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Effects of Using Technology as a Substitution for Education for Students During the COVID-19 Pandemic

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Introduction

On December 12, 2019, the first cases of COVID-19 were detected in Wuhan, China. From that moment on, the highly contagious disease would spread out across the countries of the globe, and quickly to cities and towns until every corner of the world would have the presence of the virus, thus resulting in the ongoing global COVID-19 pandemic. As the cases began to rise rapidly, the majority, if not all, of the nations of the world began to place a lockdown on everything to prevent the spread even more. This then forced many schools to shut down and transition from in-person teaching to fully online learning. It did not matter the age or grade level; everyone was experiencing the same situation whether they were a college student like myself or a nine year old elementary student. Even though schools tried their best to offer the same type of education online as it would be in person, it was clear that both methods varied greatly.

For me, it was not necessarily hard to attend my zoom meetings because I already had that discipline built in me, but even then it did feel more of a hassle to go to a class online rather than in person. With that being my only "hardship" while in online school, it made me realize that others had more and greater hardships than I did when it came to online learning, with the number one reason being that there might be some students with no internet connection. With the various hardships comes the various effects of online learning and for some, the effects are concerning. It wasn't until I began doing my service learning hours last year at an elementary school's afterschool program that I got to see an overall view of the effects of learning through technology only. One student in particular stood out to me the most because she was in 2nd Grade and still did not have the capability to read a simple picture book nor a basic understanding of addition and subtraction. Ever since then, I began to think more on this subject

matter because I know that there were probably thousands (if not millions) of students nationwide and worldwide who were in the same shoes as this little girl that I had met. Because of that, I decided to focus my attention for this capstone paper on the effects of technology as substitution for learning. The primary question that I propose for my research would be: How did the use of technology as a substitution for education affect students during the pandemic? Questions that are related to this topic would be: What is technology and the types of technology that have been used for education during the pandemic? How has it changed during the pandemic? What does research say about the effects of using technology as a substitution for education for students during the pandemic? During the pandemic were there any inequities with online learning with different types of students? If so, how did it affect students' learning in the classrooms? Did the increase of technology in teaching and learning drive students to a less physically active lifestyle according to teachers? If so, how? What will the future hold for the role of technology that could be used as a substitute for teaching and learning in the future? In other words, will technology still be an integral part for teaching and learning?

Literature Review

Research into this topic is not unknown as there have been plenty of articles and websites that demonstrate their own studies and facts about what has been observed as the true effects of using technology as a substitution for learning. The transition from in-person learning to online was difficult for a lot of schools since not everyone had the same amount of technology or digital literacy to be able to have a successful online class, or be a student in one. The dictionary definition of technology would be "the application of scientific knowledge for practical purposes, especially in industry." With schools during the pandemic, this was mainly seen through the use of computer software to operate fully online. Schools used many online software

or linked themselves to different means of communication that were used by teachers and students to continue learning remotely (Maykon Dhonnes de Oliveira Cardoso, Heliana Pereira Portilho Fuhr, & Kátia Gonçalves Dias. et al 2020 p.12). This would be applications such as Zoom and Google Meet. Compulsory education was predominantly synchronous online with homework being done asynchronous as it always has been (Klosky, Gazmararian, J. A., Casimir, O., & Blake, S. C. 2022 et. al), and college courses went further to allow the option for asynchronous classes as well. Some college students found it quite convenient that the professor would record their lectures so they can rewatch for reference and have tests be made online to take at their preferred time of the day and not have to wait for their turn during in-person teaching (Wilczewski, Gorbaniuk, O., Mughan, T., & Wilczewska, E. 2022 et al). Across elementary schools, teachers use platforms such as Schoolzilla, Nearpod, Google Classroom and Khan Academy, with high schools also using the latter two (Herold, B. 2022). One platform that was common not just in compulsory education but also in higher education was teachers' use of Kahoot, a Norwegian game-based learning platform, used as educational technology to create engaging quizzes for students. The platform allows students to learn and comprehend a material/subject by playing it as a game so the process is enjoyable instead of a boring learning method (Djannah, Zulherman, & Nurafni et al. 2021 p.2)**.**

Ever since online learning began, there have been many researchers who took matters into their own hands to uncover what were the effects of using technology as a substitution for education and learning during the pandemic. One major thing that a lot of studies have shown is that a lot of students have demonstrated to have declines in their academic abilities. In 2021, one systematic review of global learning losses during the pandemic found that all students younger than college have found declines in their academic performances. Students during this time

overall exhibited significant declines in learning and in academic behavior since school was all remote. Because of learning declines, when schools went back in person, schools would evaluate students on lower academic standards in order to move them onto the next grade since they did not want to evaluate them on materials that they simply could not learn. (Klosky, Gazmararian, J. A., Casimir, O., & Blake, S. C. et al. 2022 p. 657-660). Subjects such as Math and English were specially noted to have learning declines amongst students. A study demonstrated that after the first pandemic, students' scores showed a delay in Mathematics as compared to students in the same grade that experienced school in person (Oostdam, R., van Diepen, M., Zijlstra, B. et al. 2023).

Another effect reported of using technology as the main teaching mode was that students began to feel more and more disconnected from their academic lives and anything within it. Some students reported losing interest in their majors and future careers because part of the learning process for their studies required in person tasks and training and having to do everything online did not feel the same. Students become unmotivated as the days went by since the online environment was not the same as the classroom environment and everything felt like the students had to learn themselves. (Wilczewski, Gorbaniuk, O., Mughan, T., & Wilczewska, E. et al. 2022 p.706-707). The lack of overall connection to teachers/professors and peers was detrimental for many students. In one 2021 study, the 87% of student participants reported that connection with peers decreased dramatically and 89% said the same thing with regards to their overall college community (Gonzalez-Ramirez, J., Mulqueen, K., Zealand, R., Silverstein, S., Reina, C., BuShell, S., & Ladda, S. et al. 2021 p.13). In another study, 67.8% of student respondents say they have difficulty communicating with their professors during online lectures, 59.5% said that they had difficulty finding references or reading material during online lectures

and 62.7% had difficulties in doing assignments during online lectures (Yanti. 2021 p.185).
Seeing something through a screen is completely different than seeing it in person, and for
students, that difference caused some to slowly wither away from the connection to their
scholarly lives that they had before the pandemic.

Another effect of using technology as a substitution for learning is the unhealthy increase
of screen time amongst students through the uses of smartphones, tablets and computers. Since
everything was done remotely and access to education was only through a computer, it was quite
predictable that the use of technology would increase with students. Research shows that
students (most notably children) spend about 97 minutes on Youtube in the early days of the
pandemic, which is considered twice as much as it was in 2019 (Regis College 2021). Having
too much screen time can pose some negative consequences in a student such as vision
impairment, sleep deprivation, anxiety and even addiction to the device itself. Parents in
Australia reported that their children's screen time increased, with 48% saying by a lot and 37%
saying by a little (Reece, Owen, K., Foley, B., Rose, C., Bellew, B., & Bauman, A. et al. 2021
p.365) and in countries like Greece, parents have also reported that their children spend a
significant amount of time on the internet and technology uses on stuff other than the intended
school obligation purposes. They saw a correlation with this and a reduced amount of sleep and
interest in hobbies (Iliopoulou, & Koutras, V. 2022 p. s190-191). Additionally, because of the
growing attachment to technology, students become less interested in peer/social interaction and
educational matters. In young children, this can be quite detrimental because that is a time in
which peer interactions are crucial to develop their social skills.

When schools went online because of the pandemic, many tried to keep everything the
same and equal for everyone. However, the truth is that because of this new transition with

technology, many inequities arose amongst different types of students. Research shows that inequities were soon identified with different grade levels since fewer students were performing on grade-level who attended schools that had other students that were predominantly Black and Latinx, including schools that were located in lower-income neighborhoods. This is because of the digital divide amongst students from different backgrounds, a barrier to remote learning during the pandemic. It is the notion that schools that are not well resourced are the ones that do not have the ability to properly offer remote learning and the children from lower-income families would not be able to have the technology needed to participate in virtual learning (Klosky, Gazmararian, J. A., Casimir, O., & Blake, S. C. et al. 2022 p.662). Issues like this affected many students across the world, with all of them having one thing in common: their lower socioeconomic status. Greek researchers noted that children from lower income families are more prone to develop internet problematic use (Iliopoulou, & Koutras, V. 2022 p. s190-191) and researchers from Brazil found that only 31% of elementary students and 42% of high school students had the proper equipment to be able to attend school virtually. In other words, it was nearly impossible for more than half of the students to be able to attend school for issues that they cannot control themselves (Maykon Dhonnes de Oliveira Cardoso, Heliana Pereira Portilho Fuhr, & Kátia Gonçalves Dias. et al 2020 p.13). Students themselves have also expressed the different inequities that they have experienced themselves with remote learning. In a study previously mentioned, 60% of participants said a barrier to their education was not having a stable wifi connection, 71% said it was because they did not have a quiet place, and 45% said they did not have the financial support or resources to do online education (Gonzalez-Ramirez, J., Mulqueen, K., Zealand, R., Silverstein, S., Reina, C., BuShell, S., & Ladda, S. et al. 2021 p.11). Even if schools tried everything they could in order to make remote learning as easily

accessible to every student, studies have shown the matter to be otherwise, as they have shown that online learning was not everyone's proper fit. Even if they tried, some students did not have the adequate support for accessing their education, and this notion has been unfairly skewed towards students of lower socioeconomic status.

Furthermore, a common finding that was revealed was that because the use of technology became the primary source of learning and going to school, students saw themselves becoming less active as the days went by. Resin College goes on to mention that "researchers have found strong correlations between too much screen time, such as from television watching and computer use, and obesity in children. Some evidence suggests that children often eat less healthy food, and more of it, when they spend an excessive amount of time in front of screens" (2021). Students' screen time during the pandemic drastically increased while at the same time, their physical activity and their time spent outdoors lowered tremendously. Parents have added to this by some claiming that their children's physical activity levels (most notably, ages 12 and under) have decreased with as much as 31% of parents claiming by a lot and 39% by a little (Reece, Owen, K., Foley, B., Rose, C., Bellew, B., & Bauman, A. et al. 2021 p.365). When it comes to college students, the same change was reported to occur amongst them since in a study, 55% of respondents claimed that when school became online, their physical activity and exercise time greatly decreased (Gonzalez-Ramirez, J., Mulqueen, K., Zealand, R., Silverstein, S., Reina, C., BuShell, S., & Ladda, S. et al. 2021 p.14). During this time, students had no need to walk to class, and with everything being online, their drive to be moving around decreased overtime due to having school at the comfort of their own room and screen. Thus, many had no intention of increasing their physical activity since technology offered everything with easy access and

addiction to screens made it hard for students to even think of making the time to move around and exercise.

Now that we are entering the new post pandemic phase in our lives, the question of technology has shifted to how it would be used in the future of education now that almost every school in the world is now open for students to come learn in person. As research shows, many teachers have shifted parts of their curriculum so that technology can be an integral part of learning. A vast amount of educators will see themselves integrating platforms like Kahoot as part of the learning process due to how many media experts, material experts, teachers and learners have concluded that this specific platform has been deemed worthy of being used in teaching activities (Djannah, Zulherman, & Nurafni et al. 2021 p.6). Studies have also shown that a good amount of teachers also plan to use sites such as Google Classroom, with a survey showing that 48% percent of teacher respondents chose this platform during the pandemic and continue to use it even when education is done back in person. Many teachers and administrators alike also plan on continuing with blended learning, in which there would be a combination of face-to-face and digital instruction in the classroom and possible digital tutorings in the classroom (Herold, B. 2022). There are, however, some places that do not plan on improving the curriculum in schools with technology. They either kept everything the same as it was before or made changes that were at the bare minimum. Emiliana Vegas mentions in her article, "Education technology post-COVID-19: A missed opportunity?" that many countries/states have not reformed schools in any way and did not use the intervention of COVID-19 to make changes. The only change that was done temporarily is to make technology be the complete mode of teaching and learning during the lockdowns, but Vegas mentions that technology should be used as a crucial tool and not a substitute for education.

Methods and Procedures

For this research paper, the population mainly consisted of subjects from my hometown of Salinas and some from my own university campus. In my hometown, the main source of subjects for me was in my workplace, where a lot of college students and high school students work so it was a very convenient place to ask people to participate in this research. As for other subject participants, I mainly relied on friends and old professors and teachers to be participants in this study since they were the ones that were more likely to respond to me. For elementary subject participants, I asked my old 6th grade teacher if he would be willing to let his students participate anonymously in this research process, to which he agreed.

The way that I conducted this research was through the use of questionnaires and two live voice interviews. Originally, I had planned to interview the majority of participants using voice interviews but because of time conflicts with people's schedules, I ended up using online questionnaires as the main means of collecting data. Through the use of google docs, I created three different questionnaires: one for elementary students, one for highschool/college students and one for teachers/professors. The first two questionnaires for the students were quite similar to each other but the one for high school students had one additional question and the vocabulary was made a little more mature for the audience with more complex phrases and words. (see Appendix A and B).

The first two live voice interviews were with two college students, one of whom I am friends with and the other being his partner. One day when I went over to their house, I took the opportunity to ask if they would be interested in participating in this project and they both said yes. After those two interviews, I decided to continue the rest of the data collecting with the use of questionnaires so it would not only be more convenient for me, but for the subject participants

to be able to answer the questions whenever they would get the chance to. All I had to do was email each participant the document with the questions, and they would then make a separate copy to answer the questions and email that form back to me for data collection.

Through this method of data research, I believe that I was able to come close to answering the questions that I had proposed for this research because in a way, it was as if I was asking those exact questions to the participants themselves. For example, one of the secondary questions for this project was, "Did the increase of technology in teaching and learning drive students to a less physically active lifestyle according to teachers? If so, how?" and one of the questions of the survey for highschool/college students was "When school was online, how active were you? In other words, did you exercise? If so, in what ways?" (see Appendix B). Asking that question would allow me to understand the physical activity that students had back when school was only running through technology and see if there was a correlation between physical activity and technology.

After a month of handing out surveys and asking if others are willing to participate, I was successful in collecting responses from a total of thirty-four respondents. Six of them were teachers (two college professors, two high school teachers, one middle school teacher and one elementary school teacher) and twenty-eight were students (four college students, one highschool student and twenty-three elementary school students). I originally had planned for more respondents, but a few of the potential subject participants were not able to get back to me and turn in their responses to the questions in time for me to analyze the data completely.

Results

The results for this data were analyzed on two different sets: one for students' perspective and one for teachers' perspective. Since the questionnaires were mainly all the same for the

students and teachers, the data will be presented in an overall response with each of those questions to simplify the thirty-four entries.

Students

For student demographics, 17 of the student respondents were male and 11 were female. The majority of the students were between the ages of 11 and 12, the rest were between the ages of 18-24.

Question 1: What grades/years were you in during the pandemic when everything was online? The percentages of this data are mainly respective to the corresponding grades that these students are mainly in, so since I had a majority of elementary students, the percentages would show higher for them in these questions, and then following the other students.

- 82.1% of students were learning online the second half of 3rd grade and all of 4th grade
- 10.7% of students were learning online half of freshman year and all of sophomore year of college
- 3.5% of students were learning online half of sophomore year and all of junior year of college
- 3.5% of students were learning online half of sophomore year and all of junior year of highschool.

Question 2: Where would you attend your classes? (ex. Your room, your living room, kitchen etc.)

Between all of the responses, the most common responses amongst students would be room and kitchen

- 39.2% of students said they attended online school in their room only

- 25% of students said they attended online school in both room and kitchen

- 14% of students said they attended online school in their living room

- 10.7% of students said they attended online school anywhere that was quiet.

- 7.1% of students said they attended online school in their kitchen only

- 4% of students responded with other

Question 3: In what ways did your teacher/professor use technology while teaching you?Please list as many methods as known and as detailed as possible. (ex: zoom, google meet, kahoot games, jamboards, Google Classroom, Khan Academy etc.)

Amongst the various responses, the most common ones would appear to be Google Meet, Zoom, Kahoot and Jamboards

- 68.7% of students reported their teachers using Google Meet

- 39.2% of students reported their teachers using Jamboards

- 35.7% of students reported their teachers using Kahoot games

- 32.1% of students reported their teachers using Zoom

- 10.7% of students reported their teachers using Blooket

- 7.1% of students reported their teachers using Seesaw

- 7.1% of students reported their teachers using digital books/stories

- 3.5% of students reported their teacher using websites such as PearsonLabs and Learning Catalytics

Question 4: From 1-10, how easy was it for you to attend class online?

- 21.4% of students rated at 7

- 17.8% of students rated a 9

- 14.2% of students rated a 8

- 14.2% of students rated a 4

- 10.7% of students rated a 3

- 7.1% of students rated a 10

- 7.1% of students rated a 6

- 3.5% of students rated a 5

- 3.5% of students rated a 2

Question 5: Did you have your own room or private space where you could attend class?

- 64.2% of students responded with yes

- 35.7% of students responded with no

Question 6: Were there any distractions? If so, what were they?

- 64.2% of students responded with yes

- 35.7% of students responded with no

Out of the students that said yes, there were common responses as to what the distractions were

for them

- 61.1% said the distractions were family members who were in the house such as siblings, cousins, or parents

- 22.2% said the distractions were background/outside noise

- 16.6% said their distraction was their bed/falling asleep

- 16.6% said their distractions were technology related such as TV, games or WiFi

For this next question, the question was different for both the elementary students and the highschool/college students to prevent students of the younger grades to get confused on what is asked to them.

Question 7 (elementary students): Did you feel like you learned a lot while going to school online? Why or why not?

- 78% of elementary students responded with no

- 17.8% of elementary students responded with yes

Out of the students that responded with no, 26% said it was because they had technological problems such as with their chromebooks or wifi, 21.7% said it was because of distractions, and 17.3% claimed it to be the quality of school itself, whether it be the teacher or material not being engaging or helpful.

Question 7 (highschool/college students): Did going to school online instead of in person affect your grades or anything academically? If so, how?

- 75% of student respondents in this group said yes

- 25% of student respondents in this group said no

What was common with the students that said yes was because of the quality education they were receiving, even though their responses had different aspects of it

It is also important to note that one of the students that responded with no also said that even if their grades did not change for the worse, they do not remember anything that they learned during online education

Question 8: Would you want to go back to online education? Why or why not?

100% of student respondents said that they would not want to go back to online education for various reasons

- 46% said it was because online is not their preferred way of learning, whether it be because it is too hard, feeling disconnected from environment and academics, or did not work as hard

- 21.7% said it was because of technological problems such as WiFi or chromebook dilemmas

- 3.5% said it was because of their lack of movement

Question 9: When school was online, how active were you? In other words, did you exercise? If so, in what ways?

- 60.7% of students responded with saying that they did little to no exercise when everything was online

- 39.2% of students responded with saying that they were pretty active when everything was online

Question 10: Overall, from 1-10 how would you rate online education?

- 32.1% rated it a 7

- 14.2% rated it a 4

- 10.7% rated it a 5

- 10.7% rated it a 1

- 7.1% rated it an 8

- 7.1% rated it a 3

- 7.1% rated it a 2

- 3.5% rated it a 10

- 3.5% rated it a 6

Question 11: Did you experience any inequities while doing online education? (could be stuff like lack of resources, no stable internet connections, lack of care from teachers, etc.) Elaborate.

This question was opted out of the questionnaire that was handed to the elementary students due to the complexity of this topic. Students from the younger grades might not understand what inequities are yet and how to identify them, even if they are experiencing them. Therefore, this question was only for the highschool/college students to respond, so each of their responses will be listed here:

Student A: "I noticed that my connection would sometimes be unstable causing me to lag out of my zoom classes frequently. As for other inequalities, I think teachers began to care more so I wouldn't say that's an inequality and everything was virtual so there wasn't any lack of resources."

Student B: "I definitely experienced unstable internet connection while being online and I believe that being the reason that students all over the world were being taught online and so

many were on the internet via zoom, etc at the same time. I think there was also lack of care from teachers because even though we were in a pandemic, teachers would just throw so much work and assignments at us. I feel like their deadlines were back to back and would not consider us students having other classes as well. I think there were VERY few professors who actually cared about and for us that genuinely looked out for us. They [some professors] genuinely looked out for us, took the time to help and engage with us virtually during their office hours, and made sure we would take a break like making fun assignments or even ending class early to take care of ourselves. Other than that, for the most part, other professors just wanted to throw assignments at us and would take forever to grade them, resulting in us not knowing what our grades were until reaching towards the end of the semester."

Student C: I believe there was a lack of effort both from the students and the teachers. After finding out that our grades will not be affected by the quarantine, many students didn't even try anymore. The teachers would assign the same things every week just with different words. If a student needed help then a teacher would try to explain, but if that wasn't enough then the student would be screwed.

Student D: "Maybe the lack of resources and the lack of care from teachers even if they were trying to handle the situation as best they can…Everything was just dropped and assignments were just given. It was hard to access books and things that were supposed to be there provided, but couldn't digitally be."

Teachers/Professors

From my research, I was able to collect responses from a total of 5 teachers: one elementary teacher, one middle school teacher, two high school teachers and one college professor. The data

they provided will be presented based on the questions they were given and the responses they wrote.

Question 1: What years and grade levels were you teaching during the COVID-19 pandemic?

- Elementary School Teacher: 3rd grade

- Middle School Teacher: 8th grade US History

- High School Teacher A: Senior AP English Literature & Jr. and Sr. Honors Philosophy

- High School Teacher B: 10-11th grade Math 2

- College Professor: Graduate teaching assistant and adjunct lecturer 2020-2021

Question 2: How easy/hard was it for you to teach online? Please be as detailed as possible

- Elementary School Teacher: "In the beginning, it was difficult for me to teach online…I wasn't sure of the expectations that I might be held to by my admin and I didn't know (yet) how to hold my students accountable for showing up to Google Meets and turning in their assignments. I wanted to go above and beyond as much as possible for my students to make Distance Learning as enjoyable as possible for them but knew that I could only do so much through a computer…However, after a few weeks…teaching online became much easier. I eventually got used to the fact that some of my students were always going to refuse to keep their cameras on and that a few I learned of them wouldn't ever show up to the Google Meets and as much as I didn't like that, I always made sure to focus on the good - the students who always showed up, participated, turned in their assignments, and made the most of the unfortunate situation.

- Middle School Teacher: "It was not difficult to come up with activities and running through zoom and google meet. What was hard was eliciting discussion…conversation.

Being able to recognize deficiencies in students' learning. In the classroom, I could be

waling around in the classroom to see if anyone needed extra help."

- High School Teacher A: "Presenting information online was simple with the Google

  Suite of technology. Actually teaching was nearly impossible as our District maintained a

  no-harm grading policy and there was no participation requirement for students other

  than to "log on." Most students logged on and just left. Cheating was absolutely

  rampant."

- High School Teacher B: "From my end, it was simple enough. I had online resources that

  allowed students to write on PDFs. I would say it helped me improve my organization

  skills and find easier ways to teach. Most of my skills translated to in person teaching."

- College Professor: "I personally don't believe that teaching online impacted me to nearly

  the same degree that it would have in a more liberal state…I would contend that teaching

  online removes the most enjoyable classroom attributes. Specifically, engagement

  becomes almost imperceivable with many students opting to keep their cameras

  off…online courses eliminated much of the reactive human element from classes."

Question 3: Did you notice any inequities with online learning amongst your students? Be as
detailed as possible (Could be things like issues due to financial problems, no Wi-Fi, lack of
digital literacy, etc.)

- Elementary School Teacher: "Yes… Most of my students come from low socioeconomic

  backgrounds and therefore do not have enough financial resources to use for anything

  needed for Distance Learning (headphones for their Chromebooks, hotspots for access to

  Wi-Fi, etc.)...They either had regular, daily, successful access to [wifi] when they needed

it, spotty access every so often, or no access whatsoever…A little more than half of my students were able to successfully utilize digital literacy (to a grade-level standard) in order to complete their assignments and participate in class meetings…"

- Middle School Teacher: "Yes, whether it be a good wifi connection or a bad wifi connection. Sometimes you can just tell the work environment, where the student was working was not fair and balanced across our board. Hotspots were sometimes not as effective for students and that's if they were able to acquire one… sometimes even having a desk or having the added burden of having to take care of siblings that were also at home."

- High School Teacher A: "I work in a Title 1 school where most students and their families struggle with the many scourges of poverty. Many of my students have large families, limited space, and noisy learning environments. Moving, lack of internet, sick and dying family members, each and all of these were disproportionate burdens for many of my at-risk students."

- High School Teacher B: "I did. A lot of students had to take care of themselves and family while learning online. Moreover, a lot of the students did not have sufficient bandwidth to support the multiple siblings learning online."

- College Professor: "In Arkansas, I conversely did teach an online course in the FA'22 semester that has students with Wi-Fi availability and/or financial issues that constrained their school work."

Question 4: "What type of technology and online platforms did you use for learning while teaching? How? List as many as possible. (Zoom, google meet, google classrooms, kaboom, khan academy, etc)."

- Elementary School Teacher: "The technology and online platforms that I used include Google Classroom, Google Meet, Imagine Language, Imagine Math, Kahoot, Zearn, Google Slides, Google Docs, Freckle Math, and Seesaw. I would create ELA activities and/or homework assignments from the ELA curriculum with Google Slides and Google Docs and would then post those to my Google Classroom platform."

- Middle School Teacher: "Google meet was our main focus. I was already using google classroom, things like kahoot…I enjoyed using short videos to supplement whatever topic we were learning about in class. Flocabulary, that was another great one for me too."

- High School Teacher A: "I used Google Classroom, Meet and the web almost exclusively. Bandwidth issues made many synchronous digital activities challenging."

- High School Teacher B: "I used zoom to receive anonymous student feedback online and to direct instruction lesson. Kami was the online PDF editor that allowed students to do their work. I personally used google slides and Microsoft One note to have the resources prepared for the students and to provide them with online notes."

- College Professor: "I had only needed to truly familiarize myself with Zoom and Google meets for most synchronous online courses…One of the most useful platforms I learned to use…is Loom."

Question 5: Did you notice a decline in student physical activity when everything was online? If so, how?

- Elementary School Teacher: "To be honest, no, I didn't really notice too much of a decline in student physical activity when everything was online. I always included "P.E."

time during our daily online schedule for the students who were able to show

up/participate in class meetings."

- Middle School Teacher: "It was obvious, students were not able to freely do a lot of the

  activities whether it be sports, recreational, clubs that have them moving around. With

  P.E, there were expectations for students to do stuff in their house, their room and that

  wasn't always happening so yea I did notice a decline in that."

- High School Teacher A: "With the exception of some journal prompts, it was nearly

  impossible to know what my students were doing."

- High School Teacher B: "Students were participating less and prioritizing other things

  during online learning. When called upon, they would not always be available and many

  would choose to simply log in and do something else."

- College Professor: "I did not notice this with my own students, which again was likely

  due to the presumably more lax restrictions in the Texas and Arkansas areas throughout

  the pandemic timeframe…"

Question 6: What academic effects did you notice with your students? Did their grades decline

from what was expected? Explain

- Elementary School Teacher: "Those who were able to participate in daily class meetings

  (and therefore learn from me) were then able to do the homework assignment for the day

  and turn that in to me. The students who didn't have access to Wi-Fi or had home

  situations that refrained them from joining the daily class meetings definitely suffered

  academically."

- Middle School Teacher: "A Lot of my students were just not submitting their work. We

  had a no harm grading policy, meaning that students couldn't really fail. We were getting

alot of no work turned in, despite a lot of reaching out. Ghosting made things difficult. We did see that negative effect."

- High School Teacher A: "Student work was more often late and done to a lower standard than previous years. Although we only had three classes per term, student output dropped precipitously. Most of my students ended in the A or F categories."

- High School Teacher B: "Their grades and test scores were lower. Many resorted to other methods of getting information such as photomath, in order to perform better on test, but it was easily detectable. After the year online, many gaps of knowledge were noticed and we had to work in order to get them back to their expected level."

- College Professor: "My perceptions are that online instruction have alienated students from effective study habits in an in-person classroom. They are unaccustomed to taking exams away from a computer…nor do they seem to have foundational study habits. This may be because of decreasing communication in the online setting, including a reduction in instances of study groups, teacher-student meetings, etc."

Question 7: Were there any other effects of using technology for learning remotely that you noticed on students apart from academics? (could be physical, mental or emotional)

- Elementary School Teacher: "I noticed that some students (the ones who always loved learning and being in the classroom) became increasingly sad the longer distance learning went on. They always showed up for class meetings but oftentimes their participation would decrease or they wouldn't be as excited or happy or show as much enthusiasm for learning as they did in the beginning. Every student that I had during distance learning was unable to socialize with other kids their age in a classroom setting and after a while, I could tell that that aspect alone was taking a toll on a lot of them."

- Middle School Teacher: "This was a scary time for many, in terms of not knowing what was going on, and for students it could have affected them emotionally, with the fear of a loved one could be gone because of one's actions (in terms of getting them sick) the interactions with other students was also affected."

- High School Teacher A: "Lack of socialization and communication proved seriously detrimental to many of my students."

- High School Teacher B: "Students mentally lapse and can no longer focus for long periods of time. Online learning has conditioned students to have short attention spans and get more easily distracted than students before COVID."

- College Professor: "I think that students in general have not boded well from the long isolation periods…I find that many more students are reticent to interact once back in an in-person classroom…I think that online instruction has almost spoiled students to wanting more of the convenience that the [online] format offers…"

Question 8: Now that school is back in person, do you plan on using technology as part of the classroom for learning? If so, how?

- Elementary School Teacher: Now that school is back in person, I do plan on/currently am using technology as part of the classroom for learning… For example, the students are required to participate in 20 minutes of Lexia and 20 minutes of Dreambox every day. Lexia is an online language arts program that engages students in direct instruction without the need of the teacher. Dreambox is an online math program that follows the same format as Lexia. The students also use technology to take daily AR quizzes.

- Middle School Teacher: "Im not in the classroom right now but google meet is still used as a means to communicate with parents. Teachers still use technology to deliver instruction in hybrid programs."

- High School Teacher A: "Technology in the classroom is unavoidable, but I am doing my very best to be a luddite."

- High School Teacher B: "I continue to use zoom to project my screen for students to see, and I have updated my online notes to use in person. Because of online learning, I have been more organized with my tests and more willing to try online resources."

- College Professor: "I truly only plan to maintain online instruction as a resource for periods such as summer courses or to have supplementary content in the event I need to cancel class. Zoom and other meeting formats are fantastic tools to be familiar with…for distant students or throughout times I cannot be on campus."

Discussions

When planning for this paper, I had developed a main question and planned on using secondary questions to help me answer the main question. With the data provided from both students and teachers, I have developed an overall response to each of the secondary questions that will help in coming up with a conclusion for the primary question.

SQ1: What is technology and the types of technology that have been used for education during the pandemic? How has it changed during the pandemic?

As I mentioned before, the definition of technology is "the application of scientific knowledge for practical purposes, especially in industry" and this was mainly seen with computer software as schools transitioned online. Based on the interviews conducted, the

majority used the Zoom and Google Meets software as a means of communications remotely

with synchronous class sessions, with elementary students mainly using Google Meet and

college students using Zoom. With both groups, it was noted that Jamboards and Kahoot were

used to keep the learning process engaging and as entertaining as possible. Elementary school

teachers tend to use more engaging games and activities for the younger audiences with

applications like Blooket and Seesaw. Even though it is not really demonstrated from the data, it

can be assumed that a large number of students would access books electronically during this

time.

SQ2: What does research say about the effects of using technology as a substitution for

education for students during the pandemic?

Many of the effects of using technology during COVID-19 is seen in my literature

review. At this point, one of the obvious effects of replacing in person learning with technology

is that the learning gap amongst students grew tremendously. Millions of students, especially

those from minority groups and lower socioeconomic status, were at a disadvantage with online

learning and if they were already behind during the pre-pandemic phase, then having everything

be online only made it worse for them. Research also describe the socioemotional effects of

using technology since the increase screentime instead of in person learning prevents students

(especially in the younger grades) from developing their social skills that would be crucial in

later life. There has also been discovered a link between an increase of screentime and a major

decrease in physical activity amongst students, sometimes becoming irreversible.

SQ3: During the pandemic were there any inequities with online learning with different types of

students? If so, how did it affect students' learning in the classrooms?

Based on this research, there were definitely some inequities that were created from using technology as the main means for learning. To start off, the majority of students and teachers describe the lack of stable Wifi to be the main inequity here. Wifi was basically the the defining factor whether a student was going to have access to their education or not and some students were not fortunate enough to have access to good connections. As the elementary school teacher from my data group mentions, "Wi-Fi really was the 'make it or break it' aspect of distance learning for my students." Many students from lower socioeconomic statuses (which were also students of minority groups) were the ones who were affected greatly by this. Many students also felt like there was an inequity with how teachers would not care for their students as they should be in those hard times. One student mentions "If a student needed help then a teacher would try to explain, but if that wasn't enough then the student would be screwed" and another describes "I think there was also lack of care from teachers because even though we were in a pandemic, teachers would just throw so much work and assignments at us. I feel like their deadlines were back to back and would not consider us students having other classes as well." Not all teachers were like that, which creates that inequity with how some students get caring teachers that genuinely help and some that do not. Various other situations arose from having to learn online, as one of the high school teachers puts it, "I work in a Title 1 school where most students and their families struggle with the many scourges of poverty. Many of my students have large families, limited space, and noisy learning environments. Moving, lack of internet, sick and dying family members, each and all of these were disproportionate burdens for many of my at-risk students." Some of the things that online learning brought to the table were definitely beneficial for some students, but from looking at it from a broader perspective, there is no

denying that using technology instead of in-person learning did create unnecessary and

disproportionate burdens of the students

SQ4: Did the increase of technology in teaching and learning drive students to a less physically

active lifestyle according to teachers? If so, how?

Based on the student responses, yes, there was a link between learning online and having

a less active physical lifestyle. From the data of the student respondents, 60.7% of the students

said that they did little to no physical activity when everything was taught through technology.

One college student describes it as "My exercise was on the less, I was my less athletic self at the

time…it (online school) did make me feel more comfortable, since I was already in one spot…[I]

didn't want to move." Another student from elementary school explains that, "I was not that

active and did not play outside. I just played [on] my phone." Not having P.E be part of learning

anymore made it hard for many students to find the drive to move around on their own and

pursue a better physical lifestyle, especially if they became addicted to the screens in front of

them all the time.

SQ5: What will the future hold for the role of technology that could be used as a substitute for

teaching and learning in the future? In other words, will technology still be an integral part for

teaching and learning?

From what teachers responded, it seems safe to conclude that technology will still

continue to be part of the curriculum for student learning, even if school is back to being

in-person. Teachers plan on using interactive apps as part of the student learning experience so

that they can be enhanced. Going back to the elementary school teacher, she describes that, "for example, the students are required to participate in 20 minutes of Lexia and 20 minutes of Dreambox every day. Lexia is an online language arts program that engages students in direct instruction without the need of the teacher. Dreambox is an online math program that follows the same format as Lexia. The students also use technology to take daily AR quizzes." Other teachers will continue to use jamboards and Kahoot games to keep students entertained and others will continue to use Zoom and Google meets for communicating at a distance with students whenever necessary. As Vegas mentions in her article, technology should be used as a tool and not a complete substitution for learning to enhance the experience (2022).

Problems and Limitations