Spring 2023

# The Virtual Classroom: What can be Learned from the COVID-19 Lockdown

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## ABSTRACT

This paper seeks to examine the teaching practices utilized during the initial COVID-19 lockdown in higher education. This forced switch to the virtual classroom forced many professors to make innovative changes to adapt to this change in teaching modality. These changes can now be examined and evaluated for potential future application. By reviewing the current literature, performing an analysis of grades from Fall 2017 through Summer 2022, and interviewing select professors at the University of South Carolina, this paper seeks to illuminate some of the potential issues that arise when adapting in-person curriculums to the virtual classroom as well as strategies to minimize these drawbacks and taking full advantage of the options this allows.

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## INTRODUCTION

The COVID-19 pandemic abruptly and dramatically changed many aspects of our lives ranging from healthcare to politics and everything in between. Who would have thought five years ago that entering a bank wearing a mask and gloves would be socially acceptable? On a serious note, in addition to merely disturbing social norms, the pandemic placed lives and careers on hold as scientists and policymakers worked together to try to figure out how best to navigate the pandemic. Following the initial outbreak in the United States in spring of 2020, all except for what was deemed essential services were put on pause. With this, the education system was forced to scramble to alter their previously in-person classes to an online format while also dealing with their own concerns and fears surrounding the pandemic.

With this, a vast amount of data was made available for analysis regarding the efficacy of online learning environments and how best to teach and learn in a non-traditional classroom. For thousands of years, asynchronous and even remote learning was inconceivable due to technological restraints. With this said, distance learning has, in fact, been around for about 150 years (Caruth, 2013). In 1873, the Society to Encourage Studies at Home was founded by Anna Eliot Ticknor in order to facilitate the education of women with domestic responsibilities that would have otherwise proven prohibitive and offered disciplines of study including English, French, German, history, art, and science (Caruth, 2013). Over the next century, correspondence learning became more popular across the globe and was mostly dependent on a postal service

to deliver materials to students. In 1953, the University of Houston began operating KUHT-TV, the first noncommercial education television station and taught programs including biology, psychology, literature, Spanish, and at-home nursing (Evans, 1955). Even before the invention of the World Wide Web, email was invented in 1971 and began to overtake in popularity the more dated physical mailing system previously in place (Harasim, 2000). Even as this was occurring, researchers recognized the value in creating a way for business professionals, government officials, etc. to meet virtually using this newfound technology and thus computer conferencing was invented in 1972 (Harasim, 2000). Once invented, this technology was coopted by the education sector as the next generation of distance learning (Harasim, 2000). Even as soon as the early 1900's, many saw the advent of computer communication as a fundamental turning point in communications technology history (Harasim, 2000). As early as 1981, fully online education courses were being offered, and by 1984 the first fully online undergraduate courses were being offered. The first online graduate courses followed suit in 1985 (Harasim, 2000).

Many of the advantages of distance learning are easily recognizable and contribute to the early use of such modes of teaching even before the ease of use afforded today by the internet. These include easier and less formal circulation of knowledge. For instance, in the case of the first distance learning program created by Anna Eliot Ticknor in 1873, it allowed access to educational courses for women who would have otherwise had minimal, if any, access to this knowledge due to the social and family structure of the time period (Caruth, 2013). Additionally, by making the courses self-paced, it allowed these women to fulfill their other responsibilities while still

being able to take advantage of the educational material. Even today, online learning provides greater access to education for students to whom it would otherwise be unavailable for a variety of reasons.

These easily recognizable advantages have led to a relatively quick rise in the use of these online courses. One of the inherent disadvantages of this mode of teaching and learning is that it has had much less time to be tweaked and refined when compared to the in-person classroom which has been used for thousands of years. In comparison, both teaching and learning online is in its infancy.

During the Spring 2020 semester, courses across the world were abruptly moved online, and teachers of early education to graduate level programs were suddenly forced to adjust accordingly. One of the positives that can be taken from this is the sheer amount of information we were able to learn about teaching online that would have otherwise taken much longer to collect. This paper seeks to report certain aspects of the abrupt change to an online classroom in higher education during the Spring 2020 semester as well as what we can learn from this for future application. Observations from a brief literature review, interviews with faculty at the University of South Carolina, and a statistical analysis of grades in classes at the University of South Carolina are reported in this paper. It is hoped that by using this approach, data and insights can be collected and compared from three different vantage points and will lead to practical and actionable insights for future use in higher education.

## METHODS

This topic was approached from three angles. First, previous literature on the subject was analyzed. Second, insights from interviews of select professors teaching during the Spring 2020 semester were gleaned as well as commonalities and differences in professors' experiences with the abrupt switch to online. Finally, a statistical analysis of grades from the Fall 2017 through Summer 2022 was performed in order to see differences in student body wide performance during the semesters affected by the lockdown.

The following questions were used to guide the structured interviews of select professors who were teaching at the University of South Carolina during the initial COVID-19 lockdown during the Spring 2020 semester.

## QUESTION GUIDE

- Introduction Questions
    - What classes were you teaching when they were initially moved online? Are your classes that were moved online due to the pandemic back to being in-person courses?
    - How many semesters were your classes online?
- Teaching Practices
    - How would you describe your teaching style before the COVID-19 lockdown? (i.e. PowerPoints, pure lecture, drawing on the board, etc.)
        - How did this change once classes were initially made online?
        - What are some of the positive and/or negative differences you have noticed with these changes?
        - Now that your courses are back in-person, how would you say your teaching style has changed compared to before the lockdown, if at all?
- Student Interaction Observations
    - What changes in in-class engagement (either with you as the professor or with peers) have you noticed, if at all, when classes were made online?

    - If you had to give an estimate, about how many of your students were likely to initiate or participate in a study group for your classes before the classes were moved online? And did this change when courses were moved online? (Has this returned now to more-or-less how it was before now that courses are back in person?)
    - In your experience, have you noticed a change in the willingness to attend office hours while courses were online? (How was this affected when courses were moved back in-person?)
- Testing Practices
    - Could you describe your exams before the pandemic (Question type, length, typical scores, did you typically curve, etc.)?
    - How did this change when your classes were made online?
    - One of the big concerns with online exams is cheating, what steps did you take to try to minimize this?
    - Have you noticed an overall difference in class performance on exams comparing your online and in-person classes?

Five professors were interviewed using a semi-structured interview technique and the guide shown above during the Fall 2022 semester. The average interview lasted just over thirty-one minutes.

## REVIEW OF GRADE ASSIGNMENTS FROM FALL 2017 TO SUMMER 2022

Microsoft Office Excel was used to create the Tables and Figures in this report. The distributions of grades as assigned and reported by the University of South Carolina on their website are reported below for each semester from Fall 2017 to Summer 2022 in Figure 1.

*Figure 1. Tabulated values from the University of South Carolina's website for the grades given from the Fall 2017 semester through the Summer 2022 semester.*

| | | A | B+ | B | C+ | C | D+ | D | F | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|
| Fall 2017 | Raw Number | 95233 | 24690 | 34906 | 11590 | 15695 | 2745 | 5014 | 6624 | 196497 |
| | Percent | 0.48465371 | 0.125650773 | 0.177641389 | 0.058983089 | 0.079873993 | 0.013969679 | 0.025516929 | 0.033710438 | 100% |
| Spring 2018 | Raw Number | 97148 | 24135 | 33718 | 10852 | 14643 | 2527 | 4438 | 6197 | 193658 |
| | Percent | 0.501647234 | 0.12462692 | 0.174111062 | 0.056036931 | 0.075612678 | 0.013048777 | 0.022916688 | 0.031999711 | 100% |
| Summer 2018 | Raw Number | 17148 | 2976 | 4149 | 1164 | 1759 | 270 | 474 | 656 | 28596 |
| | Percent | 0.599664289 | 0.104070499 | 0.145090222 | 0.040704994 | 0.0615121 | 0.00944188 | 0.016575745 | 0.022940271 | 100% |
| Fall 2018 | Raw Number | 97960 | 24796 | 34832 | 11434 | 15481 | 2704 | 4800 | 7038 | 199045 |
| | Percent | 0.492150016 | 0.124574845 | 0.174995604 | 0.057444297 | 0.077776382 | 0.013584868 | 0.02411515 | 0.035358838 | 100% |
| Spring 2019 | Raw Number | 89043 | 22035 | 30251 | 10143 | 13646 | 2378 | 4166 | 6274 | 177936 |
| | Percent | 0.5004215 | 0.12383666 | 0.170010566 | 0.057003642 | 0.076690495 | 0.013364356 | 0.023412913 | 0.035259869 | 100% |
| Summer 2019 | Raw Number | 13069 | 2337 | 3004 | 905 | 1238 | 211 | 331 | 556 | 21651 |
| | Percent | 0.60362108 | 0.107939587 | 0.138746478 | 0.041799455 | 0.057179807 | 0.009745508 | 0.015287977 | 0.025680107 | 100% |
| Fall 2019 | Raw Number | 99847 | 24783 | 33695 | 11414 | 15223 | 2857 | 4399 | 6460 | 198678 |
| | Percent | 0.502556901 | 0.124739528 | 0.16959603 | 0.057449743 | 0.076621468 | 0.014380052 | 0.022141354 | 0.032514924 | 100% |
| Spring 2020 | Raw Number | 101985 | 19791 | 24355 | 5376 | 6786 | 870 | 1440 | 2803 | 163406 |
| | Percent | 0.624120289 | 0.121115504 | 0.149045935 | 0.032899649 | 0.041528463 | 0.005324162 | 0.008812406 | 0.017153593 | 100% |
| Summer 2020 | Raw Number | 16507 | 2986 | 3660 | 1099 | 1503 | 208 | 414 | 662 | 27039 |
| | Percent | 0.610488554 | 0.110433078 | 0.135360036 | 0.040644994 | 0.055586375 | 0.007692592 | 0.015311217 | 0.024483154 | 100% |
| Fall 2020 | Raw Number | 103935 | 22729 | 29346 | 9870 | 12930 | 2262 | 4204 | 7805 | 193081 |
| | Percent | 0.538297399 | 0.117717435 | 0.151988026 | 0.051118443 | 0.066966713 | 0.01171529 | 0.021773245 | 0.040423449 | 100% |
| Spring 2021 | Raw Number | 95634 | 20871 | 27211 | 8621 | 11430 | 1926 | 3382 | 6455 | 175530 |
| | Percent | 0.544829944 | 0.118902752 | 0.155021934 | 0.049114112 | 0.065117074 | 0.010972483 | 0.019267362 | 0.036774341 | 100% |
| Summer 2021 | Raw Number | 15416 | 2516 | 3406 | 1059 | 1374 | 194 | 391 | 739 | 25095 |
| | Percent | 0.614305639 | 0.100259016 | 0.135724248 | 0.042199641 | 0.054751943 | 0.007730624 | 0.015580793 | 0.029448097 | 100% |
| Fall 2021 | Raw Number | 103250 | 22234 | 29824 | 9632 | 12960 | 2321 | 3986 | 6723 | 190930 |
| | Percent | 0.540774106 | 0.116451055 | 0.156203844 | 0.050447808 | 0.06787828 | 0.012156288 | 0.020876761 | 0.035211858 | 100% |
| Spring 2022 | Raw Number | 95917 | 19886 | 26285 | 8591 | 10952 | 1936 | 3357 | 5797 | 172721 |
| | Percent | 0.555329115 | 0.115133655 | 0.152181842 | 0.049739175 | 0.063408619 | 0.011208828 | 0.019435969 | 0.033562798 | 100% |
| Summer 2022 | Raw Number | 14877 | 2562 | 3163 | 958 | 1328 | 204 | 399 | 684 | 24175 |
| | Percent | 0.615387797 | 0.105977249 | 0.130837642 | 0.039627715 | 0.054932782 | 0.008438469 | 0.016504654 | 0.028293692 | 100% |
| TOTAL | Raw Number | 1056969 | 239327 | 321805 | 102708 | 136948 | 23613 | 41195 | 65473 | 1988038 |
| | Percent | 0.531664385 | 0.120383514 | 0.161870648 | 0.051662996 | 0.068886007 | 0.01187754 | 0.020721435 | 0.032933475 | 100% |

These tabulated values were used to create Figure 2 shown below.

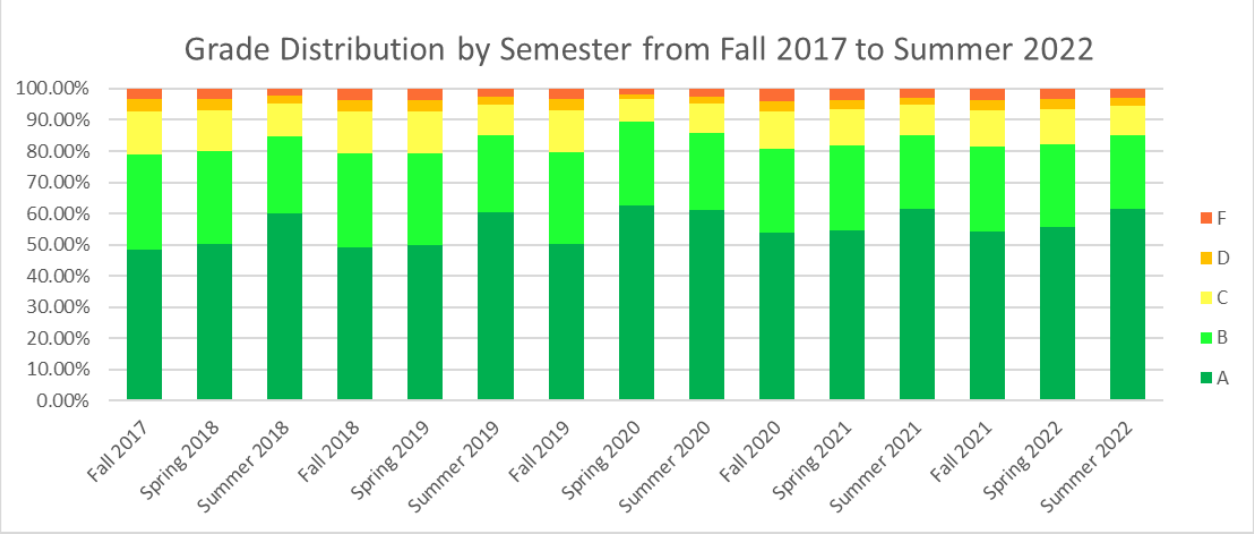


*Figure 2. A graphical representation of the data reported in Figure 1.*

The data reported in Figure 1 were also used to compute the average GPA for classes in each term. These averages are shown below in Figure 3.

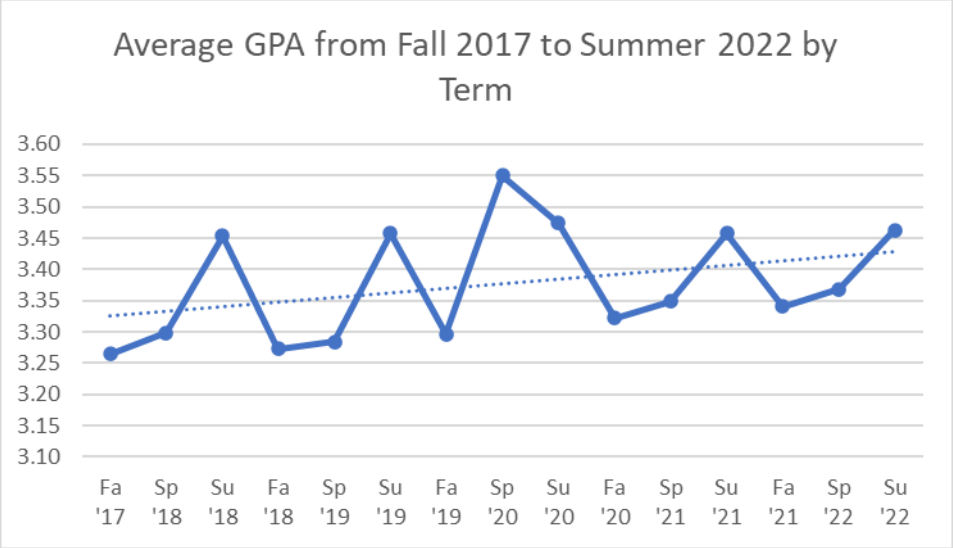


*Figure 3. A graphical representation of the average grades assigned for each semester from Fall 2017 to Summer 2022.*

Figures 4-6 show the grade distributions during the relevant terms broken up according to term type.

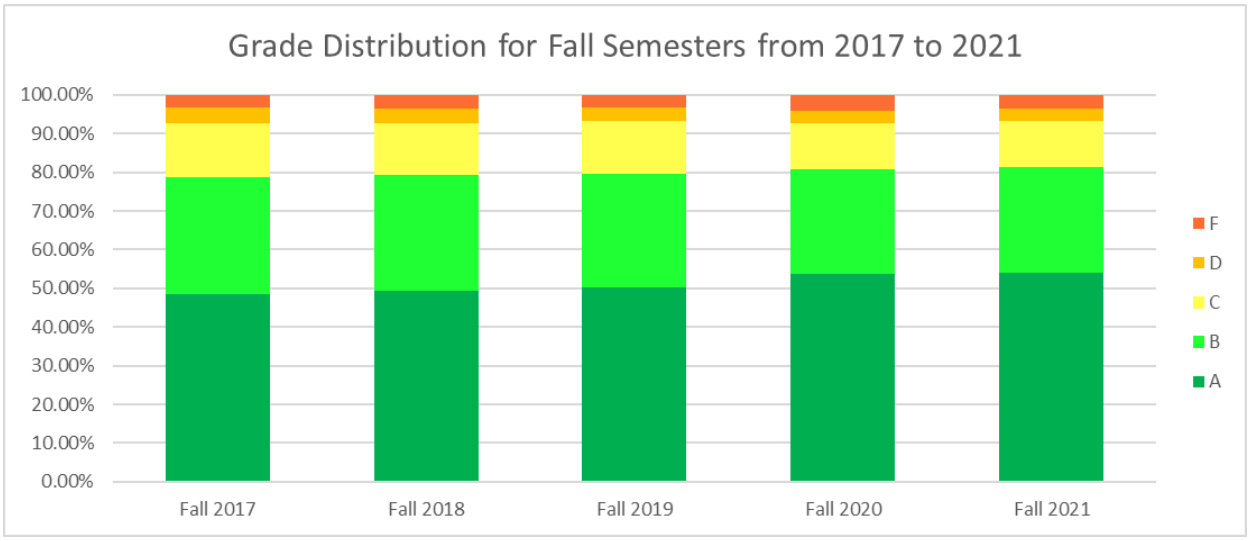


*Figure 4. The grade distributions for Fall semesters from 2017 to 2021.*

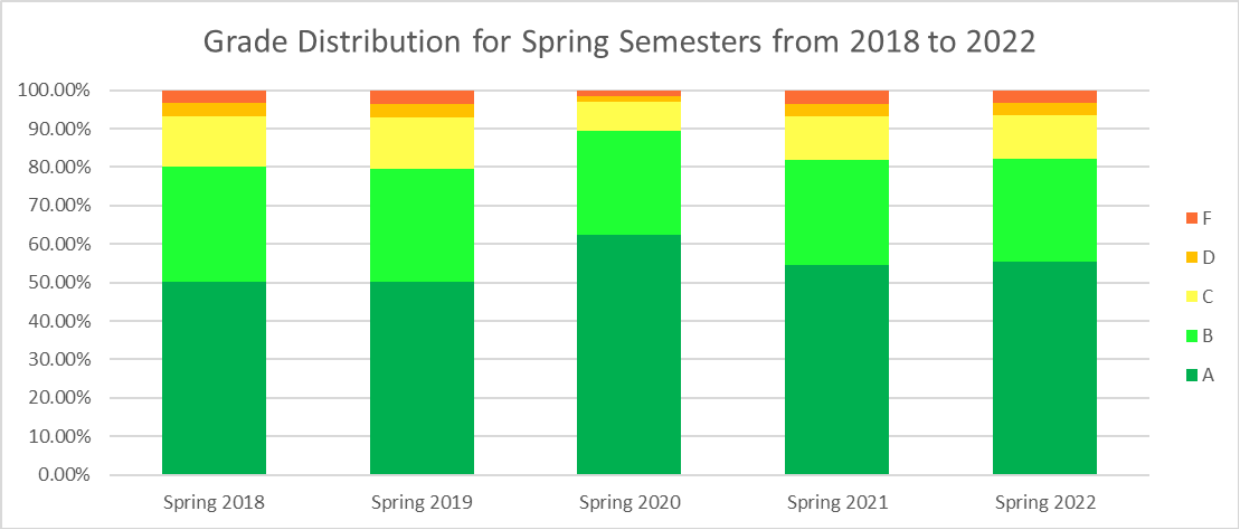


*Figure 5. The grade distributions for Spring semesters from 2018 to 2022.*

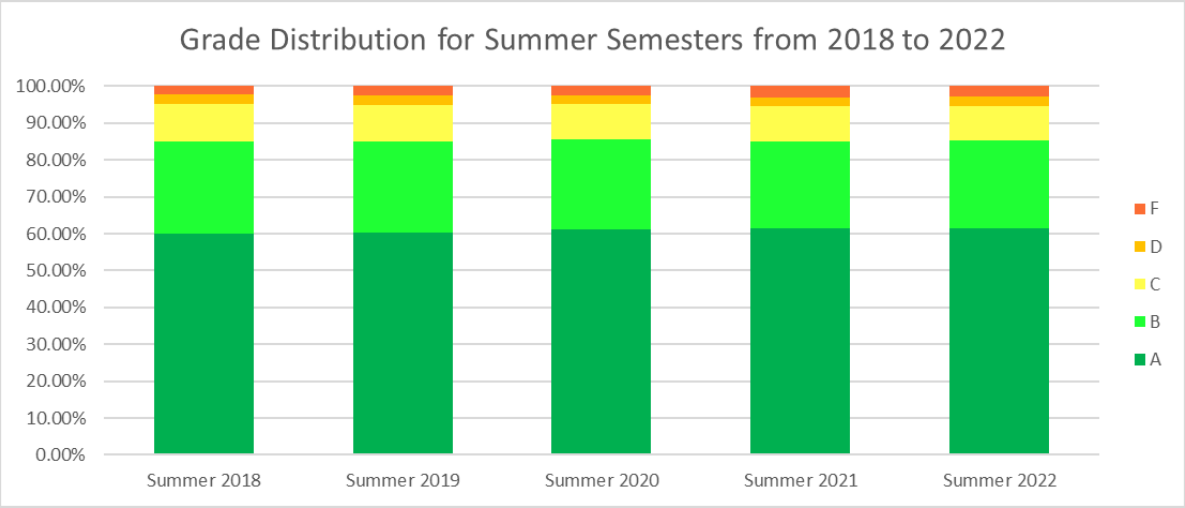


*Figure 6. The grade distributions for Summer semesters from 2018 to 2022.*

The average GPA data shown in Figure 3 were reorganized by term type and academic year. This is reported below in Figure 7.

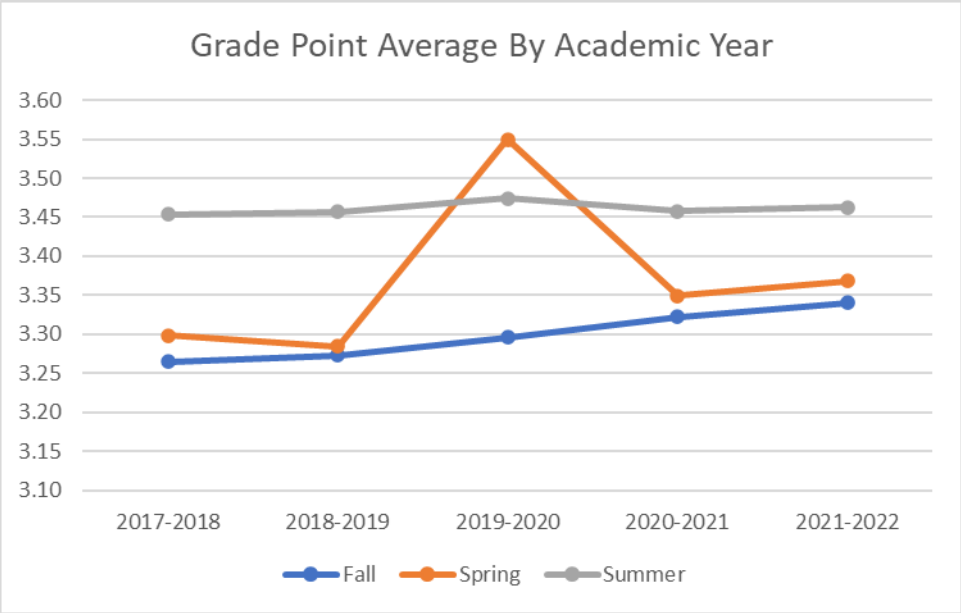


*Figure 7. The average GPA by term type for the academic years from 2017-2018 through 2021-2022.*

The data reported in Figure 1 were used to compute the percentage of grades given in each term that were greater than or equal to a B.

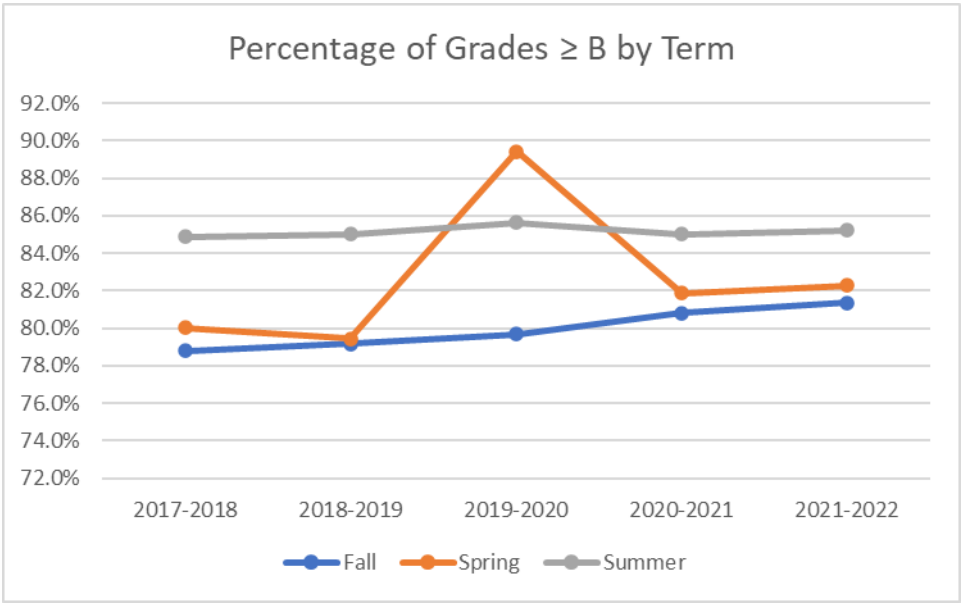


*Figure 8. The percentage of assigned grades greater than or equal to a B for each term.*

## DISCUSSION

When discussing the initial move to an online classroom, it is important to note that teachers were put in a near-impossible position as they were given merely one week to adapt their curriculum so that it could be taught online. Even when comparing different professors and their teaching styles, one can see that there are varying degrees of alteration to their lesson plans that needed to take place. For example, several interviewees noted that it is much easier to adapt the in-person practice of teaching from a PowerPoint online as the PowerPoint can be shared on the screen than to adapt the practice of pure lecture and drawing on the board. In addition to the amount of adaptation necessary to change a given lesson plan to a virtual lesson plan, some teachers had previous experience teaching online and thus adapting lesson plans to this modality while others did not. There were and still are varying levels of technical proficiency and comfort using the technology necessary to give a lesson online. For example, I had one professor who could not give a live virtual lecture from his own home, because his internet was so poor. Therefore, he had to record the lecture and give the recording to his TA who would play the lecture while he watched along with the class. Now compare that situation with a professor who had taught online before. Professors with previous experience teaching in a virtual classroom were more likely to be familiar with the available technology and best teaching practices in the virtual classroom. In this way, they were able to move more quickly through these steps and on to converting their own particular curriculum to a virtual format. Furthermore, it is understood that different teaching styles that may work well in-person may not work well online (Sharadgah & Sa'di, 2020). Teachers with more experience may be more

hesitant to alter teaching style dramatically to one best fitted to the online learning environment than those with a less ingrained method of teaching (Laata et al., 2022). In all, professors coming from all levels of prior experience teaching online as well as technological proficiency were forced to adapt their teaching styles to an online environment in a short amount of time.

## Lack of Real-time Feedback

One issue that came up in nearly every interview was the lack of real-time feedback to instructors teaching online. In an in-person classroom, observing students' facial expressions, body language, etc. can be used to assess how well students are grasping the concepts being presented. In contrast, these cannot be easily observed in an online classroom, especially if students have their cameras turned off. A similar issue was reported concerning masks upon return to the in-person classroom. These hints at understanding, which are obscured in a virtual context, can be used to determine whether the concept needs to be re-explained or presented in a different way or if the class is ready to move on. This happens almost subconsciously for some teachers and is much more deliberate for others, but the universal opinion among those interviewed was that this lack of real-time feedback greatly complicated teaching online. This is further complicated by students who are unwilling or hesitant to ask questions. This is further exacerbated if this lack of feedback and students' questions, which would usually serve to slow the pace of the lecture, then leads to more material being presented at a faster pace.

## The Student-Instructor Interaction

The overall impression among the professors interviewed was that students were less likely to ask questions online compared to in-person with a few caveats. Most professors noted that students were significantly more likely to write a question in a chat than to ask a question orally using their microphone. Interestingly, one professor noted that students were more willing to ask a question in a private chat (i.e., not viewable by other students) than even in an in-person setting. On the other side of it, it was also noted by several professors that when they asked the students questions in a virtual setting, it led to an awkward pause as students were largely hesitant to answer questions using their microphones, and instructors were unable to tell whether students were typing answers in the chat or simply did not know the answer. These issues compound together to contribute to an increased difficulty in gauging students understanding of concepts during a given lecture.

The student-instructor relationship is vitally important to the learning process. It is important that instructors cultivate an image of approachability and care to optimize the classroom environment, whether it be virtual or in-person (Hewson & Hughes, 2005). The general consensus from the interviews was that these relationships become more difficult to build without the in-person contact. One particular finding of note was that a majority of the professors interviewed reported no or insignificant changes in office hour attendance when classes, and thus office hours as well, were made virtual. Another finding was that the email communication burden increased significantly when classes were shifted online which was also consistent with previous research done by Beth Trammell and Chera LaForge (2017). This may also be related to the general

reluctance to ask questions during class as well as an inability to reach out to friends in the class with these simple questions.

## Peer-to-Peer Interaction

The lack of peer-to-peer informal interaction in a virtual classroom makes group engagement and interaction more difficult to achieve. Multiple professors said that group work was very important in their teaching philosophies for practicing and synthesizing information introduced in class. This can occur many ways in an in-person classroom including having students talk to each other in another language to practice new vocabulary and grammar, working together to apply the newly introduced concepts to novel situations, synthesizing processes into a coherent flow, etc. These collaborations are made more difficult online and are more difficult for the instructor to monitor. Students were found to be hesitant to engage with students with whom they did not have a previous rapport. This is consistent with previous research by Hewson and Hughes (2005). To combat this after the initial lockdown, one professor assigned groups similar to those he observed consistently forming in class and found this to be effective. Faced with a new class of unfamiliar students, a different professor found that consistently having these breakout group times could lead to students being more productive during these periods as they became more comfortable which is consistent with research by Joshua Owolabi (2020). Peer-to-peer engagement becomes more difficult to facilitate in a virtual environment but nevertheless remains a worthwhile endeavor if done correctly (Owolabi, 2020).

Study groups are another victim of the lack of informal peer-to-peer interaction in a virtual classroom setting. For similar reasons as are described above, students may be more hesitant to form small study groups with other students that they did not know outside of the setting of that particular class (Hewson & Hughes, 2005). For example, if student A enters CHEM 333 without knowing anyone else in the class, he is unlikely to start or join a study group with his peers even if he has a desire to do so, because he has few ways or opportunities to build rapport with other students, while student B who enters having taken previous classes with some of his fellow classmates is more likely to form a study group with these people (Owolabi, 2020). Two professors even noted that the communication app, GroupMe, seemed to have replaced these smaller study groups as it is much easier to start at the beginning of the semester for a student who does not know anyone before the first day of classes. The general consensus was that these smaller study groups, if they did exist before the lockdown, largely disappeared in the following semesters when classes were online or were supplanted by one large group text on apps such as GroupMe.

## The Informality of the Virtual Classroom

In a classroom, there is a social expectation that a student pay attention to the instructor, or at the very least, not actively distract other students. In a virtual classroom, this social pressure disappears, especially if students are not required to have their cameras on. With this in mind, there is less accountability to pay attention and not to start doing other tasks, and the virtual classroom becomes much more informal than its in-person counterpart (Rizzo et al., 2014). This is further exacerbated if the students have access to a recording of the lecture after it is given live. This is

because there is even less urgency to pay attention. If we put ourselves in the position of the student, this can be easily illustrated. Let us say that I am a student attending an online lecture in my room in my apartment early in the morning. I start to get hungry. I now have the option to go make myself breakfast, because my kitchen is now closer, and I can even rationalize it by saying that I will come back later and watch the recording when I am not distracted by being hungry. The social pressure to pay attention as well as the urgency to receive the information has now been removed, and I am also closer in proximity to other distractions (Rizzo et al., 2014). While the rationalization is logically sound, the reality is that few students will actually go back to watch the lecture they missed because they were hungry, tired, bored, etc. There is a similar temptation to pull out other assignments and start working on them. These potential issues all stem from a less formal classroom environment that virtual learning yields.

The idea that the virtual classroom is less formal can be illustrated several different ways in addition to the theoretical scenario presented above. For example, SL Miller reports that the retention rates for online classes are regularly 10-20% lower than for the same classes offered in person (Miller, 2017). This suggests that students see online classes as less of a commitment than if the same class were offered in-person. Additionally, one professor stated that she had students “attending” online lectures while in the airport or even while at work. While this is better than not attending at all, it is more analogous to attending a live lecture by sitting at the back of the room, working on another assignment, and looking up occasionally to hear what the professor is saying.

These scenarios, while better than the student not attending the lecture at all, are far from ideal.

The extent to which these temptations affect different people varies greatly by personality and other factors. If a student was prone to distractions in a physical classroom, then this was likely to be made worse by the switch to online learning, and a student that had little difficulty paying attention for the entire lecture in-person was likely to experience many fewer issues. Additionally, the environment within which a student attends an online lecture is important (Rizzo et al., 2014). For instance, is the student constantly being distracted by parents, friends, and/or siblings, is the area loud, etc.? Some of these things are under the control of the student, while others are less so or even completely out of their control. These and other stressors' impact on students cannot be discounted (Rizzo et al., 2014).

## Psychological Concerns

The psychological ramifications of the lockdown must also be taken into account. In the initial lockdown, there was an extremely high level of concern and anxiety surrounding COVID-19 (Dutta, 2020). In an article about higher education in India, Ankuran Dutta noted that more than 80% of the interviewees reported having excess stress and/or depression (2020). This mental health crisis was not limited to college students but seemed to have an especially harsh effect on this demographic. Everyone was hit hard, but this demographic was hit especially hard in part due to the fact that friends and social support groups were scattered all across the nation and even the world (Dutta, 2020). Thus, proximity to these groups was also disrupted in a way that is

less likely for students in K-12th grade or for someone who was already in the workforce. These issues had a trickledown effect on students' ability to focus and learn while society was in lockdown (Dutta, 2020).

## Freshman during the Fall of 2020

Some of the hardest hit students were those beginning college in the Fall of 2020. Not only had their senior year been disrupted, but then they entered college during a time when there were limited opportunities to form new friend groups (Dutta, 2020). This is already often a tumultuous time of change for students for a variety of reasons, and COVID-19 only compounded this. They also had to try to form new study habits under these conditions and in a learning format in which they had little experience. One professor noted that in his opinion students with good and developed study skills before the pandemic were able to weather the storm of a less ideal learning environment, whereas students with undeveloped study techniques, especially those in high school when the pandemic began, were much worse off. He continued that these students had less of an opportunity to develop the proper study techniques needed to succeed in college as well as in in-person test taking. These students were also observed to be more likely to ask for deadline extensions and the background knowledge of students entering his classes declined, especially in his non-honors students while also noting that, on average, honors students are more likely to have developed study skills and techniques. It is well established that many students struggle to make the transition to college for a variety of reasons and grades often suffer as a result, and this was only exacerbated by the COVID-19 lockdown (Szafran, 2001).

There is much more purpose to the classroom than merely learning the information presented by the instructor. For example, in pre-kindergarten students are supposed to learn to share and how to play with other children. As students get older, they learn to work on group projects together, resolve conflicts, further develop social skills and their personalities, etc. These are all skills they will presumably use for the rest of their lives. When classes are moved online, there is a tendency to lessen the emphasis on group work, and peer-to-peer interaction undoubtedly decreases for reasons discussed previously in this paper, and it can have detrimental effects on students (Owolabi, 2020). An article by Lindsay Hewson and Chris Hughes argues that certain tasks must be accomplished for the learning environment to be maximized, each of which involves interacting with fellow students (2005). They argue that it is important that students be known in the group, develop trust with peers as well as professors, and cultivate and maintain supportive relationships within the class. Each of these tasks is made more difficult in a virtual classroom and must be intentionally addressed in order to be accomplished (Hewson & Hughes 2005).

## Assessments and Grades

The format of the exams themselves changed for students when classes were moved online. This is important for a variety of reasons. First, it should be noted that for some classes, this was not as big of an issue. For instance, if a professor utilized multiple choice in-person exams, these were relatively easy to adapt to an online format. With this said, diagraming questions are much more complicated to adapt. In many cases, the question must be asked a different way. One professor noted that previously she had had students draw the product of a chemical reaction on paper.

This was adapted an online format as a multiple-choice question where there would be numerous possible answers. She included almost all of the incorrect answers she had seen students draw in the past. This was obviously not ideal, and she even reported that many students had complained to her that the multiple-choice version of this same question was much more difficult, as it lent itself to second-guessing as well as it was difficult to evaluate the sheer number of options.

The exams themselves shape students' engagement with the material (Northcote, 2003). Because of this, exams and quizzes are not only a tool to assess students' comprehension of concepts but also a tool to shape students' engagement with material (Northcote, 2003). This is true of both in-person and online evaluations. With this said, online evaluations lend themselves to certain types of questions. Both Northcote and Owolabi note that online evaluations make certain types of questions more difficult to ask (Northcote, 2003 & Owolabi, 2020). Owolabi argues that certain assessment forms, such as direct observations, and practical sessions become extremely difficult online (Owolabi, 2020). He also argues that even free response questions become more complicated (Owolabi, 2020)). One professor noted that diagramming, which had made up a large portion of her paper exams, was made nearly impossible online. All this to say, online examinations seem to lend themselves to multiple choice or true/false questions much more so than to free response or diagramming questions (Northcote, 2003 & Owolabi, 2020). This is important as the types of questions better suited for online exams are more likely to assess students' ability to memorize information (Northcote, 2003 & Owolabi, 2020).

Bloom's taxonomy provides a simple framework within which to assess how this aforementioned change in assessments affects students. Bloom's taxonomy is a framework developed by Benjamin Bloom that classifies different levels of learning and understanding (Armstrong, 2010).

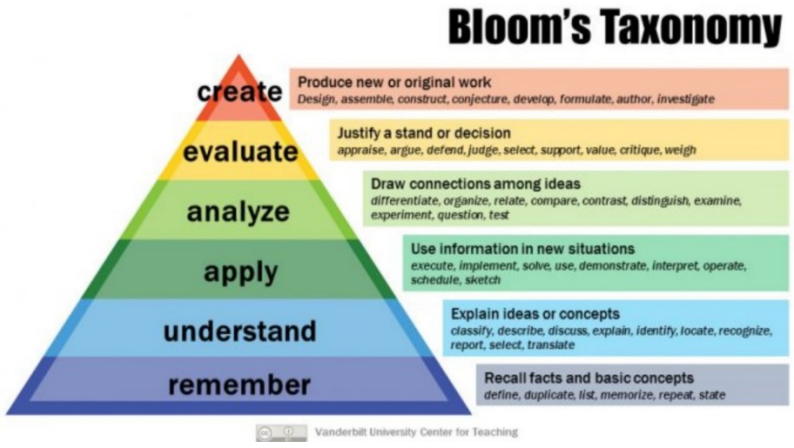


*Figure 9. Bloom's classification system for the different levels of thinking.*

Maria Northcote notes that online examinations frequently can merely assess students' ability to memorize information and regurgitate facts (Northcote, 2003). While this is certainly not true of all online examinations, this represents a potential pitfall that must be intentionally avoided through careful evaluation of potential questions and their corresponding learning outcomes. This is important as it directly affects how students will engage with the material and potentially lessens the emphasis on these higher levels of comprehension in Bloom's taxonomy if not properly addressed (Northcote, 2003 & Armstrong 2010). This is similar to the idea that if students know that topic A will be heavily tested on an upcoming exam and topic B will not be addressed at all, the students are much more likely to engage with material from topic A than from topic B (Northcote, 2003). In the same way, if students know they only need to be able to

recognize the correct answer out of a group of choices set in front of them, they are likely to spend less time studying than if they know they will be expected to draw a diagram or explain a process in a short essay response.

There were other factors that also affected the assessments used and how they were graded. One professor noted that during lockdown, “People were just surviving.” There was a fear of the unknown as no one knew how and to what extent the COVID-19 pandemic would affect healthcare, jobs, etc. Students were sent home, and their environment and social circles were abruptly and dramatically altered in many cases. Professors also noted that it seemed unfair to test for the same level of comprehension as before, if they felt that their own ability to teach had been compromised. Multiple professors noted that this entered into their decisions regarding assessments and grades in general during this time, especially during the Spring 2020 semester when the initial lockdown occurred. This could and likely did play a role in the increased average GPA observed during this semester as can be seen in Figure 7.

## CHEATING

Online assessments lend themselves much more readily to cheating than do their in-person counterparts (Gammage et al., 2020). There are simply more ways to cheat online. There is less supervision during online exams even if it is recorded or monitored in real-time, which is the crux of the issue. Additionally, multiple professors noted that it became difficult to distinguish between what was genuine technology issues and what was cheating. One professor even noted that the monitoring software used for her classes’ exams seemed to have more difficulty recognizing the faces of people with darker complexions. She noted that these students were more likely to be

falsely flagged for cheating. These issues are concerning, and multiple professors said that their main concern or worry was that honest students would suffer, while those who chose to be dishonest would benefit. There is also another element to this. To return back to the idea that examination shapes student engagement with the material, if students are repeatedly able to cheat successfully, then not only will their grades be inflated in relation to their comprehension level but also the pressure to put in the effort to grasp the material is now gone (Northcote, 2003). In this way, significantly less effort will be put into understanding the material, and comprehension will become less than what it would have been otherwise, even as the grades they are receiving are inflated. This is important for a few reasons including its effects on the baseline knowledge with which these students enter courses for which these online courses were prerequisites. Multiple professors noted that they felt the baseline knowledge of students entering their classes had declined, especially in the first few semesters after the initial lockdown.

## Moving Forward

The COVID-19 pandemic and ensuing lockdown had, and in many ways is still having, devastating effects in multiple arenas of life. With this said, there are some positives that can be gleaned from this experience, especially when it comes to higher education moving forward. The lockdown forced many instructors to learn to teach online and to become familiar with the online classroom format. Additionally, many different ideas were implemented in these online classrooms as teachers were forced to adapt on the fly. This gives a unique opportunity to examine and compare these different teaching styles in order to learn more about how the online classroom can

function optimally. It allowed a much larger data set to be accumulated on a much smaller timescale.

## What can be Applied to the In-person Classroom?

While professors were forced to adapt to a virtual classroom for a period, many found that some of these tools could be both retained and beneficial in an in-person classroom. Multiple professors noted that they have retained some elements of recorded lectures, and that this has been helpful. For instance, they noted that they now feel more comfortable recording review sessions not held during typical class time, so that they are now available to students who would have otherwise missed the opportunity to view the review session. These recorded review sessions can also be helpful to students who attended live as well, as they can now go back to re-review if a topic was unclear. Similarly, it is now easier for professors to record lectures for students with excused absences. One organic chemistry professor noted that while she is hesitant to record all of her lectures, because she has found that students are less likely to attend lecture live, she now posts short videos showing key reaction mechanisms that students can go back and review to aid students. She also noted that she has received extremely positive feedback and plans to continue to provide these for students. Although educators were forced to adapt abruptly and to become more familiar with and comfortable using these technologies and this caused considerable strain, some of these changes can now be retrofitted back to the in-person classroom for the benefit of the students.

Office hours have also changed, and this change seems to have remained even as classes have now returned to being in-person. Most professors now offer virtual

office hours or the possibility of scheduling virtual appointments. Several professors suggested that this may encourage students to ask more questions as now the activation barrier to attend office hours has been lowered. Students no longer need to make a trip to campus if office hours do not fall conveniently in their schedule but can now easily join a virtual office hour and ask a quick question without it being as much of a time commitment. In this way, by utilizing the option of virtual office hours, the professor becomes much more accessible to the students outside of merely the designated class times.

The lockdown forced professors to rethink how they were going to teach in order to account for teaching in a virtual classroom. Several professors noted that they took this opportunity to alter their teaching style. One professor noted that while he used a primarily lecture style of teaching before the pandemic, the lockdown forced him to create more PowerPoints and that now he has incorporated many of these into his in-person curriculum. Another professor noted that she put a great deal of effort into making her material as engaging as possible when lesson planning for her virtual classes and has now incorporated many of these ideas into her in-person classes and has received overwhelmingly positive feedback. In this way, when classes were forced online, it also forced professors to rethink what and how they were teaching. Additionally, by forcing educators to alter their teaching style, it allowed an opportunity for them to incorporate some of their own observations in previous and/or current classes into actionable steps to improve the learning environment for students.

## What should be Emphasized in the Virtual Classroom?

Topics such as teaching methods, facilitating peer-to-peer engagement, and methods of assessment were all affected with the switch to an online classroom. When the virtual classroom became a necessity, many professors came up with innovative ideas and solutions to accommodate this newfound reality. These ideas were put to the test and now we have the opportunity to examine the techniques that were used and to see what worked well under these conditions.

A theme across each of the interviews conducted as well as in the literature is how the lack of real-time feedback to the instructor is one of the downsides of a virtual classroom that must be addressed. As discussed previously, many professors said that they had previously taken for granted how much they were able to glean about students' comprehension just by visually scanning the room. This tool is, for the most part, taken away in the virtual classroom. One professor noted that she was able to overcome part of this hurdle by having students respond to questions requiring only a short response. It is important that these questions have extremely short answers as if not, as one professor noted, there can be a lag after the question is asked where the professor cannot tell whether students are typing a long answer or are lost. One professor even noted that in some ways, she preferred this method to asking questions in-person as she could quickly scan the answer submitted by each student and get a more complete snapshot of understanding as opposed to just having one student answer and moving on.

In smaller classes it may be feasible to have students have their cameras on during class. If feasible, this can help with several potential issues. It provides accountability to the student at least to be present while the lecture is going on as opposed to logging in and then leaving their computer to go do something else. Additionally, this could potentially allow professors to observe the class for signs or body language of understanding similar to what is possible in the in-person classroom. Finally, it can allow students to feel more of an identity in the classroom, which has been identified by Lindsay Hewson and Chris Hughes as one of the important phatic tasks that must be accomplished for the learning environment to be maximized (2005).

For a variety of reasons, adding elements of a flipped classroom, even if the switch is not made completely, may be beneficial. Similar to having students turn on their cameras during class, if students are expected to interact and discuss in class, they are likely to pay more attention in class and put more effort into keeping up with the material outside of class. One of the issues with online learning observed by several professors who were interviewed was that students did not seem to have as much of an urgency to keep up with the material as they had observed in their in-person classes. The simplistic goal of the flipped classroom is to have students become initially exposed to the material before class and then use class to accomplish higher level learning objectives. According to Maria Northcote, how a student is graded has a direct impact on how students engage with the material (2003). Thus, it logically follows that if students know that a portion of their grade will come directly from their contributions in the classroom, then they will be more likely to engage with the material before each class and hopefully avert the faulty logic that they can just cram the material right before

the exam. Additionally, using a flipped classroom style lends itself particularly well to groupwork, the benefits of which have been discussed above.

Group work is another way in which these peer-to-peer relationships can be facilitated by the professor as well as allowing students to develop their own self-identity and for group dynamics to develop (Hewson & Hughes, 2005). These are all noted by Hewson and Hughes to be important to the learning environment for students (2005). This also facilitates some of the other vital goals of education such as developing teamwork and communication skills (Hewson & Hughes, 2005). Several professors stressed that it is important to assign groups, especially if there is no preexisting rapport among students. This can help, at least partially, to alleviate some of the awkwardness and timidness that can exist in groups, especially at first. Several professors noted that these groups seemed to become more functional as the semester progressed. Another professor noted that when the lockdown initially occurred, he intentionally placed students in groups based on preexisting “cliques” he had observed in class. Lindsay Hewson and Chris Hughes claim that students must develop an identity within the group as well as a rapport with the other students before the learning environment is maximized (2005). This shows that even if breakout groups are largely ineffective at first, it does not mean that this will be the case for the entire semester. Additionally, by assigning group assignments, it may also help facilitate the formation of study groups once these initial peer-to-peer relationships have been formed. The benefits of having students work together either in-class or outside of class are well-documented for in-person classes (Hewson & Hughes, 2005). With this said, groupwork is vitally

important, perhaps even more so in the virtual classroom, due to the loss of informal peer-to-peer interaction in this setting.

Each of professors interviewed expressed concerns about the integrity of the online assessments given while classes were online. One of the main concerns was that honest students would suffer while those who chose to cheat would benefit and, thus, it would be unfair. It becomes obvious that the sheer number of ways to cheat increases significantly when taking an exam online in an uncontrolled environment. While many of these can be dissuaded or caught using monitoring services and/or lockdown browsers, these systems are not perfect. As mentioned previously, they may have more difficulty recognizing the faces of students with darker complexions, and they are also, in general, not as good at preventing and catching incidences of cheating as teachers monitoring an in-person exam. Additionally, students may be more inclined to cheat on online exams. Virtual exams also lend themselves to questions merely requiring memorization of information instead of assessing higher learning outcomes (Northcote, 2003). With all of this said, it is important that educators be cognizant of these potential pitfalls and intentionally avert them. Much of the current literature suggests that virtual classes favor smaller formative assessments as opposed to a few summative assessments. This may also help educators gauge the level of comprehension of the students earlier and perhaps replace some of the informal feedback lost in the virtual classroom. Additionally, educators in the virtual classroom should be intentional about making their quizzes and exams an accurate assessment of the learning outcomes they wish their students to achieve. For instance, multiple choice or true/false questions may be insufficient to assess the higher levels of Bloom's

taxonomy even though they are the most convenient types of questions to ask online (Armstrong, 2010 & Northcote, 2003). This is important as how students are evaluated or graded plays a critical role in how they engage with the material (Northcote, 2003). Assessment in virtual classes should be thoughtfully contemplated, and evaluations should be consistent with the desired learning outcomes.

## CONCLUSION

This paper focuses on the impact of the COVID-19 pandemic and the ensuing lockdown on higher education, but the pandemic significantly affected nearly every aspect of life for people in every stage of life across the globe. The pandemic particularly affected the education system, and I suspect we will continue to witness the fallout from this for years to come. With this said, one of the main takeaways from this was the resiliency of educators across the board. Forced in many cases to remake their course materials completely and to alter their lesson plans to accommodate a virtual classroom, these roadblocks nevertheless did not stop educators. Additionally, when given the opportunity to take a step back and review what they learned in the last half of the Spring 2020 semester, they were able to return grades to a level consistent with what was seen before the pandemic, and a significant change was not observed as classes were transitioned back to being conducted in-person. One of the benefits of the abrupt switch to being online, at least in hindsight, is that educators were forced to innovate, and these innovations can now be evaluated and shape future virtual learning environments for their benefit. This paper seeks to evaluate these experiences and what a few professors at the University of South Carolina learned in the context of other available research.

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