what may be lost with technology. We need to feel that we are known, and that applies to our students as well.

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