Integration of Photoelectric Eye Sensors into Online Learning Tools

Comparison of Online and Face-To-Face Learning's Effects on Society

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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General Research Problem: Gauging the Effectiveness of Online Learning

Have online learning curriculums made for a more educated and healthy society?

Over the past thirty years, the integration of technology and education has grown at an exponential rate. In the early 1990's, it was not possible to gain a high school or college degree through the internet – in fact, the first online college was created in 1995. Now, there are virtual learning programs that include pre-school classes, high-school degrees, PHD programs, and everything in between (A Brief History of the Online Classroom and Virtual College Courses., 2012). The number of students who are opting to complete their lower education online has been increasing at a large rate, especially over the past few years (Michelle, 2021). Universities today are offering online courses, and some students are starting to choose online learning over face-to-face. In the fall of 2019, there were 7,313,623 students enrolled in distance education courses at degree-granting postsecondary institutions. Aside from those who are opting to learn online, when the Coronavirus pandemic shook the globe two years ago, almost all publicly educated students in the United States of America were being taught virtually for an extended period of time. The pandemic also increased the usage of other online learning tools, such as Khan Academy, with a three-fold increase of the amount of traffic on their site within a week of the pandemic ensuing. (Tate, 2021).

However, one issue that has been prominent in discussions of online learning is the detrimental effect that it has on students' eyes. Without including online learning, on average, young people between the ages of 11-24 already spend over 10 hours staring at screens (Bruce, 2020). With the addition of online school, students may easily be spending over two-thirds of

their day staring at screens. My technical project, which I will detail later in the prospectus, will try to mediate this issue utilizing photoelectric eye sensors.

Integration of Photoelectric Eye Sensors into Online Learning Tools:

How can a photoelectric eye sensor be combined into an online learning system such that the system ensures that students' eyes will not be placed under too much duress?

As I stated earlier, students who are participating in online learning are spending too much time staring at screens. The negative consequences of too much screen time are lengthy and concerning. Some of the consequences include sleep deprivation, increased risk of obesity, loss of cognitive ability, impaired social skills, delayed learning in younger children, and lowered self-esteem (Active Health).

Figure 1: **A Photoelectric Sensor**

These negative effects of too much screen time were not able to be completely studied because of the forced adoption of online learning due to the pandemic. I seek to research the effect of integrating photoelectric eye sensors (see Figure 1) into online learning tools; I would like to utilize photoelectric eye sensors in online learning tools so students can be notified that they have spent too much time learning and that they should take a break from their screen. This research would provide statistics on the effect of screen time on eye strain. The studies that have been done up until this point have not quantified any of the effects of too much screen time and have only been qualitatively stating the negative effects.

I would begin my research by approaching someone who owns a smaller scale online learning service, but their business still records lectures and posts them online – for example, Sylvan Learning. I would then purchase photoelectric eye sensors and integrate them into a few computers, and program the photoelectric eye sensors to record data about the eyes of the students, such as how much time is actually spent watching the video, how many consecutive minutes a student is able to stay focused, and the attentivity of the eyes. The attentivity of the eyes can be determined by measuring the size of the pupils – when someone is focused on a near object, the pupils will constrict. Alternatively, they will dilate when someone is looking at a far distance (A. V., 2014). I would also program some of the computers to force the student to stop watching videos after a certain threshold of time – such as an hour. I would then ask a few students who attend the smaller scale online learning service if they would be interested in participating in my study. Then, I would have some of the students use my computers – some of the computers would have the threshold setting and others would not. I would record the data values that I listed earlier, as well as some other metrics, such as how the student did on the assessment for that session, and the student's overall opinion of the session. After I collect all of the data, I would look to see if any trends can be seen that suggest the integration of photoelectric eye sensors into online learning tools is beneficial by comparing the data from the students who used the computers with thresholds and those who didn't. This process is summarized in Figure 2 below.

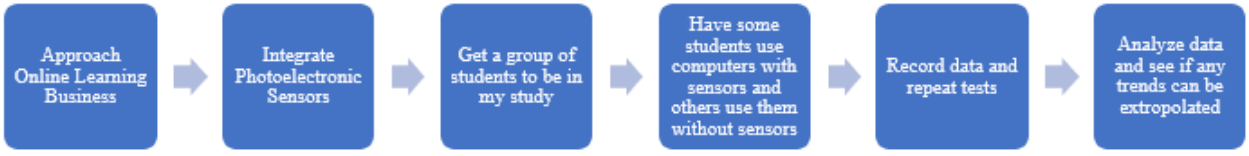

Figure 2: **Flowchart of Research Process**

I do not believe there are any unusual constraints on the project, except for the fact that my study subjects would most likely be under the age of 18, so they would need a guardian's approval if they wanted to participate in my study. Since my subjects would be studied while they are enrolled in and learning through a non-private educational institution, FERPA would not have an effect on my research.

After this research, I hope to have found that the utilization of photoelectric eye sensors in online learning tools is beneficial, and that students being accurately notified that they have spent too much time learning is helpful for their overall physical and mental state. I believe that this will diminish the degree of the negative consequences that affect students and allow them to partake in online learning without having many detrimental side effects. I believe my research would provide the basis for future studies on the effect of screen time on humans, and it would be one of the first studies that provides statistical data on this phenomenon.

Comparison of Online and Face-To-Face Learning's Effects on Society:

What is the effect of online learning on educational groups, such as children and teachers, versus that of face-to-face learning?

The increased accessibility of education and knowledge is surely a profound effect of the rise of online learning, and the transition to online learning during a time of crisis was warranted and necessary. However, the long-term effects of online learning are not well-known. How does online learning affect the student, both academically and socially? How are the teachers performing when teaching online versus teaching in-person? How do students fare in subsequent classes after they completed an online course? How much information do students retain when they are taught online versus when they are instructed in-person? These questions, and more, are

imperative to how we continue to develop the American education curriculum, as America has fallen farther and farther behind the top countries in terms of educational rankings over the past 5 years. In 2018, the United States was ranked number one in the world across all subject areas. Now, we fail to reach the top ten in most categories (Amadeo, 2022). It is apparent that the United States of America has slipped in education over the past few years, and this decline coincides with the increase of online learning in America. This may just be a coincidence, but if we do not do our due diligence as a society and determine the long-term effects of online learning, we could actively continue to hurt our future generations by providing them with subpar education.

Background and Literature:

Education in America has been a core issue since the youth of our country, and Americans have always prided themselves in innovation. Thus, it is not a surprise that the first online institution was founded in America. When the first online learning institution was created in 1995, there were not too many patrons, as online school was not accredited at the time. However, with the work of various online universities, such as Strayer University, online degree programs started to gain traction in society. This initial traction turned instantly into acceptance for online degree programs once the pandemic began. Now, online learning programs are a widely accepted form of education (A Brief History of the Online Classroom and Virtual College Courses., 2012). However, despite this, we do not know the long-term effects of online learning on society in America. The specific societal groups that are affected by this issue are students, teachers, universities and colleges, online learning foundations, and the Department of Education. Students, online learning foundations, and teachers are obviously affected by online

learning, but universities and colleges, as well as the Department of Education, are the ones behind the scenes making the decisions about online learning for their respective educational curriculums.

There is a good amount of literature present on the effects of online learning, however, a substantial portion of this literature are summaries of trends seen. There are numerous websites that restate the same information about the long-term effects of online learning, however, most of these websites do not have statistical evidence to back their claims up. There have been a few studies done on this topic over the past few years, which will be discussed later in the paper. These studies look at the performance of students and/or teachers when exposed to online learning and record various statistics to measure their performance.

Methods of Data Collection:

In order to address my question, I will gather data that details the long-term effects of online learning versus that of face-to-face learning on each of the societal groups that I enumerated earlier. I will search for credible sources online that detail these effects, as well as studies that have been performed on this topic. I will utilize online medical databases, such as PubMed, to find any studies or journal entries that have been created for this topic. PubMed and other medical databases are useful for my research because they contain research done on the effect of online learning on the well-being of students and teachers. I will also utilize public policy databases to discover potential policies that may have been passed related to online learning in the pandemic. Finally, I will use certain news articles that focus on various university and college plans during and after the pandemic. I will utilize the data that I gathered to develop a position on the question I posed at the beginning of this project.

As far as actually collecting the data, my first step was to come up with a list of key words and phrases, such as “effects of eye-strain on students”. I would then use these key words and phrases when looking up articles in the database. I only used articles that were from the past fifteen years and that were from a scholarly source. I ended up with an assortment of about twenty to twenty-five articles. A lot of these articles were about redundant information, so I would pick the most descriptive of the two articles. After all of this, I had a final assortment of about fifteen articles that I included in this paper.

Online learning increases accessibility and decreases the amount of physical bullying a student might have encountered while at school. However, online learning has been found to increase social isolation and to decrease communication skills (Carroll, 2021), both of which are detrimental to students, especially those of an early age. In a study done by Krieg and Henson, it was shown that college students who take an online course did worse in the subsequent class than students who took a face-to-face course by an average of 0.22 grade points (Krieg & Henson, 2016). If this trend is somewhat viable, the entire United States’ educational system took a massive hit during the pandemic last year. Everyone in the nation has spent over a year receiving education that does not translate to in-person school, which is what students are returning to now. Finally, the amount of stress placed on students’ eyes is very unhealthy. Online learning mandates at least 8 hours of screen time a day, which is already a detrimental amount. This does not even account for the video games, television, mobile phones, and other devices that students use throughout the day. As I mentioned earlier, too much screen time is very detrimental to students and causes a variety of psychological problems, such as low self-esteem and sleep deprivation (Active Health).

Online learning, when first introduced to teachers, was extremely helpful for them. They felt less stress and felt it was easier to facilitate learning. However, as time progressed, teachers started to realize that they needed to meet with students face-to-face to be able to teach effectively. Teachers, especially those who taught younger students, started to become unmotivated and frustrated (Lizana, Vega-Fernadez, Gomez-Bruton, Leyton, & Lera, 2021).

Summary:

After gathering data and finishing my analysis, face-to-face learning seems to be more beneficial long-term than online learning. Online learning has a detrimental effect on the students, which is the group that is supposed to be reaping the benefits of the education given to them. Students do worse by an average of 0.22 grade points when taking an online course as a prerequisite to a face-to-face course, and students experience social isolation and lowered self-esteem. Teachers are also negatively impacted by online learning, as they are not able to teach effectively and feel unmotivated to teach online. This knowledge is useful for the US Department of Education, universities, and colleges. If they genuinely believe that we should receive the best education possible, they will reconsider their stances on online learning.

However, some of the trends that have been recorded are not to be taken without a grain of salt. Students who took an online course certainly weren't as engaged as students who took an in-person course, but is that truly because of the online course, or is it because of the attention span of the student? When teachers feel like they can't have the same connection with individual students as they did with face-to-face learning, did they ever reach out to the student and ask to set up a meeting with them, or did they just let it be? If teachers were to have more one-on-one meetings with students, would that allow them to foster a connection with the students? There

are a lot of variables present in online learning that have been labeled as “constant” when they shouldn’t be. The interest level of a student in a course, the effort level of a teacher, the type of student – all of these variables should be accounted for in the research that is being done, but that has not been the case. This is why research on the effects of online learning versus that of face-to-face must continue to be researched.

Conclusion:

Overall, online learning seems to be detrimental to society, as students and teachers are currently being negatively impacted by online learning. However, there is no possibility of online learning being removed from our everyday lives, and the research that has been done was partially incomplete. For this reason, I have decided to research the effect of integrating photoelectric eye sensors into online learning tools. Hopefully, my research results in using these photoelectric eye sensors in online learning tools to notify students that they should take a break from their screen, and that this will help counteract some of their repercussions. I recommend researching what specific aspects of online learning actually cause these harmful effects in students. If these detrimental aspects are found, then we can try and neutralize them so students will be able to effectively learn virtually without being afraid of negative long-term effects.

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