The Effects of Remote Learning on Students

Abstract
The purpose of this study was to discover some of the effects remote learning had on students in order to find better way for universities to conduct remote learning in future semesters if necessary. The data was collected via an online survey containing 7 multiple choice questions and 2 short answer questions. The results from this survey show that remote learning had negative effects on a student’s academic performance.

Introduction and Literature Review
Due to the recent COVID-19 pandemic many universities across America have been forced into finding new ways to teach their students while maintaining social distancing in order to slow the spread of the virus. The proposed solution from Penn State was remote learning (learning completely online instead of in a classroom setting). Switching to having all of the course material be completely online involves a lot of logistical challenges such as taking exams and what to do with in-person labs and projects. The next major aspect impacted is the student’s academic performance since the environment for all their classes is different from what it was before. One study conducted by Nenagh Kemp and Rachel Grieve compared students’ performances in an online and traditional in-person class. They found that the scores on most assignments and exams had little to no difference between the online and in-person instruction [1]. However, most students found that any type of group work or discussion was more difficult to do in the online class. The major benefit from the course being delivered online was that it allowed for a lot of flexibility with the student’s schedule compared to having to meet somewhere in person [1].

Another major concern brought on by online learning is making sure that a student is engaged in the material and effectively studying. This is certainly more of a challenge when the student is not physically in front of the professor to participate in classes. A study done by Sarah A. Reese looked into this subject matter from the perspectives of both the students and the instructors. A main limitation of online courses is the lack of interaction between students and instructors, which can be crucial in helping to learn new material. Reese found that these types of online collaborations are possible, but that online learning should be more of a supplement to a traditional face-to-face class [2]. She concluded that online learning was not a suitable means for higher education like a university since it makes the student feel isolated and unable to reach out for help from the professor.
Administering exams is another area of struggle for online learning. How should a professor give an exam online that they originally planned to do in-person? The main issue a professor has to deal with is academic integrity and ensuring that students are not cheating. A study done by Lee William Daffin Jr. and Ashley Anne Jones looked into the differences in grades of a proctored online exam versus a non-proctored exam. They noticed that whenever students had an exam that wasn’t proctored the average scores of the class improved [3] This means that professors have to find a way to proctor an exam in order to ensure academic integrity. In a planned online class this can be very doable because the professor and students know that the class will be online, but in a switch from face-to-face to online this can prove near impossible. In the COVID-19 situation some students might have moved back home, which could be halfway across the world making it difficult for them to take an exam at the same time as the rest of the class.

Now non-proctored exams may show improved scores, but that does not mean that online exams always result in better grades than in-person. In a separate study done on testing in-class vs online for a Spanish course there was no noticeable difference in exam scores administered by the two methods [4] From this study it seems that grade distribution will be similar, but the real question is what type of exams do the students prefer.

Online learning is not entirely negative if done correctly. According to a study done by Maureen Hannay and Tracy Newvine there are instances in which students prefer an online environment. Their study consisted of mostly part-time students who had other commitments. For that reason, online learning helped them with organizing their time. Students also responded that they quality of education was the same online compared to an in-person class [5]. This helps show that Penn State can offer quality instruction through an online means.

An online education can also be of equal quality according to Anna Ya Ni. She conducted a study looking only into the academic performances of students taking the same course but in different environments (online vs traditional). She found that there was no significant difference further emphasizing that a switch to online classes can be just as effective for students [6]. This information is key for Penn State so that they can continue to operate even if fall 2020 must go online.

Students also need the virtual means to deliver live lectures to be good. Having subpar instruction due to technical difficulties is a serious problem and can greatly decrease a student’s opinion of the quality of instruction and lead to negative outcomes [7]. Penn State attempted to use Zoom in order to accomplish this however there are technical issues with using Zoom, which can discourage students and make a remote environment much more challenging.

This study was meant to discover the affects that the switch to remote learning had on a student’s academics in order to find better ways to improve remote learning. This was done by sending a survey to a group of 10 students; the survey consisted of 7 multiple-choice questions and 2 open-ended questions all about the academic affects of remote learning. This past semester Penn State University was forced to switch to remote learning due to the COVID-19 pandemic. The results from this study were used to create recommendations for Penn State in order to improve the quality of remote learning in case it must continue in the fall of 2020.
Methods

In order to collect all the data for this method a survey was sent out to 10 students containing 9 questions (7 multiple choice and 2 short answer) about the academic effects of remote learning. The multiple-choice questions were as follows:

- What kind of effect did remote learning have on your academics?
- How much time did you spend on classwork during remote learning?
- Did remote learning affect your participation in class?
- How often did you attend class?
- How many distractions were there because of remote learning?
- How much work did you have for classes during remote learning compared to normal?
- How were lectures delivered?

The short answer questions were as follows:

- How were exams taken?
- Were there assignments that were altered (labs, projects), and if so how?

Results and Findings

The survey was sent out to a group of 10 students who all had to switch from in-person classes to remote learning during the Spring 2020 semester. In Figure 1 it shows that most students were spending significantly less time studying than they would in a traditional classroom environment.

![Figure 1. Time Spent on Classwork during Remote Learning Compared to Normal](image)

Students spent less time on classwork even though most classes were still being taught live by means of a Zoom class. In Figure 2 it can be seen that most classes were delivered via Zoom.
Figure 2. Ways in which Lecture were Delivered

Distractions could’ve played a key role in underperforming academically and in Figure 3 it shows that almost all of the students had more distractions compared to in-person classes.

Figure 3. Amount of Distractions as a Result of Remote Learning

Not only were more students distracted and spending less time on schoolwork due to the new remote learning situation they were also participating less in class as can be seen in Figure 4.

Figure 4. Student Participation during Online Lectures
A lot of projects and labs had to be altered in order to work in a completely online setting. When asked if how labs and projects were altered students responded as follows:

- Assignments had fewer topics that they covered and labs had prerecorded data.
- For example, in EMCH classes, we should build projects as our finals in the normal time. Since it is impossible for us to do a project together, our professor asks us to finish questions for exam.
- All of my physics labs were altered. Rather than having hands on practice, we would do more homework-like problems.
- In spring semester, I had a religion class. At the beginning of the class, we were assigned with a writing assignment. We have two choices, one is go for a religion service and write about your experience for two times; another one is just one 10-page research paper. As a non-religious person, I chose for the religious service one. However, after remote learning, we can not go to church anymore. Thus, the instructor assigned us a 5-page religion research paper. However, reading religion paper is such a pain for me, a non-religious person.
- I had a lab with a final project that had to be turned into a project proposal with research instead. I had a class that had to take out the Matlab component because too many students were having trouble with it. My business Chinese class was supposed to have a business showcase with guest. But we had to do a zoom meeting instead.
- My labs were changed significantly because I was not able to use laboratory equipment. My field required me to know the ins and outs of radiation detectors, but with not even getting the chance to see them, I feel I am lacking in that knowlede.
- We did a lab where my professor did the lab work, and we analyzed the data.
- Labs were altered such that we were to buy some of own hardware, and they were also shorter/ simpler.

Exams were also delivered in a variety of ways. When students were asked how their exams were delivered, they responded as follows:

- Exams were taken through various applications. Some exams were recorded through video and audio monitoring.
- Online. Most are multiple – choices
- In canvas
- It is not as serious as in class. It is just like doing another homework with the web camera and time limit.
- For some classes, they were a multiple choice and long answer choice on the canvas quiz section. Another class had a pdf of the exam that was available for download during the exam time and had to be scanned and submitted in the same time. All of the classes provided a zoom office hours to provide support during the exam. One class required that are camera be on during the exam.
- Exams were a mix of sitting in Zoom with a camera and a professor uploading the document and giving an allotted time to finish it.
- Our exams were given on canvas
• We had to be on the zoom call, then open up the document the professor unlocked, take the exam and then take pictures of our solutions to upload

• I just wanted to note, that my lectures were delivered all three ways depending on the professor. I had a few different styles of exams: through canvas quizzes only, "take home" style exams with 24+ hours to complete, and exams that were to be finished in the 50 minute time period with 10 minutes to upload.

Discussion

After observing the results from the survey, it seems that remote learning had a negative effect on most students’ academic performance. This could be due to a number of reasons, such as that students had much more distractions during remote learning and that they spent less time on classwork. There might be a correlation between the amount of distractions and the amount of time spent on classwork. It would make sense if there was and that this was how student academics were negatively affected.

The way that classes were delivered should also be considered, because if a class is delivered in a subpar manner that can make the material more difficult for a student to learn. With most classes being delivered through Zoom in order to try maintain a normal classroom setting. It seems that this method did not work as well as anticipated since students did not do as well academically as hoped, and since students participated a lot less in class even though they had a live lecture. The other options to deliver lectures are either prerecorded lectures available to watch at any time or scraping lectures altogether. Completely online lectures would offer a lot more flexibility of schedule for students since during remote learning there were a lot of unexpected obstacles in a student’s new schedule. The work load seemed to be more or less the same as it was beforehand so that shouldn’t be a major problem going forward.

The sudden change of exams, labs and projects can also explain why students’ academics were impacted negatively. Changing exams to being online was a major problem for a lot of professors because exams were delivered in multiple different ways. Some exams switched format to multiple choice Canvas quizzes, which could’ve been open-ended exams before. Switching from an open-ended to a short-answer exam could’ve hurt a student’s grades where beforehand they had the opportunity for partial credit, which is impossible in a multiple-choice exam.

Eliminating a lot of the data collection from labs can also hurt students who are more hands-on learners. Not getting the experience of using the equipment to see proof in the theory can make certain material more difficult to understand. This also hurts students who would learn how to use equipment that is common in industry because they never got the opportunity. For this reason, students felt that they learned less during this semester because they never got the chance to learn how to use this equipment.

There were many limitations with this study however. For instance, the small sample size of only 10 students greatly limits the validity of the results. It is also worth mentioning that all of these students are in STEM majors (Science, Technology, Engineering, and Math). Because of this there can be a bias towards the way that labs are viewed since students in nontechnical majors
may have no issue with labs being switched to an online format. The questions in the survey did not ask a lot about how students felt about the ways that professors the switch to online learning. In order to improve this study a larger sample size of more diverse majors should be used.

**Recommendations**

Since remote learning is a very real possibility to continue into the semester of Fall 2020, universities must be prepared to be able to effectively teach in a remote environment. Some changes that the university can make are as follows:

1. **Offer more sections of a specific class in order to reduce class sizes and encourage participation from students**

   Penn State is a large university and for that reason has some large classes (up to 800 people). Being in a large online class can discourage a student from wanting to participate. One way to counteract this is by reducing the sizes of a lot of classes by offering more sections of the same class. Having a smaller class size can encourage a student to participate in an online learning environment. This would require more professors and organization in order to schedule all of these classes.

   A majority of professors were holding online Zoom sessions to give live lectures in a remote environment. However, offering a mix of Zoom courses and WEB courses can make it possible to make class sizes smaller and benefit the students that feel as if they aren’t able to participate in class.

2. **Have small Zoom sessions in order to proctor exams and have all exams follow a similar format for submission.**

   Another major problem is administering exams in a remote learning environment and making sure that students are not cheating during the exam. One way to manage this is by having small Zoom sessions run by professors and TAs to observe students taking exams. Having one large Zoom session makes it very difficult for a professor to observe every student, and it puts a lot of strain on Zoom and usually leads to poor connections. Having smaller sessions that are run by one professor or a TA can make this task easier for the exam proctor as well as on Zoom.

3. **Offer online lab simulations that are more easily available to students and tutorials for the equipment used.**

   Many students had lab classes that were changes significantly in order to work in an online environment. The main struggles were either working with data collected by the professor and not doing the lab, or not having the resources to do the lab at home such as Solidworks or
MATLAB for engineering students. One way to get around this is by having simulations that are online and recorded videos giving tutorials on the equipment used in the lab.

Since labs are more for application compared to theory it is important for students to know how to use different equipment that is used in their field such as an oscilloscope for an Electrical Engineering major or a spectrometer for a Physics major. Students can’t access a lot of this equipment in a remote learning environment, but they can still learn how to use it by having a tutorial and doing simulations online.

Labs are also helpful for seeing application of theory through collecting data. Working with prerecorded data makes this a less valuable learning experience, but it is still important for students to go through the process of collecting data and proving theory. A main difficulty discovered in the survey was that students didn’t have the resources to accomplish some labs at home. This could be done by having students do online simulations available on the internet in order to go through this process.
References


