Recommendations for College Online Instruction and Learning Methods in China and the U.S.

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Abstract

The recent rapid transition to online learning worldwide has revealed many of its challenges. Working with our sponsor from Hangzhou Dianzi University, we evaluated and compared student and instructor perceptions of college-level online education. We conducted surveys and interviews in both China and the U.S. to identify the successes and failures of online learning. We compared the state of online learning between each country and observed any differences. Using these findings, we formulated evidence-based recommendations aimed to help improve the quality of online education.

Executive Summary

With fluctuations in purpose, pedagogy, and pertinence over the years, higher education has evolved several times. A relatively recent development has taken advantage of new technology to make education more accessible through an online platform. At a time where these changes were already well underway, the 2020 COVID-19 pandemic accelerated them, making the value of online education well known and well sought after. With the growing demand for quality online learning programs and millions of students and instructors using them, a lot is riding on their future.

Our goal for this project was to observe the current outlook of online learning. We identified its successes and failures at two universities, one in China and one in the United States. This evaluation provided us insight into what online education areas need improvements and which areas could serve as an example of good practice. After identifying these points, we offered recommendations on how to help better the future of online education. The locations included Worcester Polytechnic Institute (WPI) and Hangzhou Dianzi University (HDU) in China. Two student teams, one from WPI—the interactive qualifying project (IQP) team who authored this report—and one student team from HDU.

Methodology

To achieve our goal, we investigated first-hand experiences from students and instructors. By doing this, we could understand student and instructor perceptions of online teaching methods. Throughout our investigation, we needed to analyze the collected data to determine the learning efficiency, effectiveness, and teaching quality of online teaching. The collected information helped us identify the factors that affect the quality of online education and formulate recommendations for its future directions.

Our teams utilized surveys, interviews, and statistical analysis to arrive at our findings and recommendations. The same survey was distributed in both China and the U.S. and began with some demographic questions including age, year, and department. Seven student-based and eight instructor-based Likert-type questions asked respondents to rate their agreement to a given statement from strongly disagree (1) to strongly agree (5), followed by two open-ended questions. Our team then conducted interviews with both instructors and students. Individuals who agreed to be interviewed in the survey responses were contacted by email. Survey data was

used to adjust interview questions for participants. The interviews allowed participants to elaborate on their survey responses and provided further insight into their perceptions of online education. Both teams—WPI and HDU—divided up their team members to conduct more interviews.

Once the interviews were completed, we used content driven analysis strategies to categorize the open-ended survey questions. The interviews were also recorded (with consent) and reviewed by all team members after they took place. Each survey's Likert questions were organized into a pivot table in Excel, with the rows of the student categorized by graduation year and the rows of the instructor by age. When comparing averages in our data, we performed t-tests to evaluate whether the differences are statistically significant. These tables were analyzed for any trends and the results were recorded.

Results

After the surveys were developed and distributed, we collected 266 student and 46 instructor responses from WPI, and 190 student and 50 instructor responses from HDU. Teams from both schools were able to interview a combined total of 27 students and 20 instructors, which were used to further explain and support the findings in our survey.

Some major comparisons between China and the U.S. we found in our findings were that on both sides, students were easily distracted in their online classes and that they've had to study more independently to keep up in class. Despite this, students in China said that online learning improved their academic performance, whereas U.S. students reported the opposite. Chinese students also felt they had an easier time communicating with their instructors and performed better in asynchronous classes, two things that U.S. students frequently mentioned were challenges for them. Overall, U.S. students were less satisfied with online learning. Both student respondent groups agreed that they felt their instructors and universities are actively trying to improve online learning overall.

We found that instructor experiences in the two countries shared the same sentiment that online classes required more time and effort in daily preparation. Many cited that they had to prepare new course material for their online courses and take extra time for recordings. Instructors also believed that communication with their students online was not as easy as in-person. Lengthy or boring lectures were a common dislike, as instructors often cited that their

students lost focus too easily during online classes. These findings can be classified under instructors being forced to properly adjust their classroom to the online platform, which both universities agreed is important. We did notice that China instructors had little concern for using online asynchronous lectures, while U.S. instructors and even students commonly brought up that they had little success with asynchronous lectures.

Recommendations

After data analysis, we made recommendations based on our findings. These recommendations were most supported by the survey and interview evidence.

Our first recommendation is for instructors to employ shorter lectures. Students find sources of distraction abundant in online learning, whether it be due to personal focus issues or a lack of engagement from their instructors; shorter lectures will reduce distraction. Asynchronous lectures should be recorded at around twelve minutes to take advantage of student attention spans, as well as making the consumption of their material more manageable. Synchronous lectures should be kept to around thirty minutes, ensuring that the instructor fosters interactions with the class through elements of active learning and consistent student engagement.

Instructors should require their students to keep their cameras on during class lectures and meetings. For students, it puts a responsibility on them for their own sources of distraction. With not only the instructor but the whole class able to see you, students are much more likely to pay attention. For instructors, cameras can remedy a lost tool from physical lectures: student facial expression and body language. Cameras will help facilitate a more responsive class environment.

We recommend instructors to fully transition to online learning. It is important for instructors to embrace the online format and go beyond replicating their typical lectures remotely. Examples include making use of online tools, such as discussion boards and forums, modifying the type and amount of content that can reasonably be covered in the new online format, and finding ways to interact with students outside of lectures. This will help with maintaining student attention, teaching course material more effectively, and will create a higher quality course overall.

Another recommendation would be to make sure that a university's learning technology help center is well equipped to assist the instructor with any problems. Developing a help center

can be difficult, due to training costs and time. We also advise instructors to be open to suggestions from colleagues and students and to seek out their help when needed.

We recommend that instructors maintain consistent or daily interaction with the class. Both students and instructors felt that interaction with each other is missing in the online platform, becoming a source of many negative perceptions. This interaction can be done through check-ins with each student to help them stay positive, focused, and on track. We also recommend smaller class sizes so instructors can have more meaningful interactions with the students in their class.

Instructors should avoid using only asynchronous lectures. In a strictly asynchronous class, there is minimal interaction between instructors and students. Engagement during a pre-recorded lecture is little to none, which is bad for the already low focus levels of students in online learning. Providing synchronous elements into their classes can facilitate interaction and engagement for students to help improve their online learning experience.

We also recommend instructors to provide a proposed coursework schedule for students. One of the primary challenges students face is managing their time online. By providing a day-by-day schedule suggesting what work should be completed when would provide students with a plan to help manage their time and stay on track

Our team also determined some recommendations that were less supported by our findings, but we still believe hold value for instructors teaching online:

- Increase Student Engagement in Lectures
- Commit Sufficient Time to Daily Class Preparation
- Maintain Clear and Responsive Lines of Communication
- Employ Discussion Boards
- Post Recordings of All Synchronous Materials

These recommendations are based on the perceptions and experiences of both students and instructors on an online learning platform. We believe they will help provide a higher quality online education experience for both students and instructors.

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1.0 Introduction

With government mandated shutdowns, public health concerns, and paranoia rampant throughout modern society, traditional learning settings have become hazardous. Large gatherings that are normally seen in schools and universities can no longer take place because they may contribute to the spread of the COVID-19 virus, so alternative teaching methods had to be implemented. One of these alternate teaching delivery methods includes online learning.

Online learning was adopted by schools globally in order to continue education for students; Zoom—an online video communication system popularly used for online education—saw its user base increase 378% during the opening months of the pandemic (Bary, 2020). The use of distance learning has proved to be a necessity to keep learning safe and operational. It creates an environment where students are able to resume their education remotely, while adhering to World Health Organization recommendations and practicing safe social distancing in an otherwise crowded environment.

Schools and universities had to transition to online learning incredibly fast on an international level, with some schools being less prepared than others. With almost every school in the autumn of 2020 having some form of online or remote learning, this raises the question of how schools can guarantee the quality of their online educational experience. Since the duration of the pandemic remains unknown, schools must evolve their programs to better suit an online instructional delivery platform.

Distance learning has existed for decades, but only recently has been thrust into the spotlight. Specifically, in higher education, there is demand for quality online learning programs, especially given the existence of the COVID-19 pandemic. This context has pushed for a wave of innovation, bringing out new ideas and building on old ones. It has shown us that online education has the potential to be effective, but in its current state it is likely not enough. With millions of students and instructors currently using online learning, a lot is riding on its performance and caliber. This is at the heart of our motivation for this project: to find potential innovations for online learning.

Our project sponsor was Professor Rui Zhang of Hangzhou Dianzi University (HDU). She teaches in the HDU School of Management, a school that has taken great interest in the current state of online learning for now and the future. The main issue Professor Zhang was

facing is the growing need for improved and robust online learning tools and strategies. Online education is being widely used and widely criticized, with constant comparisons to the traditional classroom experience. Professor Zhang wished to see improvements for both instructors and students in the future, and hoped that our project would be able to provide insight on the direction online learning is headed. The results of this project aimed to help not only HDU but provide valuable recommendations for broader improvement in university online learning programs. It was also a means to provide direction on how to approach possible future issues.

To help determine these recommendations, we collected and analyzed data pertaining to student and instructor perceptions regarding online learning as well as the adaptation and execution of online teaching methods. With this, we explored the differences between online instruction in China and the United States and used the investigation to identify broader improvements. We then provided possible methods to resolve these issues. Using this definitional analysis, we explored the possibilities of improving these methods, and how online learning could move forward as a robust means of education.

2.0 Literature Review

Distance learning is a form of education that has been around for decades or even longer, but since the invention of the internet and the technology brought with it, online learning has exploded in both popularity and practicality. In a few short decades, massive developments in online learning have allowed schools to continue the use of their in-person courses as well as transition to fully remote learning programs.

Online learning is a growing trend for many universities that exploded in necessity during the COVID-19 pandemic. Technological advances since the creation of the internet have increased the practicality of substituting a traditional classroom setting with a digital one. While developments continue to be made, there remain drawbacks in comparison to an in-person learning experience. Due to this, institutions are continuously working to improve the design and methods used in increasing the quality of online learning.

2.1 History of Distance Learning

Although online learning only began after the creation of the internet, it is the successor to much simpler forms of distance learning dating back to as early as the 1700s. The earliest known form of distance education was through the parcel post after a man named Caleb Phillips posted an advertisement in the paper offering to send educational materials through the mail in 1728 (Kentnor, 2015). Distance learning was also used in the form of radio broadcasts to bring education to the public. One notable example of this is the Ohio School of the Air, founded by Benjamin Darrow in 1929 (Ohio History Central, n.d.). The school broadcasted various subjects for primary and secondary education, with courses in art appreciation and history, such as a series named "The Men Who Made America". The school lost state funding and eventually ended in 1937. The Public Broadcasting Service (PBS) debuted in 1970, and still airs educational television broadcasts, such as children's shows, documentaries, and educational series to this day. Radio and television are some of the earliest forms of distance learning and their utilization far precedes the creation of the internet.

2.2 Growth of Online Learning

While the COVID-19 pandemic has caused an immense spike in online learning, its growth and development date back to well before the outbreak. Between 2004 and 2016, the number of students enrolled in online courses increased every year, with more recent years seeing the greatest growth in the number of students. Between the fall semesters of 2015 and 2016, online enrollment increased by 5.6%, reaching a total of 6,359,121 in the United States alone (Allen & Seaman, 2018). By the beginning of the 21st century, about a quarter of all higher education students had taken at least one online course per semester, with more than half of institutions granting distance learning courses (Berg & Simonson, 2017). The distribution of students to universities is very concentrated, with 46.9% of online students in the United States enrolled in 5% of total institutions in 2016, with the University of Phoenix taking the top spot with 131,629 enrolled students (Allen & Seaman, 2018). The growth and popularity of online classes was prevalent well before they became a necessity.

Because of the growth and success of online universities, a gold rush for online learning led to massive developments in just a few decades (Hunter, 2015). Major universities, to remain competitive, have had no choice but to embrace and adapt to the online learning format. When constructing an online program, expertise and experience are still a necessity for the program and the school to succeed. Massive Open Online Courses (MOOCs) that are for-profit, such as Khan Academy, in combination with existing, completely online courses have kept the field competitive which factored into the speedy developments made in online learning. (Hunter, 2015). The competitive field has pushed online learning to reach a point where full courses and programs can be conducted completely online, with some even granting degrees.

2.3 Modern Status of Online Learning

Distance learning has greatly evolved since the days of radio broadcasts and parcel posts; universities are now able to offer undergraduate degrees from a solely online platform. Waseda University is credited with having Japan's first fully online undergraduate program in 2003 (Nishimura, Scott, & Kato, 2009). The university utilized emails, phone calls, and video conferences to conduct lessons and maintain student-instructor interaction. Classes were, based on their content, personalized for the lecturer and its students. In an online teaching environment, video remains the primary method for delivering content, with email being the most popular

form of student-teacher communication (Downing, 2020). Student to student interaction is most commonly done through discussion boards on learning management systems (LMS), such as Canvas and Blackboard. The resources that the advancement of technology has brought has allowed full courses and degree programs to be conducted fully online, while still maintaining a level of student-instructor and student-student interaction.

Chinese students taking online classes receive learning material such as lectures remotely over platforms such as Zoom and DingTalk. The social media and instant messenger app WeChat is widely used in China for education due to college students having easy access to cellular devices. Pictures, audio, and video files are distributed on this platform. WeChat also has applets, which are small applications that rely on WeChat for users to access without needing to download and install the app (Sun, 2019). These applets are cheap and have a short development cycle, making them a very useful and practical tool for e-learning.

2.3.1 Existing Student Impressions of Online Learning

While online learning has proved to be a game-changing educational tool, it has also shown what does and does not work outside a traditional classroom. More and more universities are implementing online learning options, making it common for the average student to have encountered an online course during their education career. Overall, surveys have shown that these students are fairly content, if not happy, with their online learning experiences.

A study across several Western Australian universities assessed students on satisfaction across six aspects of their online courses: organization, content, motivation, available feedback, interaction, and learning strategies (Siragusa, 2002). On a scale of 1 to 5, results from over 250 students yielded an average score of 3.9. (Siragusa, 2002). Individual interviews among 25 students revealed that in general, students were satisfied with their experience, but expected better implementation of the online element in some of their courses. Another study took place at the aforementioned Waseda University in Japan. This anonymous survey also yielded positive results from students; with questions like "was the course well planned" and "was the course helpful", average ratings stood out at 5.7 out of 7 (Nishimura, Scott, & Kato, 2009). With over 1,200 student responses across two questionnaires, it showed great promise for fully-online programs, the only catch is that most of these students voluntarily signed up for these online courses.

These results may not necessarily imply that all of these students chose online courses as a preference over an in-person experience, it should be noted that students may have come into these learning environments with existing opinions on the format. Regardless, both studies reflected that one of the most appreciated aspects of online learning was its flexibility. Whether it be the option to more easily create a schedule around classes, or that the required time-management allowed for more control of one's learning, flexibility was shown to be a key to success. However, an abundance of free time was not always seen as a positive for some.

2.3.2 Concerns with an Online Transition

The quality of the course instruction is an essential part of a successful higher-education program, however, within the context of online learning, this factor becomes even more important as unique challenges are presented. According to a collection of "award-winning" online-course teachers, one aspect is to "include authentic and relevant course materials that connect to the practice" (Kumar, 2019).

Due to these courses being online, the course materials usually consist of videos and other forms of digital content, rather than receiving this information from the instructor. The content must be relevant to the course materials, as usually in an in-person environment, the instructor can perhaps gauge how their course materials are having an impact on the students, but in an online environment, that person to person engagement is lost. In regards to the learning environment, it is important to take a look at the bigger picture with relation to online learning, such as the expanding enrollment, life-long learning, retention/attrition, rising tuition, and student loan debt, just to name a few (Picciano, 2015).

When compared to in-person learning, these environmental aspects will have either a larger or smaller impact in the world when placed within the context of online learning. For example, would the tuition stay the same for both online and in-person learning? These aspects need to be analyzed to have a better idea of where online learning is going. Of course, with these new aspects come new policies to handle them. Some colleges may have policies already in place thanks to a substantial online program, but colleges that are just developing these programs need to draft these policies. Due to the change from in-person learning to online, the curriculum approval, course workload, intellectual property, accreditation compliance, faculty observations, and evaluations would all have to be changed or modified to suit the unique environment of

online learning. (Picciano, 2015). This massive change ties back into new environmental aspects that need to be considered. As more problems arise within this, more policies would need to be drafted or modified to help mitigate these problems.

2.3.3 Negative Effects of an Online Transition

Online learning can quickly turn into an overwhelming and stressful experience, only serving to increase the difficulty for the student, particularly those with mental health conditions. A lack of physical presence and social interaction on campus can be troubling for students, affecting their ability to study and attend class. This situation combined with fewer available support networks will lead to increased feelings of loneliness for virtual learners (Marrero, 2019). In addition, students will not have direct access to counseling and mental health resources due to the online platform. This has led to higher dropout rates for online learning students, regardless of GPA or academic performance (Marrero, 2019).

It is not just the students that are stressed: some universities are having trouble keeping up with the "gold rush" that has become online learning. With its huge increase in prevalence, schools are being forced into the online learning arena just to stay afloat and continue to remain competitive (Hunter, 2015). This can lead to rushed programs of poor quality that are affecting not just the students, but the instructors as well. Preparing instructors for the classroom-to-online transition can be exhausting, especially without professional help. Instructors require additional training in the use of online learning platforms and tools and will be expected to handle technical difficulties. Even with familiarity with these programs, they may have to individually adapt their teaching style, and not all methods can be brought online.

2.4 Areas of Improvement in Online Learning

As these new adaptations are a direct response to the rise of students beginning to experience online learning for the first time, institutions and instructors are discovering their old methods are not enough to provide quality education. While these methods would have worked previously in an in-person environment, some unique problems that come with online learning require these methods to be modified. Different institutions and instructors have come up with unique methods to improve their online learning programs, but the end goal is the same: to continuously improve the design and methods used to provide a better learning experience.

2.4.1 Commitment of Staff

A committed teaching faculty, focused on bringing quality education to students, is important to the future of online education. Similar to in-person teaching, if the instructors are not dedicated to the topics they are teaching, the course material will most likely fall flat. The only difference is the staff and faculty must be willing to commit to this new online environment as well. The current state is that instructors are more pessimistic than optimistic in this new environment, as most of them believe that the results from an online course cannot possibly compete with an in-person course (Picciano, 2015).

What they do not realize is this perception of quality imbalance contributes to the belief that online courses cannot compete with in-person courses. They may believe that online courses are inherently bad, or be unwilling to put forward the effort it requires to shift their lessons to the online platform. There are already plenty of methods to try, which includes providing assistance to teachers and having them start small rather than working on a full course (Picciano, 2015). That way, more instructors would be inclined to test online learning rather than writing it off as a useless platform. The instructor also needs to make sure that their course is presented with a purpose or an objective. The idea behind this is to have their students try to see the big idea behind what they are learning (Kumar, 2019). That way, it can encourage students to be engaged with the content as well.

2.4.2 Student Engagement in an Online Setting

While the instructors and staff have to work on being committed to teaching their courses, on the other side, student participation must be actively encouraged. If students are not engaged, then the course will likely fail. There are some ways to ensure that students are fully engaged in their online courses. These include getting the student's reflections on the course learning, such as asking their option on class quizzes or exams, to self-assessments on how the course is being taught (Kumar, 2019). This type of evaluation is common in face-to-face classroom settings, as there are instructors who commonly send out self-assessments to their students. In an online setting, there can be unique questions, such as if the method of receiving their course teachings is the best it could be, or if the students want the instructor to release more online person-to-person office hours. That way, students have a way to tailor their experiences to better encourage their participation.

Another method to encourage student engagement is by having them create digital content both individually and collaboratively. These usually include digital stories, websites, or audiovisual presentations (Kumar, 2019). The idea behind this activity is to help keep students engaged in the content being taught by giving them a hands-on experience which would allow for an experimental approach to online education.

One last method is to have the option for the course to be experienced both through asynchronous and synchronous methods. This information comes from a study that researched whether an online course's delivery method was correlated with the success of the student. What they found was that the success of the student was not directly affected by this, but that the time spent with the online system had an effect (Nieuwoudt, 2020). Ultimately, a course being asynchronous or synchronous can indirectly affect the success of the student, as it allows for more flexibility for the student to experience the course. This flexibility can increase the time spent with the online system and will have a positive effect on the student's success in the course.

2.4.3 The Proper Tools

While the institutions, instructors, and students all have a part to play in the development of online learning, the actual tools and formats that facilitate online learning also have a significant impact on the future of online learning. Schools need to ensure that they have the essential hardware, LMS, and communication methods to support the course and the same for students who need to ensure the same to attend the course (Picciano, 2015).

Say if the software was not as good as it can be, or if students did not have the necessary hardware to attend the course, that would certainly be detrimental for the future of online learning. LMS such as Canvas and Blackboard are important starting points for online education but can prove to be very costly (Picciano, 2015). Despite this, LMS and other software have proven to be necessary for online learning. The usage of multimedia resources can help with the success of the course, for example, including lectures, podcasts, and other forms of media in the course (Kumar, 2019).

If students have the option to select which media format they prefer to learn from, that could positively affect the success of the program. This choice does not stop at media formats, however, as new emerging learning environments are being considered for use in college online

learning. Environments where online learning used to be non-existent or has seen success, are all valid for consideration, future technological uncertainties and innovations will exist. Examples such as social media, massive open online courses (MOOCs), and even game-based learning are possible avenues for online learning to take (Martin, 2020). While these suggestions have the potential of assisting online learning programs, it is ultimately up to the college to research and choose which program is best for them. As the improvements to online learning continue, now is a better time than ever for it to be utilized during the COVID-19 pandemic.

2.4.4 Assessment in Online Courses

Assessments are the primary tool used to determine student understanding of course material, providing evidence that course learning outcomes are met in both in-person and online environments. There are two primary types of assessment methods: formative and summative (Harlen, 1997). Formative assessments serve to track a student's progress during the course, such as a weekly quiz, whereas summative assessments measure a student's progress to see if education outcomes were reached, such as a final exam. This combination of testing-for-learning and testing-of-learning has been used as a critical grading practice in the classroom for decades (Iamarino, 2014). However, while they tend to go hand-in-hand, it is important to identify them distinctly.

Formative assessments not only show instructors the current progress of their students but also act as a source of feedback for the students themselves (hence testing-for-learning). This harmony is called a standards-based assessment, since it builds off of predetermined criteria set by the instructor to match progress at a certain stage of the course (Iamarino, 2014). This approach contrasts with summative assessments, known as points-based or grades-based, which evaluate what a student has learned and to what degree, often serving as the final judgment of their knowledge and therefore determining their representative grade for the course. It is also important to recognize that these methods take shape outside of just quizzes and exams, and that a restricted online platform may utilize different tools than the traditional in-person classroom setting.

While assessments in an online course still follow the same principles as an in-person one, the actual testing tools/methods used vary greatly. There are ways to detect a student's

comprehension of material outside of formal assignments, such as asking questions or non-verbal cues which are not as obvious on the virtual platform (Crosslin et al., 2018).

Assessment tools such as e-portfolios, projects, oral presentations, and written responses are used in online learning. E-portfolios are useful in displaying labor-intensive work that can be identified as authentic. By storing their portfolios in digital folders, students can easily distribute and submit work in an online learning environment. Students can also be assessed online through group projects. These allow students to work collaboratively, utilizing the plethora of media tools that makes doing this remotely easy and realistic (Conrad & Openo, 2018). Oral presentations ask students to give a virtual presentation or speech for the instructor and students in the class. Written responses can take the form of open-ended questions or essays, which has the students apply their knowledge to different problems or prompts (Crosslin et al., 2018). Each of these methods could be applied as both formative and summative assessments, depending on instructor objectives.

2.5 Comparison of Higher Education in China and America

Higher education is a beacon for both Chinese and American students. However, the paths that the two countries offer are varying. Chinese education prioritizes teaching their students factual information and rewards students for obtaining a correct answer (Ma, 2020). This manifests itself into a learning system that revolves around memorization, rote learning, and high stakes testing. In the United States, there is a greater emphasis on creativity, critical thinking, and rewarding students based on their effort. The two systems contrast one another, creating two distinct education systems that prioritize improving different facets of their students' abilities.

2.5.1 Differences in Instruction

Representative of their respective educational beliefs, America and China have drastically different approaches towards their curriculums. In America, discipline majors such as science, economics, and history are common, but other discipline majors may gain popularity depending on present societal demands. (Feng, 2008). These disciplines, such as the humanities, were historically important in educational philosophy but have lost some of their weight to programs that are more directly geared toward a profession. In China, they are more geared

towards finding "quick success and immediate gain" in employment (Feng, 2008). With this knowledge, Chinese universities can appropriately prepare their students for when they enter the workforce. To help achieve this system, Chinese curriculum has been cultivated so that it revolves more around dualistic thinking, instilling factual knowledge, and personal ability (Ma, 2020). These methods have proven successful, despite China's recent movements towards American education models that favor innovation. In a sense, the countries have now swapped their education priorities, with China seeking the United States' humanities background, and the U.S. looking to produce more scientists, engineers, and economists.

While American and Chinese instructors teach similar topics, their styles of teaching are radically different. In America, most instructors try to encourage students to learn independently by having them draw their own conclusions about the course material after thorough thought and analysis. This independent learning stems from the idea that "students should participate in the teaching process, even encouraging them to challenge the academic authority" (Feng, 2008, p.61). In contrast to how teaching is executed in America, most Chinese instructors implement a "force-feed type" teaching, where students would directly take in what was being taught (Feng, 2008). However, these methods have evolved in recent years. For example, some Chinese colleges have started encouraging their students to take more initiative in their own learning, such as at HDU, where some hybrid courses have implemented a requirement for students to take time outside of normal lectures to study key theories.

2.5.2 Comparison of Universities

These two countries' schools also utilize different management styles. In the United States, private and even public universities are largely independent, where individual initiative and enthusiasm are valued in students. After the Higher Education Act of 1965, the government was allowed to directly intervene in higher education programs, despite them often not doing so, instating a more passive, macro form of control (Pei, 2017). Their focus lies on expanding educational opportunities for all while still producing high-quality graduates. In China, public schools tend to rank higher than private ones, and various levels of universities are directly controlled by the government. China categorizes their universities with the C9 being the nine most prestigious universities. Project 985 schools are first-rate universities competitive at the international level and conducted by the Chinese government. There are 39 schools at this level.

Project 211 schools consist of 112 universities that the Chinese government puts in the effort to develop and strengthen (Project 211 and 985—China Education Center, n.d.). However, with so many schools in their jurisdiction, not every university is managed objectively or fairly, leading to an unpredictable competitive market (Pei, 2017). This brings up a weakness of both Chinese and American universities, as they are sometimes too focused on marketing and gaining a competitive edge instead of personal development.

2.6 Quality Assurance

While colleges are developing and running their online education programs, they also need to ensure these programs are being run to the best of their ability. By taking into account previous concerns and improvement methods, universities can design specific methods to analyze factors and produce improvements. Through quality assurance, they can gauge how well their programs are doing and can take steps towards improving them. This is critical to the success of higher education, especially when it involves e-learning. As e-learning continues to grow, more universities are interested in having it as a mode of delivery for their courses. This would result in higher accountability for the quality of these courses, which would present the need for some form of accepted standards and benchmarks to arise (Masoumi & Lindström, 2012). This is where quality assurance practices are useful, as they present standards for these online programs as well as methods to chart out testing. There are several areas that quality assurance encompasses, but some of the major ones include pedagogical factors, student support, and faculty support.

Factors that relate to how a learning environment and its pedagogical resources are being utilized can be used to determine the quality of a college course. If any of these factors are found to be lacking, the educational value of the course could be lacking as well. For example, communication within the course or any social aspect is important to consider. These aspects would include any interaction between the students and instructors, as well as any student to student interactions (Masoumi & Lindström, 2012). If a student struggles to understand the material being taught, they should be able to rely on their instructor or fellow students for help. Through quality assurance, these elements in an online course would be held to a standard, which would ensure that these interactions are available or perhaps encouraged.

Institutions that aim to ensure the quality of their online courses should place a heavy emphasis on high standards for their faculty and staff. Standards include training and certification for professors looking to teach online courses, and providing adequate technological and administrative support (Britto, 2014).

3.0 Methodology

The goal of our project was to research and develop recommendations for future directions of online learning in both China and the United States. To accomplish this task we investigated the adaptations of different teaching methods in online courses through the collection of student and instructor opinions, perceptions, and experiences with online education. We decided surveys and individual interviews to be the best methods to gather this information; a short, straightforward online survey could be easily distributed to participants and would efficiently bring in large amounts of data from our targeted sample, while interviews would allow us to truly understand a participant's experiences through quality dialogue. Once collected, we analyzed our data to identify trends and patterns and built an understanding of the different teaching methods that were utilized during the recent, widespread adoption of online learning. After our examination, we formulated recommendations to improve the efficiency, effectiveness, and quality of online learning.

3.1 Acquiring Student and Instructor Perceptions

Before we discuss the exact tools and methods being used in online education, we wanted to first build an understanding of current student and instructor perceptions of online learning. More specifically, we wanted to understand the general consensus on the effectiveness and satisfaction with online education in both the United States and China. For the students, we determined their perceptions of online education in comparison to a traditional classroom experience, and their reasoning behind whether they believe it was better or worse. We also investigated some academic behaviors of the students, such as how often they participated in class, their studying habits, and their interactions with instructors. For instructors, we targeted their overall opinions on the situation, thoughts on online teaching methods, as well as if they are satisfied with both their students' performance and their own performance as an educator.

3.1.1 Survey Design

In order for us to conduct an effective survey, we had to first determine our sample, design the layout, and select a distribution method. Only then could we distribute the survey accordingly and collect and analyze the results (McCombes, 2019). The sample of survey

participants was a convenience sample from the student and faculty bodies at both Worcester Polytechnic Institute (WPI) and HDU. We aimed to survey a combined total of 150-200 students and 30-40 instructors from both universities to obtain statistically significant sample sizes. Our selection of survey participants did not discriminate based on age, major, department, or any other factor aside from their status as an instructor or student. Surveys were structured to gather answers to straightforward questions regarding our chosen topics of interest and yielded both quantitative and qualitative data. The content of the survey included Likert-type scales (agree/disagree on a scale from 1-5), checkboxes, and brief open-ended questions. Two separate surveys were developed: one for students and one for instructors.

Several rounds of revisions took place before the final release of our surveys. The first round involved a pilot release; an early version of our surveys was sent to ten students and two instructors for general feedback and to confirm that our questions were clear. After that, we met with two faculty members who were involved in a previous study on online learning, which involved collecting their data through surveys. The purpose of these interviews was to get advice on how to formulate our questions, distribute our survey, and get insight on what to expect during the study. We also met with our sponsor multiple times to make sure the questionnaire aligned with her project goals. For the surveys, our HDU counterparts were responsible for translating questions and responses to and from Chinese. The translated surveys were also back-translated to English and compared against the original to verify its accuracy. Frequent communication between the WPI and HDU teams ensured that not only any translational errors were corrected, but also the logic and structure of the translated survey (which used a different piece of software to collect data) stayed true to our intentions. A copy of our surveys can be found in Appendices A and B.

3.1.2 Survey Distribution

We distributed our online survey using Qualtrics in the U.S. and Tencent Questionnaire in China. Our methods of distribution included email alongside the social media networks Facebook, Reddit, and Discord to share and distribute our survey among the WPI student community. To distribute the instructor survey, our team received help from one of our advisors who was able to email it to the faculty list at WPI. The HDU team distributed their surveys similarly, by sharing it with their classmates via the social media network QQ or through their

WeChat friends. They also sought help from the sponsor, who had offered to send the survey out to her students.

This approach brings up a large weakness of survey responses and sample: it was difficult to manage or guarantee responses (Roy, 2016). Since there was often no real motivation to complete the survey, it must be quick and simple enough for the participant to willfully finish, answering all questions thoughtfully. To help combat this lack of interest, we created an incentive for people to respond: the option to enter into a raffle upon survey completion. The raffle prize included a $50 gift card to the winner's choice of either Amazon or Dunkin' Donuts. For the HDU team, their incentive was using red envelopes of money—a method to transfer funds through the WeChat social media platform—to attract students.

3.2 Investigating Online Teaching Methods

Once equipped with supporting knowledge of student and instructor perceptions of online learning, we carried out our main objective of investigating the best practices of online education and formulating recommendations. To meet this objective, we conducted interviews to follow up on our initial questionnaire with both instructors and students, as they are a more personalized form of data collection that provides greater depth and understanding of causal relationships (Bhattacherjee, 2012).

3.2.1 Interview Design

Interviewees were recruited by asking on the survey whether they would be willing to participate in an interview at a later date. Initially, we decided that if the number of respondents who agreed to a follow-up interview was not sufficient, we would reach out to individual students and instructors via email, in addition to taking referrals from the candidates we did manage to interview. This additional step proved unnecessary as we collected an adequate number of willing participants.

We planned for each team to gather a minimum of ten students and ten instructors to interview. We chose this sample size because its collection was reasonable given the scope of the project. Instead of having a pilot interview, we met with a faculty member with experience in collecting data through interviews and sought their advice on proper interview structure and technique. We also continuously revised our questions as we completed more interviews. Also,

similar to our surveys, we met with the sponsor to confirm that our interview questions were to her satisfaction, after which the questions were sent to the HDU team for translation. The same back-translation process used with the surveys was performed.

Our goal when interviewing instructors was to learn what they have employed in their online learning courses to make them successful, or what they have found to be unsuccessful and why. This way, we could discover a pattern in similar teaching methods between instructors, and compare the methods used between U.S. and China instructors. The student interviews would supplement this information, validating instructor methods depending on how effective the students found them to be.

We used our initial survey data as a basis for our interview questions. We could not solely rely on our survey data for our entire analysis as the responses did not explain why certain trends take place, but they allowed us to make critical observations before conducting our interviews. These observations helped us in formulating interview questions that can elaborate on the trends noticed in the survey. The majority of our interview questions were perspective questions, which are critical in understanding how a subject views a situation (Hass, 2018).

Our main reason for choosing to interview these students and instructors was to look into their personal experiences regarding online learning. Each student or instructor has experienced an in-person classroom environment. They can each speak on how they adjusted their learning or teaching style and methods to conform to online conditions. Their observations with regard to these adjustment's effectiveness would also prove valuable. That way, we could discover the details that would explain why an online course was successful or not.

3.2.2 Interview Structure

Each interview followed a general format, directly asking the interviewees questions and recording the results, but may have been personalized for the particular participant (Bhattacherjee, 2012). The HDU team was responsible for translating and conducting these same interviews for the students and faculty at HDU. With the consent of the interviewee, all interviews were recorded for further review. If the interviewee did not consent to this recording process, detailed notes were taken. To be more efficient, we divided our project team into two pairs of students, each operating independently of each other to conduct interviews more frequently. For the HDU team, they split up individually to interview one person each day for a

period of three days. Interviews were conducted over Zoom in the US and over DingTalk in China, to minimize any asynchronous factors that could possibly delay responses (Openakker, 2006).

If we were unable to carry out a live interview, we planned to carry out an asynchronous interview, such as one through email. To ensure a complete evaluation of our interviews, we reviewed each one multiple times. First, the initial interviewing team listened to their recording and discussed their notes. Then, the other interview team listened to the same recording, to catch any details the first team may have missed. Our interview questions are found in Appendices C and D.

3.2.3 Time Constraints

We had to consider the largest weakness of interviews: how time-consuming they can be, both with respect to planning and execution (Opdenakker, 2006). Our two-team interviewing system helped combat this limitation. Something else we had to consider was that interviewees should be able to express their own views without a specific framework imposed by the researcher, or in this case, their peers (Bolderston, 2012). We believed it was crucial that participants remain transparent in their opinions without the worry of consequences following negative opinions.

We were also careful not to introduce researcher bias into the data. With interviews, it is possible that we could be writing down what we interpret the interviewee to mean, not what they are saying (*Interview*, n.d.). If this bias occurred, our data would be skewed towards what we think and not what actually happened. Any written text must be word-for-word or paraphrased from the interviewee. Our recordings of each interview helped prevent bias, as we were able to review each interviewee's exact response.

3.3 Data Analysis

Our main objective for the data we collected was to draw evidence-based conclusions in order to make valuable recommendations. The first step of this process was to use software applications to organize the data we collected to assist in finding trends. We used integrated analysis tools in Qualtrics and Microsoft Excel, providing the basic functionalities of graphing and visualizing data as well as simple statistical analysis. We created pivot tables with the rows

based on graduation year for student survey and age groups for the instructor survey. This allowed us to analyze the averages for each question as well as spot any numerical trends that may exist by age or graduation year.

Since our analysis was an ongoing process, this kind of quick visualization helped us in forming the interview questions that followed our surveys. We created data tables based on the pivot tables we initially created. In these tables we included average response ratings for each survey question along, separated by age or graduating year, with their standard deviations. Having all our data in one place allowed for quick comparisons between any given values, and the standard deviations helped explain the breadth and variance of responses for a question. Whenever two factor values were directly compared, a Student's t-test was performed to determine if a statistically significant difference existed between the two values.

3.3.1 Qualitative Analysis

We first categorized all non-numerical data. In both surveys and interviews, responses that expressed similar ideas were grouped and tallied accordingly through the process of content-driven analysis (Luo, 2019). In this fashion, commonly expressed student and instructor experiences were identified and isolated. This identification was important for our interviews, as the interviewee may have had a uniquely worded and sometimes indirect response to the question. A content-driven analysis is prone to inaccuracies resulting from subjective interpretation of the text (Luo, 2019). In order to minimize this inaccuracy, our content analysis was conducted as a team to discuss any disagreements and reach a consensus. We also had one interview team look over the other's notes to draw their own conclusions, and compare findings.

3.3.2 Cross-Examination of Surveys and Interviews

Here, our analysis split into two parts. The first part involved data from the survey responses, which pertained mostly to opinions on and satisfaction with online learning. Again, the surveys mainly served to identify discussion points for following interviews, but that does not mean their data could not be cross-examined with that of the interviews (Evans, 2018). The second part involves said interviews: these were the most fruitful of our data. Student and instructor interviews complemented each other, as we learned exactly why certain teaching methods were perceived as successful or not, and if students and instructors agreed. We used

interview evidence to verify trends found in the surveys. These aspects were vital to the analysis and understanding of our data. Any visuals we used to express our data was in the forms of tables and charts, as these mediums are easily comprehensible.

3.4 Formulating Recommendations

Our final goal for the project was to formulate recommendations for the future directions of online learning. We formulated these recommendations by analyzing the trends in our data and finding solutions for the most prevalent issues. We also observed positive experiences students and instructors have found throughout their time with online learning and found a way to turn them into recommendations that could apply to any online course. These recommendations involved aspects of online education that both instructors and students found to be essential in creating a positive and successful learning environment.

There are many elements of online learning that can factor into the overall experience, so we had to consider which teaching methods are essential, which ones were beneficial, and which ones were not. We looked for the most common themes and issues in our data and connected those with solutions. These recommendations will hopefully be useful in aiding educators to improve the quality of online learning in both China and the United States.

3.5 Limitations and Obstacles

In this study, there were certain limitations that we encountered given our resources. The first of these was time; this study took place over the course of seven weeks. We had to keep the scope of our project narrow enough to achieve focused results that aligned with all of our goals and objectives. This limited the number of people we were able to interview, as well as the areas of interest in our research. We were also not able to go into further depth on aspects such as gender, or the effect a specific subject or major has on student and instructor perceptions of online courses. We were only able to make observations that applied to the online classroom.

3.5.1 Sample Size

Another limitation of this study was that our survey and interview samples were not a random sample, but rather a convenience sample. Factors such as communication, restricted travel due to the pandemic, and time made us unable to collect our data at random. Therefore, we

selected people who were readily available to us rather than a truly random sample, which would more accurately represent the general population (Waterfield, 2018). Other factors, such as the time we sent out the survey and whether a student uses the social media platforms used for distribution, may also lead to bias and limited coverage. As long as we described the demographic of the sample in detail, we could ensure that the participants are theoretically relevant to the study and their selection was not based on convenience alone (Waterfield, 2018).

We conducted this research exclusively at WPI and HDU. WPI consists mainly of Science, Technology, Engineering, and Math (STEM) majors while HDU includes a variety of courses in fields such as business and management. Because a course's subject and content could have an impact on the methods of material distribution and student interaction, this may be the cause of any differences in our data between the two universities. For example, a large portion (19%) of responses from the WPI student survey were from Computer Science majors. Certain types of classes may use different teaching tools, and it was important to be aware of this when analyzing our data. The HDU survey respondents consisted mostly of students from the class of 2022, which was also a limitation of this project. This could potentially misrepresent HDU data due to the different experiences of students by year.

3.5.2 Communication

Communication with the HDU team was challenging at times due to different languages and time zones. While the HDU team knew some English, instructions had to be restated more often at times to ensure our objectives were communicated clearly. This typically increased the amount of time it took for a planned objective to be completed, more than what was originally allotted. The different time zones also presented a problem, as both teams could only set up meetings either very early or late in the day. A similar problem presented itself while communicating using text messages (via WeChat). We could not often get an immediate response; if a message was sent during the day, the other team would be asleep. In order to solve this problem, one WPI team member had to stay awake later than usual in order to maintain back-and-forth communication between the HDU team when it was needed.

3.6 Ethical Considerations

We had to be cautious of certain ethical considerations in our study. Therefore, we did not collect any identifying information of our survey and interview participants in order to keep their identities anonymous. This freed all participants from any potential risk of scrutiny for their responses. Before each survey and interview, the participant was given an informed consent preamble so they were fully aware of what the study intended to collect and that their privacy would be protected.

3.7 Project Timeline

We started our project with a proposed timeline for its seven-week duration. This timeline involved deadlines for important achievements and deliverables throughout the project, aiming to keep us focused and on schedule. It considered formulating our survey questions, contacting interviews, when to stop data collection and even when to begin writing our final report. We found this guide to be incredibly useful and ended up following it closely. There were only a few minor tweaks made to the initial timeline, due to time constraints and communication delays with the HDU team. The final timeline for our project can be found in Appendix E.

3.8 Methodology Conclusion

By the end of our project, we configured our findings into presentable charts and tables that could easily convey our results, as well as recommendations with supporting evidence from our data. The collection methods of in-depth interviews and surveys provided us with a substantial amount of usable data which was used to support our recommendations. This information in conjunction with our analysis showed trends and patterns in our data, and highlighted its most important characteristics. Overall, we wanted to distinctly identify aspects of online learning that can be improved, and give clear suggestions on how to improve them. We want educators to be able to learn from our results and propagate a positive impact on higher education that would have lasting influence into the future of online learning as a whole.

4.0 Results and Analysis

This section highlights our findings and results from our three-week data collection process. Through surveying and interviewing active students and instructors in online learning environments, we were able to collect a substantial amount of information. The WPI team collected 266 student survey responses and 46 instructor survey responses from their university, and the HDU team collected 190 student and 50 instructor responses from their university. Using the results from our surveys, we evaluated the reasoning behind certain patterns in our interviews, providing evidence to support them. With 12 student and 10 instructor interviews from WPI, and 15 student and 10 instructor interviews from HDU, our team was able to tie our findings to our survey data to draw evidence-based conclusions on observed trends.

4.1 Student Results

Student responses in our study were crucial to our analysis. If we surveyed instructors alone, we would mostly receive perceptions of how effective their teaching methods are, whereas the opinions of the students, those actually subject to such methods, would be lost. We asked students for their views on online education, in terms of their own performance and their instructors' performance. Each student was asked 16 questions in the survey, eight of which were Likert-type questions, and 10 questions in individual interviews.

Among the 266 collected WPI student responses, ages ranged between 17 and 26 years old. Ages 17-19 accounted for 38.72% of respondents, and ages 20-22 accounted for 60.90%. There was a larger response rate within a few student majors in particular, such as Computer Science (19.92%), Mechanical Engineering (15.04%), Robotics Engineering (10.53%), and Biomedical Engineering (10.53%). Twelve WPI students were interviewed, coming from a variety of majors and ages.

Within the HDU data of 190 students, ages ranged between 18 and 24 years old. Students aged 18-20 and 20-24 each accounted for 47.36% of the total. Students from the class of 2022 accounted for 78.94% of all responses. Engineering and Management students were the most common respondents in the survey, accounting for 88.42% of the total. Ten HDU students were interviewed, coming from a variety of majors and ages.

4.1.1 Student Satisfaction

Survey question 6.1 asked students to rate how satisfied they were with the current state of online learning at their university with 1.00 being the lowest satisfaction (strongly disagree), 5.00 being the highest (strongly agree), and 3.00 being in the middle (indifferent). The WPI survey collected 266 student responses, with 156 students (58.65%) saying they were either satisfied or very satisfied with the current state of online education at their university. As seen in Table 1, the average satisfaction of all student respondents out of 5.00 was 3.289 with a standard deviation of 1.069 (standard deviations will appear parenthetically after averages values in describing results). This average is above an indifferent opinion of 3.00 with only 16 respondents (5.97%) claiming they were very satisfied with online learning.

From our interviews, we found that the main source of positive perceptions toward online learning was due to the convenience of being able to watch course material on a flexible schedule. Three of the interviewees also stated that their positive perception was largely due to their instructors' ability to adapt well to the online platform, being more lenient and understanding of the situation (quarantining during the pandemic), and having a positive classroom environment. Common negative perceptions of online learning stem from the limited interaction that students have with their instructors, drastic differences between the online and in-person classrooms, and difficulty with motivation and scheduling online.

One finding from this data was that students from the class of 2024 (55 students) had a more positive perception of online learning with an average of 3.509 (0.979), which is .220 higher than the total average. After conducting a t-test, we obtained a p-value of 0.161, which is greater than 0.05 (p >0.05), signifying this difference is not statistically significant. After interviewing a student from this class (2024), we found that this could be due to the first-year students' lack of experience with in-person college courses, only being able to compare their experience against high school classes.

The HDU survey collected 190 student responses, and of the 190 student answers, 11.6% (26 students) said they were either dissatisfied or strongly dissatisfied with their current state of online education. From their interviews, students were found to be dissatisfied with the given communication methods. Some of their courses need a combination of voice and text communication. With the software the school chose (DingTalk), while both methods are available, only one can be used at a time. 104 students said they were either satisfied or very

satisfied accounting for 54.7% of answers. The satisfaction was the lowest for the class of 2024, but this could be due to the lack of respondents in that demographic (3.16% of total). The overall average satisfaction with online learning at HDU was 3.579 (0.949). This was higher than the WPI average of 3.289 (1.069). After conducting a t-test on the data, the p-value of 0.00298 showed this difference is statistically significant. This implies that students in China at HDU are more satisfied with online learning. HDU averages can be found in Table 2.

Year	Number of Respondents	Question 6.1	Question 6.2	Question 6.3	Question 6.4
2020	8	3.625 (1.188)	2.375 (1.408)	4.125 (1.458)	4.000 (1.512)
2021	65	3.246 (1.090)	2.215 (0.960)	3.923 (1.361)	3.800 (1.188)
2022	83	3.205 (1.068)	2.373 (0.972)	4.446 (0.953)	3.819 (1.139)
2023	55	3.200 (1.112)	2.491 (1.169)	4.273 (1.193)	3.873 (1.263)
2024	55	3.509 (0.979)	2.273 (1.079)	4.109 (1.286)	3.582 (1.197)
Grand Total	**266**	**3.289 (1.069)**	**2.338 (1.045)**	**4.203 (1.205)**	**3.782 (1.196)**

Table 1: WPI Student Survey Average (and standard deviation) Responses to Questions 6.1-6.4

Survey Questions 6.1-6.4 (rate how much you agree/disagree with the following [on a scale from strongly disagree (1) to strongly agree (5)]):
1. I am satisfied with the current state of online education at my university
2. My academic performance in school has improved with online learning
3. I feel easily distracted/less focused when taking online education courses
4. I learn more from synchronous (live) classes than asynchronous (pre-recorded) classes

Year	Number of Respondents	Question 6.1	Question 6.2	Question 6.3	Question 6.4
2021	18	3.444 (0.856)	3.667 (0.970)	3.444 (0.983)	2.889 (0.900)
2022	150	3.627 (0.923)	3.560 (1.039)	3.640 (1.031)	3.000 (1.181)
2023	16	3.375 (0.885)	3.000 (0.730)	3.750 (1.000)	3.125 (0.957)
2024	6	3.333 (1.861)	3.333 (1.861)	2.000 (1.549)	3.333 (1.861)
Grand Total	**190**	**3.579 (0.949)**	**3.516 (1.047)**	**3.579 (1.074)**	**3.011 (1.159)**

Table 2: HDU Student Survey Average (and standard deviation) Responses to Questions 6.1-6.4

4.1.2 Academic Performance

The second Likert-type question of our survey asked students if they felt that their academic performance has increased due to online learning. Of the 266 WPI student responses, 55.64% of students disagreed or strongly disagreed with this statement and 29.70% of students (79 responses) believe their performance has stayed the same. The perception among WPI students was that online learning has hurt their academic performance with an average of 2.338 (1.045), as seen in Table 1.

In our interviews, we found that some students stated that work has become easier due to easier access to notes and less required preparation for class, yet only 14.66% of respondents at WPI (39 students) believed their academic performance had improved due to online learning. One student said, "I was a better student in-person… with online classes there is less studying involved".

From our survey data, the classes of 2022 and 2023 had noticeably higher averages than the other class years and the average for all class years. When conducting a t-test the p-values for these class years were 0.786 and 0.335 respectively. Both p-values are greater than 0.05 ($p>0.05$), so each pair of these values are not statistically significant. Seniors had the lowest average with 2.215 (0.960). This could be due to academic burnout, commonly referred to as "senioritis" where students experience an increased lack of motivation as they approach the end of their schooling (Lucietto et al., 2019). Students felt that their performance has also been impacted by it being harder to focus and keep a consistent schedule. Others contribute this to their low levels of interaction with their instructors due to the online platform. All WPI averages can be seen in Table 1.

For our HDU survey, 53.2% of students (101) felt that online learning helped improve their academic performance. Through our interviews, we found that students attribute this to their online class app, which has many features designed to help them learn better, such as live playback of lectures and viewing teaching material including lecture slides on their own devices. They also believe that the school has made a significant amount of changes for online classes. On the other hand, 63 of the respondents believed that their performance has not changed at all because of online learning (33.2%). The remaining negative responses are due to the lack of supervision in online classes, increasing the difficulty to focus, the low interactivity of online courses, and the fact that more practical courses are very difficult to operate remotely, all similar to the opinions of WPI students.

Students at HDU had a more positive view on their academic performance than WPI students, with an average of 3.516 (1.047) compared to their average of 2.338 (1.045). When conducting a t-test on the data, we got a p-value <0.001. This is substantially less than 0.05, meaning that this difference is statistically significant. Students at WPI and HDU have drastically different opinions on the effect online learning has had on their academic performance. This large difference could be due to the fact that HDU students use the app

DingTalk for their online classes, which included live and recorded lectures, attendance, as well as class exercises. They also turned in homework and assignments and asked questions about exams all on the same application. Students at WPI largely use the app Canvas, which has similar functionality as DingTalk, but can be limited by the instructor's knowledge of the platform.

There are also cultural differences between the two schools that could have contributed to this difference. From speaking with an HDU instructor, students in China are not expected to ask questions or have high levels of interaction with their instructors and are typically in larger classes, making participation more difficult. Their learning is much more independent than in the United States. With easier access to lectures and course material, there is reason to believe that students in China would be able to perform better on the online platform.

4.1.3 What Distracts Students

Question three asked students if they are less focused or more easily distracted during online learning, and resulted in 81.96% of 266 WPI students that agreed or strongly agreed with this statement. This question had an average response rating of 4.203 (1.205), as seen in Table 1. The class of 2022 felt the most distracted (4.446 (0.953)), while the class of 2021 felt the least distracted (3.923 (1.361)). After performing a t-test, the p-values were found to be 0.094 and 0.103 for the classes of 2022 and 2021 respectively. This shows that there was no significant difference (at the $p<0.05$ level) between their values and the overall average. Only 19 respondents (7.14%) strongly disagreed with the question.

53.68% of 190 HDU students strongly agreed or agreed that they are more prone to distraction in online learning, fewer than WPI students. The average response rating for this question is found in Table 2, as 3.579 (1.074). This value was noticeably lower than that of the WPI students, and a t-test confirmed that the two sets are statistically significantly different with a p-value of <0.001. The HDU class of 2024 had a significantly different rating of 2.00 (1.549) (also p-value of <0.001), lower than any other student body from either school.

Knowing that students are having trouble focusing on online learning, we asked them why in our interviews. The biggest distinction we sought to make was whether or not this was an individual issue, as in the students, or if it were a larger one, as in the instructor or course. We found that all 12 of WPI and 10 of the HDU student interviewees brought up focus issues in

online learning, with the majority of them admittedly blaming themselves for their lack of focus. Both WPI and HDU students found that it is too easy to pull out their phones, open a new tab on their computer, or get caught up in something else entirely, whether it be during studying or watching a lecture, even synchronous ones. Michael Bugeja, director of Greenlee School of Journalism at Iowa State University, highlights this issue as a key concern with the growth of technology in the classroom. Digital distractions are rampant and easily accessible, which he theorizes is greatly undermining the critical thinking ability of students, leading to more trivial conclusions rather than concrete ones (Bugeja, 2008).

Several respondents mentioned location being an issue for distraction. Traditionally, their classes were held in a designated lecture hall, creating a learning environment for them and their peers. In online learning, many find themselves living out of one room, and have difficulty separating their workspaces from everything else. HDU students mentioned external factors like the voices of roommates/family members affecting their concentration. However, even though much of this seems to be a personal issue, many students still brought up the inability of instructors to keep their students engaged.

Both synchronous and asynchronous lectures were cited as being too long or too dense at WPI, with synchronous lectures sometimes lacking any student-instructor interaction at all, essentially negating their live component. A 2016 Australian study found similar results after interviewing 13 university students. Students said they lost interest in pre-recorded lectures after 10-12 minutes, struggling to make it the 40+ minutes of a full lesson (Hajhashemi, 2016).

Boredom also came up a few times, especially when referring to instructors who seemed to be reading off of a script, speaking in a monotone voice. Students from both schools agreed that the absence of face-to-face interaction can decrease attention. The use of cameras during these synchronous classes, or lack thereof, also took some responsibility off of the students to focus. Since no one can see you, there is no enforcement to take notes or pay attention, with one WPI student telling us that they even occasionally cooked dinner during their live lectures. Another student said that they have "found that forcing myself to keep my camera on has been nice for [staying focused] 'cause then the teacher can see if my eyes are wandering down to my phone, or anything like that". Cameras during class hold students accountable for their own disruptive tendencies, and therefore help them focus.

4.1.4 Content Delivery Preferences

In question four, 62.78% of WPI students agreed or strongly agreed that they learn more in synchronous classes over asynchronous classes. Table 1 shows that graduating class averages were similar to the overall average of 3.782 (1.196) (p-values for 2020-2023 all reported >0.612), except for the class of 2024 (3.582 (1.197)), whose p-value of 0.259 shows the greatest difference of all the classes, though not significant.

HDU student results were even across the board, with 66 students who strongly disagreed/disagreed and 62 students who strongly agreed/agreed with the question, leaving 62 students indifferent. In Table 2, the average rating was 3.011 (1.159), with a larger standard deviation supporting a broad distribution of responses. The class of 2024 favored synchronous classes more than anyone (3.333 (0.920)), while the class of 2021 favored more asynchronous classes (2.889 (0.900)). The HDU data set for this question proved to be significantly different from WPI's, with a t-test p-value < 0.001.

WPI interviews reflected the same results as their survey, where the majority of students favored synchronous over asynchronous classes, for different reasons. The most common reason was that it is easier to ask questions during a live session, not just because of the convenience being with the instructor, but because asking a question in the moment leads to more comprehensible answers. These results were similar to a 2009 study aimed to determine differences in student performance and preference in a course that used two types of online instruction. Out of 41 students taught through both synchronous and asynchronous methods, they found that despite concluding both forms were effective in delivering instruction, 30 students (73.17%) favored the synchronous lectures (Skylar, 2009). More specifically, interactivity in a course was found to be an important factor in student satisfaction.

Students also argued that the regularity and synchronicity of scheduled live courses made it easier to focus than watching lectures on their own, but almost every student proposed that a combination of the two methods worked best for them. Synchronous lectures were the perfect time to ask any questions and get some engagement for the day, whereas asynchronous lectures and lecture recordings had the benefit of being able to be rewound and watched again in case anything was missed.

In HDU interviews, those who favored synchronous lectures agreed with WPI students, advocating for the aspect of regularity, feeling that these live classes were the main time to learn.

Because of this, they felt that re-watching recordings of the lectures were unnecessary, as they were able to execute a high learning efficiency when synchronous. Those who favored asynchronous lectures contrasted WPI students with their belief that it is more difficult to concentrate on synchronous lectures. They did however appreciate the ability to repeatedly watch recordings to deepen their knowledge. This disparity in attitude towards asynchronous lectures shows the variance in student learning habits, at least at HDU.

4.1.5 Independent Studying

For the fifth question, we asked students if they had to independently study more in online classes to achieve the same results as their in-person ones. There was an observable trend toward having more independent study for WPI students. Of the 266 survey responses, 72.9% of students reported that they felt that they had to do some degree of additional work outside of class. This suggests that students felt they must study more extensively to compensate for the new online format. Table 3 shows that the mean value of all responses from WPI students comes out to 3.996 with a standard deviation of 0.942. The standard deviation is relatively low compared to other questions, implying that there were fewer polarizing responses, and the high average implied that respondents lean greatly toward having increased independent studying. This was even more pronounced among underclassmen (4.073 (0.858) for Sophomores, 4.018 (0.850) for Freshmen). Their higher response averages suggest that they felt they must study at a greater rate than their upperclassmen peers. This may be because underclassmen have fewer classes under their belt and are still adjusting to a college workload in addition to online learning. These results may also imply that students tend to absorb less information in online classes, which could be due to several factors.

First, in terms of study habits, studies suggest that people who have control over their study schedules tend to allocate their time to studying concepts and material that they consider the most difficult (Metcalfe & Kornell, 2003). This is known as the *dominant discrepancy reduction* model. Knowing this, students may find that it was difficult to learn material due to the current unrefined state of online learning. They may then follow the dominant discrepancy reduction model and allocate additional study time to concepts that they consider "difficult". As a result, their overall study time increases because students felt they must compensate and focus more effort into studying. The difficulty of their online courses could have been artificially

amplified by the rushed transition to online learning, which forced students to commit to additional independent study.

During interviews with WPI students, many report additional reasons as being more easily distracted during online lectures, not being able to communicate with instructors as easily, or simply having issues with internet connections or time zones discrepancies.

The data for question five from HDU students—see table 4—suggest that on average, students do think that they have to complete additional work outside of class to achieve the same results as in-person. The largest respondent group was from the class of 2022 and reported a 3.33 (1.091) average. On average, HDU students (3.421 (1.122)) felt they had to study less than WPI students (3.996 (0.942)). When a t-test was conducted to compare these two values, the resulting p-value was <0.001. This p-value is extremely small, suggesting that there was a significant difference between WPI and HDU responses. This also supports our initial analysis that WPI students felt that they need to do more independent studying to compensate for online learning than their HDU counterparts.

Year	Number of Respondents	Question 6.5	Question 6.6	Question 6.7	Question 6.8
2020	8	4.125 (1.126)	3.125 (1.126)	2.875 (1.356)	3.125 (1.126)
2021	65	3.938 (1.014)	3.692 (1.060)	2.662 (1.215)	3.431 (1.045)
2022	83	3.964 (0.993)	3.530 (1.016)	2.711 (1.283)	3.482 (0.902)
2023	55	4.073 (0.858)	3.618 (1.063)	2.673 (1.389)	3.727 (1.062)
2024	55	4.018 (0.850)	3.727 (0.891)	2.618 (1.178)	3.509 (1.069)
Grand Total	**266**	**3.996 (0.942)**	**3.617 (1.015)**	**2.677 (1.262)**	**3.515 (1.014)**

Table 3: WPI Student Survey Average (and standard deviation) Responses to Questions 6.5-6.8

Survey Questions 5-8 (rate how much you agree/disagree with the following [on a scale from strongly disagree (1) to strongly agree (5)]):
5. I have to independently study more than usual to do well in my online classes
6. I feel that my teachers have adjusted their methods for online education
7. I find communication with my professors in online classes as easy as in-person classes
8. I feel that my university actively attempts to improve our online learning accommodations in hardware/software

Year	Number of Respondents	Question 6.5	Question 6.6	Question 6.7	Question 6.8
2021	18	4.000 (0.686)	4.000 (0.840)	4.000 (0.686)	3.889 (0.758)
2022	150	3.333 (1.091)	3.813 (0.797)	3.147 (1.057)	3.720 (0.905)
2023	16	3.625 (1.360)	3.375 (0.500)	3.000 (1.032)	3.375 (0.500)
2024	6	3.333 (1.861)	3.333 (1.861)	3.333 (1.861)	3.333 (1.861)
Grand Total	**190**	**3.421 (1.122)**	**3.779 (0.837)**	**3.221 (1.081)**	**3.695 (0.909)**

Table 4: HDU Student Survey Average (and standard deviation) Responses to Questions 6.5-6.8

4.1.6 How Have Instructors Adapted Their Courses

For our sixth question, 48.0% of WPI students answered that they "agreed" with the statement that instructors have adapted their education methods for the online platform. From Table 3, the average response to this question was 3.617 (1.015). This result suggests that while students acknowledged that instructors are putting in effort, many of them did not feel that instructors have done enough to adapt.

Interviews with both students and instructors have shed light on this phenomenon. We discovered that some instructors have gone above and beyond, purchasing new lecturing equipment and making heavy modifications to their courses to help accommodate the new method of learning. Other instructors have underperformed, doing little besides recording their lectures and posting them online.

Another finding was that upperclassmen tended to have lower opinions of their instructor's adaptation efforts, with the class of 2020 rating at a 3.125 (1.126). This was likely due to upperclassmen having taken a wider variety of quality courses, leading to higher expectations overall. They were also taking more difficult, higher-level courses, meaning that failure to properly adapt a course to the new online format will only make explaining difficult concepts even more challenging, causing the lack of adaptation to be even more pronounced. A t-test gave a p-value of 0.179, telling us it was not significantly different than the average. However, there were only eight respondents for the class of 2020, which may not be representative of the population.

HDU students report a similar trend to WPI. In Table 4, with an average of 3.779 (0.837), students at HDU seem to acknowledge that their instructors have adjusted some portion of their online course to suit the new online platform. This was higher than the response given by WPI students in Table 3 (3.617 (1.015)). When conducting a t-test comparing the WPI and HDU results, the resulting p-value was 0.071. This p-value suggests that there was less of a difference in the WPI and HDU survey results than initially expected (at least not a significant one at the $p < 0.05$ level), and that there may be a higher perception from HDU students that their instructors have adapted their online courses in comparison to WPI students.

4.1.7 Student-Instructor Communication

For question seven, of the 266 WPI students, 35.34% of students disagreed that communication with their instructors during online classes was as easy as their in-person classes. The fewest students, with only 9.02% of respondents, chose strongly agree. As seen in Table 3, the overall average for the question agrees with this observation, with a score of 2.677 (1.262). For each graduation year, all of their averages were similar to the overall average. This was proven by the p-values generated from t-tests being within 0.66 to 0.98, so no significant statistical difference was present.

The WPI interviews gave us some insight into online student-instructor communications. Some students believed that instructors were doing great things to handle student-instructor communications, citing that their instructors were quick to respond and gave helpful feedback. Most have cited areas in which instructors need to improve, as some instructors were consistently going over the allocated time for the lecture or were leaving their teaching assistants (TAs) confused on instructions. Students and instructors must work together to create an effective system of communication; student-instructor interaction is important in maintaining student satisfaction in education (Sher, 2009). Some instructors were also receptive to feedback, for example, students mentioned that their instructors switched from fully asynchronous to a hybrid course simply because the students had said that fully asynchronous was not working.

WPI students could also get help from both the instructor and other students via discussion forums such as Piazza or more informal communication channels such as Slack. On the other hand, some students have mentioned that getting in contact with the instructor has become more difficult, such as completely relying on email communication or having to set up individual office hours. Among these students, some mentioned that it was difficult to explain their questions over the screen, while during physical office hours they could easily show their work. Something we also noticed was that Freshman responses had the lowest average for this question, at 2.618 (1.178) in Table 3. After conducting t-tests comparing each class's averages against the Freshman average, each p-value (between 0.57 and 0.84) proved that this difference was not significant. One of the Freshmen we interviewed did echo some of the useful technology surrounding student-instructor communication, such as Slack and Piazza, but also responded that they preferred to ask a question in-person.

For the 190 HDU students, 29.5% of the students thought there was no change in student-instructor communication and neither agreed nor disagreed with the given statement. A total of 43.2% agreed or strongly agreed that online student-instructor communication was just as easy as in-person, and thought it was more convenient. As seen in Table 4, the overall average of 3.221 (1.081) seems to match up with this statement.

HDU student interview answers reflected this data, revealing that it was convenient to ask questions to the instructor after class, without going to the instructor's office. Some students think that they are less anxious and more relaxed when communicating with instructors online. There are 27.4% of students that disagreed or strongly disagreed that online communication was as easy when compared to in-person. Also during in-person classes, instructors can easily use tools to explain the problem more vividly.

There are two common beliefs regarding student-instructor communications within both WPI and HDU student communities. One group of students believe that communication online was just as easy as in-person, citing the technology behind it as well as mentioning that they are less shy while doing so. On the other hand, some believe that in-person communication was easier, with students mentioning that they struggle to effectively communicate complex problems online. It seems that more HDU students agree that online communication was as easy as in-person, while more WPI students disagree. Through our t-tests of the overall averages, the resulting p-value was <0.001, which confirms this difference was significant.

4.1.8 University Efforts

For question eight, 44.74% of surveyed WPI students agreed that their university was trying to actively improve their online learning accommodations. This result was supported by the overall average seen in Table 3, at 3.515 (1.014). The lowest class average was the class of 2020, at 3.125 (1.126), while the highest class average was for the class of 2023, at 3.727 (1.062). Most of the other classes range at 3.431 (1.045) (class of 2021) and 3.482 (0.902) (class of 2022). Conducting t-tests supports this observation, as when comparing the overall average to the class averages, the classes of 2020 and 2023 had the lowest p-values, at 0.28 and 0.16 respectfully. Compared to the other classes, their p-values ranged between 0.55 to 0.97. No graduating class in particular was significantly different than the average result.

Through our WPI interviews, we discovered that most students believe that WPI was making some sort of effort to improve their online learning accommodations, but not all have an exact idea of what WPI was doing. Some students have noticed that the most recent semester was better than the initial online term, and that WPI tries to be transparent. For a majority of students, they are noticing that their instructors are mostly in charge of how their online courses are structured. Some noticed their instructors improving their course themselves, such as taking in feedback or accommodating for specific students in different situations. In fact, most students have concluded that WPI might be leaving a major part of this responsibility to the instructors.

For the 190 HDU students, 46.32% of them agreed that their university was trying to improve their online learning accommodations. Only 29.47% were indifferent to the statement, and 7.37% of them disagreed or strongly disagreed with the statement. The overall average, as seen in Table 4, was 3.695 (0.909). Based on the analysis of our interview results, we found that the university has been encouraging or even requiring instructors to use online learning apps to teach online.

It is clear that both WPI and HDU students have a majority of their students agreeing that their university actively attempts to improve online learning, even if the reasoning behind these viewpoints are different. WPI students seem to be hoping that their university was doing something, while HDU students seem to be more satisfied with the state of online learning. Either way, from the t-test comparing the overall results of this question between the WPI and HDU students, the p-value was 0.052, which means that this data is statistically significantly different (at least at the p<0.10 level). From observing the overall responses, more WPI students chose to disagree with the statement when compared to HDU students, which could be why the data was statistically different.

4.1.9 Student-Instructor Communication Methods

Out of all the choices that 266 WPI student respondents found useful for student-instructor communication, the most picked option was email, with 84.59% of student responses (see Figure 1). From our student interviews, this method of communication was consistently brought up. For example, when students had difficulty contacting their instructors through synchronous methods, they usually would try to email them. The second most useful method was live office hours, with 50.0% of student responses. It was interesting that the synchronous option,

being the office hours, had significantly fewer responses, despite many students mentioning that office hours with the instructor or TAs were useful, and that synchronous communication was often clearer. One potential reason was that a few instructors never offered this option, as some students gave us insight into fully asynchronous courses that they took. There was also the fact that some instructors would require the student to manually schedule office hours or that the office hours were offered at inconvenient times. Both reasons came up during our WPI interviews.

For comments on submitted assignments, 39.85% of students found it useful. Its lower priority could be due to instructors who did not provide useful feedback on submitted assignments. On forums and discussion boards, 28.95% of students found it useful, which we grouped with the students who chose "other" (as all of them mentioned either Discord or Slack, two discussion board applications). This lower response rate became clearer after looking into our open-ended responses and interviews. We found that some instructors did not correctly deploy or manage their discussion boards, even though they had the potential to be a good resource. Instant messenger apps only had 17.29% of students finding them useful, which could be due to these apps not having a strong presence in student-instructor communications.

In the HDU survey of 190 students, 84.21% (160) of the students said that a live, online broadcast was the most suitable method for communication between instructors and students (see Figure 2). This result includes online office hours. The reason for this was because of the popularity and use of mainstream broadcasting platforms, such as Zoom and DingTalk. Instant messaging apps were the second most suitable way, with 37.89% (72 students) agreeing that it was useful. This result makes sense, as it has a large presence in student-instructor communications in China. With forums and discussion boards, only 13.68% (26 students) believed it was suitable, and only 10.00% (19 students) thought that email communication was useful. One possible explanation was that instant messaging apps can perform both tasks that forums/discussion boards and email communication try to achieve. Also, in the eyes of Chinese students, e-mail was more well suited as a tool to announce important information and assign tasks, not for two-way communication.

It was interesting to see the opposing opinions of WPI and HDU students on the platforms most useful for student-instructor communications. For example, while email was used as the most common form of two-way communication at WPI, it was more referred to as an

announcement tool at HDU. At WPI, not a lot of students use instant messaging apps to communicate with their instructors, but at HDU these apps are well known to both students and instructors.

Which of these platform(s) do you find most useful for student-teacher communication? (WPI Students)
Note: Respondents were allowed to pick more than one catagory
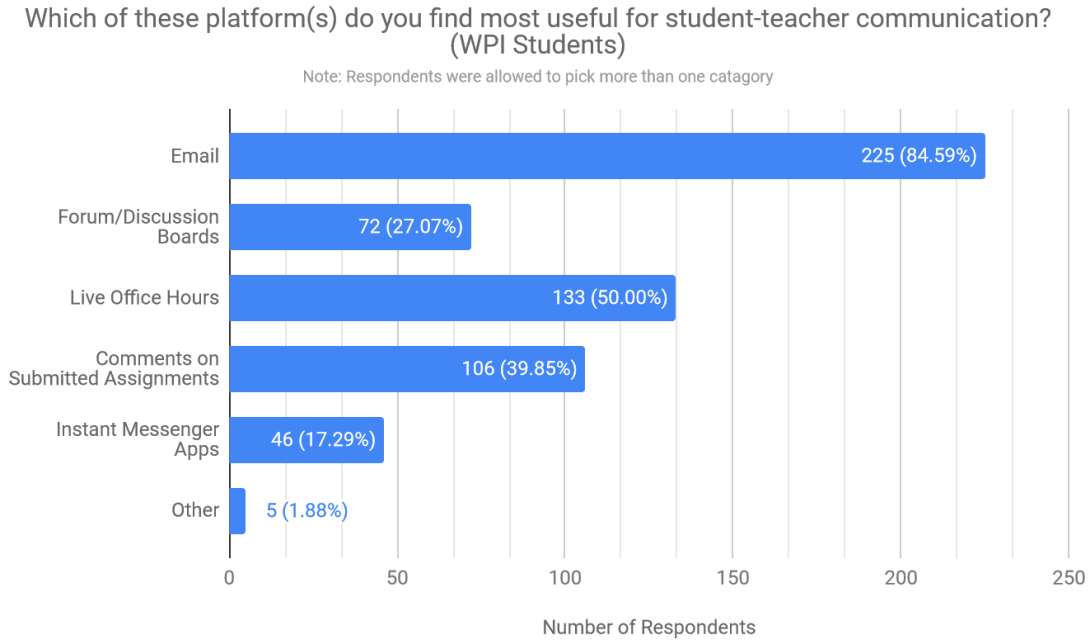
Figure 1: WPI Student Survey Communications Results

Which of these platform(s) do you find most useful for student-teacher communication? (HDU Students)
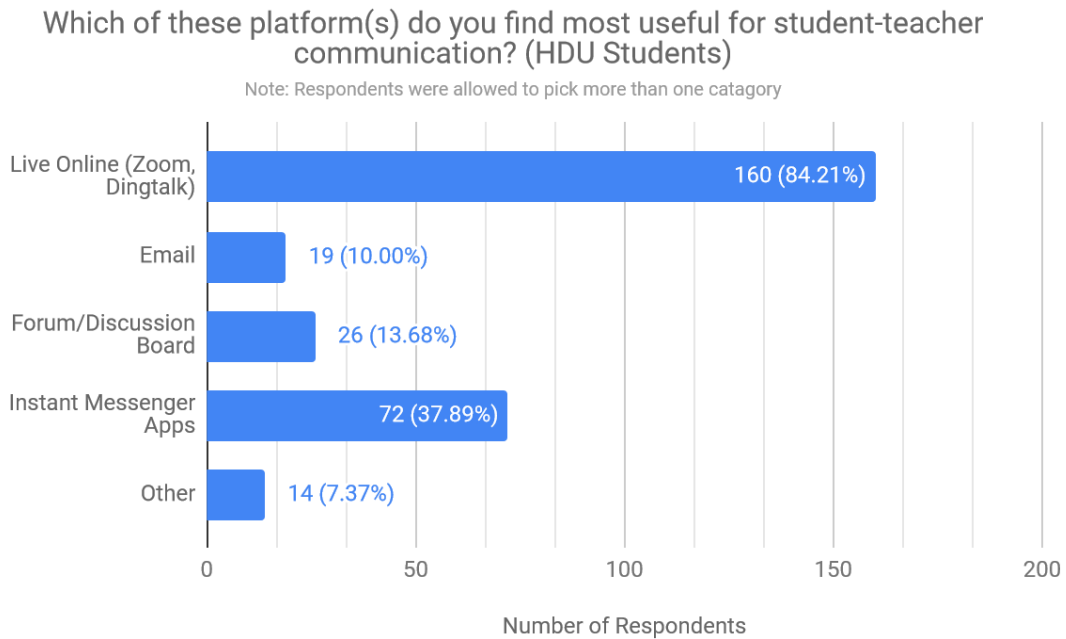Note: Respondents were allowed to pick more than one catagory

Figure 2: HDU Student Survey Communications Results

4.1.10 Positive Perceptions of Online Learning

The first of two optional open-ended questions we included in our survey asked students what instructors have done to make their online experience a successful one. Of the 224 WPI responses, the top four most common answers were clear and responsive communication (23.7%), frequent and/or increase in office hours (21.4%), flexibility (18.3%), and recording and posting synchronous lectures (18.3%)—see Table 5.

We found that students appreciate instructors who are clear when communicating things like due dates and assignments, as well as being timely in their responses. Students found that having a platform for communication such as a class Slack or Discord makes their courses more successful (20). Students preferred when their instructors communicated with them individually (35). Students believed that increasing both the number of office hours as well as the flexibility of their time has helped them in their online courses.

Instructors increasing their availability to meet with students outside of office hours as well as communicating more frequently during the day has also been beneficial to students. A study conducted at Columbus State University found that virtual office hours are generally preferred by students over in-person office hours due to their accessibility and flexibility (Li, 2009). Twenty-six student responses mentioned that instructors being understanding and flexible with due dates has helped them in online classes. That along with simplifying assignments and lessening the workload has been noticeably beneficial to students. Several responses (35) mentioned that they preferred synchronous lectures but found it beneficial when they were recorded and posted afterward.

The HDU survey received 31 clear responses, with the top four most common answers being question and answer sessions (25.8%), upgrading of hardware facilities (22.6 %), PowerPoint-driven classes (19.4%), and careful lesson preparation (16.1%). Through the interview results, students are most responsive to the question and answer sessions. This differs from the West because in China, students are not as encouraged to ask questions, rather just listen in class. Students also noticed when instructors have taken the time to prepare their lessons and courseware such as PowerPoint slides, which has contributed to a positive learning experience. While HDU students commonly cited PowerPoints as a successful online learning tool, many WPI students implied that a non-interactive lecture format would be unsuccessful for them.

Student-instructor help sessions such as office hours and question and answer sessions have been found to be helpful in both China and the United States, being among the most common responses. Both demographics of students also commonly believed that when the course material was organized and well prepared, they became more successful in the class. In China, PowerPoint was seen as a very successful tool while it was never mentioned in the WPI survey answers. This may be due to the students in China having a more independent learning environment than in the United States.

What is one thing a professor has done to make online learning successful for you?	
WPI Student Responses (224)	**HDU Student Responses (31)**
Clear and Responsive Communication (53, 23.66%)	Question and answer sessions (8, 25.8%)
Frequent Office Hours (48, 21.43%)	Upgrading of hardware facilities (7, 22.6 %)
Recording and Posting Synchronous Lectures (41, 18.30%)	PowerPoint Driven Classes (6, 19.4%)
Flexibility with Deadlines and Attendance (41, 18.30%)	Careful lesson preparation (5, 16.1%)
Organized Course Material (23, 10.27%)	Class check-in (4, 12.9%)
Communicated Clear Course Expectations (15, 6.70%)	

Table 5: Student Survey Open Response Question 1 Top Answers

4.1.11 Negative Perceptions of Online Learning

The second open-ended question we asked in our survey proposed what things instructors have done to worsen their students' online education experience. We received 182 responses for this question from our WPI survey and the top three answers were using only asynchronous classes (17.6%), increasing the workload (13.7%), and poor communication (11.5%), as seen in Table 6. Many students had issues with classes that were purely asynchronous. Some of them felt that their asynchronous classes were very low effort with instructors reusing old lectures or other instructors' content (9). Students prefer a face-to-face learning environment and show higher levels of communication and satisfaction with it (Cole, 2016). We also found that many instructors increased the workload for the classes under the assumption that the online platform gives students more time to work on assignments. Poor communication also hindered many student's experiences with online learning, with some instructors not being responsive to emails or leaving too much of the communication to the teaching assistants.

We received 27 clear answers from the HDU survey, and the top three most common responses were un-interactive lectures (22.2%), using only asynchronous lectures (18.5%), and poor hardware facilities (14.8%), as seen in Table 6. A common issue that hurt the students at

HDU was instructors lecturing material for too long and leaving no room for communication. Students were unable to get interaction or ask questions in these classes which worsened their online experience. Through interview results, we found that students experienced many technological issues from the hardware limitations of their instructors, as well as the lack of help the instructors received to use the technology.

Is there anything a professor has done that you felt hurt/worsened your experience with online classes that would not have the same effect in-person?	
WPI Student Responses (182)	**HDU Student Responses (27)**
Using Only Asynchronous Lectures (32, 17.58%)	Un-interactive Lectures (6, 22.2%)
Increased Workload (25, 13.74%)	Using Only Asynchronous Lectures (5, 18.5%)
Poor Communication (21, 11.54%)	Poor Hardware Facilities (4, 14.8%)
Lack of Office Hours (15, 8.24%)	Instructor Struggles to Operate Online Platform (3, 11.1%)
Unorganized and Unclear Course Content (14, 7.69%)	Unclear Communication (2, 7.4%)
Not Adjusting Course for the Online Platform (14, 7.69%)	

Table 6: Student Survey Open Response Question 2 Top Answers

4.2 Instructor Results

Collecting instructor data was just as important as collecting student data. Similar to student responses providing feedback on instructors, instructor responses provided insight for students, in addition to confirming certain student responses. With trends discovered in the student data, we approached instructors to ask them "how's" and "why's" to have them explain our data results. Each instructor was asked 14 questions in the survey, mostly like those of the student survey, and 11 questions in individual interviews.

Among the 46 collected WPI instructor survey responses, the ages ranged between 30-60+ years old, with those 60+ accounting for 34.0% of responses. Instructors from 13 different

departments participated in the survey. Ten instructors were interviewed, coming from a variety of departments and ages.

Fifty HDU instructors responded to the survey, from six different departments. 44.0% of these instructors were ages 30-39, and another 32.0% ages 40-49. Of this, 64.0% were instructors from the school of management. Ten instructors were interviewed, coming from a variety of departments and ages.

4.2.1 Instructor Satisfaction

The first Likert-type question of our instructor survey asked to rate their satisfaction with the current state of online learning at their university. Of the 46 instructor survey responses at WPI, 32 of them were either satisfied or very satisfied with the current state of online learning (69.57%). As seen in Table 7, the average satisfaction of instructors surveyed was 3.717 (1.004), which was higher than the average satisfaction of students. We conducted a t-test comparing the student and instructor data and calculated a p-value <0.01. This shows a statistical significance between the two satisfaction levels, indicating instructors are more satisfied with the current state of online education than students at WPI.

Of the 10 instructors from WPI that we interviewed, all of them said they had some satisfaction with different aspects of the online platform including the flexibility of teaching online, an easier time contacting and communicating with students, and the helpfulness and positivity of their university. Instructor dissatisfaction lies in the elements of an in-person class that are too difficult to replicate online. These include the many visual cues that instructors get from students when lecturing in a live classroom, the normality of talking to an audience rather than a computer screen, and student-instructor relationships, which are more difficult to form when you cannot meet your face-to-face. In our survey, the seven responses from the 40-49 age range had a larger average satisfaction of 4.286 (0.488). We conducted a t-test and found a p-value of .1496. This means that the larger average satisfaction was not statistically significant, and this difference may be due to the small number of survey respondents from this age group.

Of the 50 instructor responses at HDU, 26 of them said they were either satisfied or very satisfied with the current state of online learning at their university (52.0%). The average satisfaction of instructors at HDU was 3.52 (0.76), which was lower than the students' satisfaction at HDU with a p-value of 0.685 as well as instructor satisfaction at WPI with a p-

value of 0.278; neither of these differences was found to be significant. From the ten instructor interviews conducted at HDU, instructor's satisfaction came from the flexibility of online teaching in regard to location and time, and the ease of contact and communication with their students. Instructors were dissatisfied with not being able to receive visual feedback cues from students and low student participation. HDU Instructors also experienced many network and software issues, something that was not mentioned by the WPI instructors.

Age Range	Number of Respondents	Question 5.1	Question 5.2	Question 5.3	Question 5.4
30-39	8	3.625 (1.061)	2.875 (0.641)	3.250 (1.282)	3.625 (1.061)
40-49	7	4.286 (0.488)	2.857 (0.690)	2.857 (1.574)	4.000 (0.816)
50-59	14	3.571 (1.158)	2.571 (0.938)	2.857 (1.562)	4.357 (0.745)
60+	17	3.647 (0.996)	2.647 (0.996)	2.824 (1.185)	4.118 (1.111)
Grand Total	**46**	**3.717 (1.004)**	**2.696 (0.866)**	**2.913 (1.347)**	**4.087 (0.962)**

Table 7: WPI Instructor Survey Average (and standard deviation) Responses to Questions 5.1-5.4

Survey Questions 1-4 (rate how much you agree/disagree with the following [on a scale from strongly disagree (1) to strongly agree (5)]:
1. I am satisfied with the current state of online education at my university
2. My students' academic performance in school has improved due to online learning
3. My students participate in my online classes as often as my in-person classes
4. I typically commit more time to the daily preparation and execution of my online classes than with in-person classes

Age Range	Number of Respondents	Question 5.1	Question 5.2	Question 5.3	Question 5.4
20-29	8	4.00 (1.07)	3.50 (0.93)	3.25 (1.16)	4.00 (0.76)
30-39	22	3.37 (0.79)	3.00 (0.76)	3.00 (0.75)	4.09 (1.02)
40-49	16	3.50 (0.52)	2.88 (0.62)	2.63 (0.50)	3.88 (0.62)
50+	4	3.50 (0.58)	3.00 (0.00)	3.00 (0.00)	4.00 (0.00)
Grand Total	**50**	**3.52 (0.76)**	**3.04 (0.73)**	**2.92 (0.75)**	**4.00 (0.81)**

Table 8: HDU Instructor Survey Average (and standard deviation) Responses to Questions 5.1-5.4

4.2.2 Student Academic Performance

The second Likert-type question of our survey asked instructors how much they agreed with the statement that their students' academic performance had increased due to online learning. Strongly agree was represented by a five and strongly disagree was represented by a one. Of the 46 WPI instructor survey responses, 19 of them either disagreed or strongly disagreed with the question (41.30%). With an average response of 2.696 (0.866), instructors generally disagreed with this statement where the majority of respondents (20) felt that their students' academic performance neither increased nor decreased (43.48%). High levels of participation and student interaction are desirable in an online course, so because both of those

averages are low, there is reason to believe that a lack of these is affecting student performance (Coldwell et al., 2008).

Instructors of age range 50-59 had the most negative perception of their students' academic performance at WPI with an average of 2.571 (0.938). When compared to the total average for instructors with a t-test, we got a p-value of 0.646, meaning this difference was not statistically significant.

Of the 50 HDU instructor responses, 20 of them either disagreed or strongly disagreed with the statement that their students' academic performance has improved due to online learning (40.0%). The average response was 3.04 (0.73), so instructors generally felt that their students' academic performance neither increased nor decreased. From both the WPI and HDU surveys, instructors from 50-59 years old both had the most negative perceptions of their students' academic performance. A t-test confirmed that the WPI and HDU instructor responses were significantly different with a p-value of 0.037.

4.2.3 Student Participation

When asked if the participation levels of their students in online courses was equal to that of in-person ones in the third Likert-type question, 47.8% of instructors strongly disagreed or somewhat disagreed with this statement.

With HDU students, the data average was similar to WPI's (2.92 (0.75) for HDU vs 2.913 (1.347) for WPI), however WPI had a much larger standard deviation—and thus dispersion of perceptions. When a t-test was performed to compare the two sets of data, the resulting p-value was .975, suggesting that there was no statistically significant difference. Instructors from both universities felt that their students' participation in their online classes was lower than in-person.

The explanation that many instructors provided in their interviews for a decrease in participation was the ability for students to mute themselves and turn off their cameras during online lectures. Instructors felt that students who did this tended to disengage and shield themselves from attention. Instructors also report that few students tended to participate often, while the majority of the class rarely did. Explanation for increased participation involved higher engagement outside of the classroom in forums, discussion boards, and emails.

A 2013 study suggests that there is a correlation between student participation and teacher engagement (Park, 2015). The author, Park, suggests that in an online learning environment, teachers must actively engage and communicate with their students if they wish to receive higher levels of student participation. It is likely that many instructors who expect higher student participation do not directly engage their students enough to warrant such expectations. The fact that there was no significant difference between the WPI and HDU answers suggests that the lack of student participation was not a cultural, national, or demographic phenomenon. Rather, it was more likely that instructors from both universities must adopt more engaging and active teaching styles to captivate their students.

4.2.4 Course Preparation

For our fourth Likert-type question, we found that instructors from both schools tended to agree with the belief that their online classes require more time and effort to prepare for, with older instructors agreeing more. This sentiment was reflected by similar averages from our results, seen in Table 7 and Table 8 (4.087 (0.962) for WPI vs 3.99 (0.810) for HDU). When the two results were compared with a t-test, the resulting value had a p-value of about 0.632, suggesting that the two response samples are not statistically different in a significant way. This suggests instructors from both campuses agree that their online courses take them more time to prepare for and execute. A prominent study performed by the National Educational Association (NEA) found that phone interviews of over 400 instructors resulted in about 53% saying they spend more time developing their online courses (Hislop & Ellise, 2004). Overall, there was a trend that instructors spent additional time preparing and refining their online courses, similar to our results.

A second trend we found was WPI instructors over the age of 60 reported an average of 4.118 (1.111) to this question. WPI instructors in their 30s responded with an average answer of 3.625 (1.061), however, a t-test determined the two datasets were not significantly different from one another(p-value of 0.305). While not clearly shown in our survey data, our interviews still suggested that a number of older instructors typically have to commit more time each day to the execution of their online courses. This result was likely due to older instructors being unaccustomed to online tools that younger ones have either experienced before or already used.

Adapting to new technology was often harder on older generations, and older instructors may need to not only prepare for their class, but additionally wrestle with computer issues.

We did not find a similar trend with HDU instructors. There were fewer responses from older HDU instructors, but of those responses, both those in their 30s and their 60s responded with averages similar to one another (4.00 (0.76) and 4.00 (0.00) respectively). Even at ages 40-49 (3.88 (0.62)), this suggests that instructors at HDU across all age groups felt that they spent additional time preparing for their courses (all p-values >0.57).

Between both universities, instructors, when interviewed, reported that they had to spend additional time with a variety of preparations. Some had to prepare and edit pre-recorded lectures, while others reported that they had to make adjustments to ensure each online lecture covered a suitable range of topics.

4.2.5 Transitioning to Online

For question five, of the 46 WPI instructor responses, 45.10% of instructors agreed that they were able to smoothly transition to online learning. The overall average reflects this, at 3.565 (1.205), seen in Table 9. Within the age ranges, most of them are near the overall average, except for instructors in the 40-49 age range, who responded with a higher average of 4.00 (0.816). While conducting t-tests comparing the age range averages to the overall average, the 40-49 age range had the lowest p-value of 0.36, while the other age ranges had p-values between 0.55 and 0.99, none of which reflect a significant statistical difference.

Through WPI instructor interviews, we discovered that most instructors had to carefully examine their courses before determining what needed to be altered. We also discovered that WPI has offered instructors the opportunity to learn how to structure their online courses and receive valuable feedback and support, however, not everyone takes advantage of this. One instructor with significant online teaching experience addressed the concern that some instructors may have simply copied their in-person courses over to an online format. Even though the transition may have been smooth for these instructors, their online courses will reflect poor design and execution.

For the HDU survey, 44.0% of the HDU instructors were indifferent when asked if they were able to smoothly transition to online teaching, with 36.0% of instructors who agreed or strongly agreed with the question. The overall average value was 3.24 (0.87)—see Table 10. In

terms of the age range, instructors over 60 years old did not think they moved to teaching online smoothly, while those aged 20-29 felt they had transitioned with no issues. T-tests revealed p-values for the age range averages of 20-29 and 50+ were 0.13 and <0.001 respectively. While the p-value of 0.13 implies no statistical difference between the overall average and the age range of 20-29, it was lower than the p-values of age ranges 30-39 and 40-49, which were 0.63 and 0.58 respectively. Ages 50+ were found to be significantly different from the total average, however.

Through HDU interviews, we found that many instructors were uncomfortable because of the new teaching environment, especially the process of live broadcasting, where interactive feedback was limited. While they had fewer problems in course preparation, instructors who pre-recorded their lectures for asynchronous delivery spent more effort in preparation. There were some difficulties in the process of switching to online teaching, but younger instructors had an easier time.

While a clear trend was seen with older HDU instructors having trouble smoothly transitioning to online classes, the same trend was not found with WPI instructors. Younger WPI instructors (among the 30-49 age range) agreed more when compared to their older instructors of ages 50+ that their online transition was smooth. When comparing ages 50+ at WPI to ages 50+ at HDU, WPI instructors had differing opinions on their transition, as proven by the p-values of 0.067 (50-59) and 0.012 (60+). Ages 60+'s p-value was significantly different, but ages 50-59's p-value was not close enough to the standard for a significant statistical difference (<0.05).

Age Range	Number of Respondents	Question 5.5	Question 5.6	Question 5.7
30-39	8	3.625 (1.408)	2.875 (1.458)	4.250 (0.886)
40-49	7	4.000 (0.816)	3.286 (1.380)	4.571 (0.535)
50-59	14	3.571 (1.089)	2.357 (1.336)	4.071 (0.917)
60+	17	3.353 (1.367)	2.235 (1.200)	4.000 (0.935)
Grand Total	**46**	**3.565 (1.205)**	**2.543 (1.328)**	**4.152 (0.868)**

Table 9: WPI Instructor Survey Average (and standard deviation) Responses to Questions 5.5-5.7

Survey Questions 5-8 (rate how much you agree/disagree with the following [on a scale from strongly disagree (1) to strongly agree (5)]:
5.   I was able to smoothly adapt my in-person classes to an online platform
6.   I find it as easy to individually communicate with my students in online classes when compared to my in-person classes
7.   My college administration provides assistance as I run my online courses

Age Range	Number of Respondents	Question 5.5	Question 5.6	Question 5.7
20-29	8	3.75 (0.89)	2.25 (1.16)	3.75 (0.89)
30-39	22	3.36 (0.90)	2.91 (1.11)	3.36 (1.09)
40-49	16	3.13 (0.62)	2.13 (0.34)	3.50 (0.52)
50+	4	2.25 (0.00)	2.00 (0.00)	3.25 (0.00)
Grand Total	**50**	**3.24 (0.87)**	**2.48 (0.95)**	**3.44 (0.86)**

Table 10: HDU Instructor Survey Average (and standard deviation) Responses to Questions 5.5-5.7

4.2.6 Student-Instructor Communication

For question six, of the 46 WPI instructor responses, 52.94% either disagreed or strongly disagreed that communicating with students during online courses was as easy as in-person courses. The overall average in Table 9 shows 2.543 (1.328). Something that we noticed was that older instructors in the age ranges of 50-59 and 60+ had lower averages (the averages being 2.357 (1.336) and 2.235 (1.200) respectively) than younger instructors in the age ranges of 30-39 and 40-49 (the averages being 2.875 (1.458) and 3.286 (1.380) respectively). According to our t-tests, all p-values indicated no statistical difference between age groups (values between 0.41 and 0.65), including the lowest p-value 0.18 (between ages 40-49 and 50-59).

Through our WPI interviews, we discovered that most instructors noticed that class engagement was low. It can be difficult to get students involved, especially when it can be more difficult to build trusting relationships with them. It is important to facilitate time for students to become acquainted and form meaningful connections, which can lead to greater collaboration going forward (Terblanché, 2015). Some instructors found that specifically teaching to larger groups of students was more difficult, with one having to swap from one large scale meeting to multiple smaller meetings in a week. As for individual communication, most instructors noticed that some students were struggling due to the current pandemic or the nature of online learning. Some instructors allocated more time to help these students.

For HDU instructor responses, 68% of instructors also disagreed that communicating with students during online courses was as easy as in-person. As seen in Table 10, the overall average value for question six was 2.480 (0.950). Within all age groups, the same conclusion can be drawn, except in the age range of 20-29 years old where the degree of disagreement was weaker (2.91 (1.11)). When conducting t-tests, the age range of 20-29 ended up with a p-value of 0.10, which was not enough to be considered a significant difference, but it was the lowest average (other p-values ranged from 0.15 to 0.54).

Through the HDU interviews, we found that many instructors mentioned it was difficult for them to interact with students, and that students rarely took the initiative to communicate. Sometimes students were absent from their computers or failed to respond to messages. When personally communicating with students, instructors observed they did not like to communicate through video chat.

We found that both WPI and HDU instructors disagreed that communicating with students online was as easy as in-person. To confirm this, a t-test was conducted between the two, resulting in a p-value of 0.79; they were statistically in agreement.

4.2.7 University Support

For question seven of the instructor survey, 78.26% of WPI instructors agreed or strongly agreed that their university provides assistance as they run their online courses. Compared to their total average of 4.152 (0.868), instructors ages 40-49 more strongly agreed at an average response of 4.571 (0.535). Not one respondent said they strongly disagreed with the question. While this tells us that instructors are receiving help, it does not specify if that help was adequate. In our interviews, we found that, at least at WPI, the teaching staff has taken great interest in helping each other. While it varied between departments, several instructors said their colleagues shared tips with each other on what was and was not working, and even met up to discuss their experiences and possible improvements.

More than half of the instructors interviewed at WPI also mentioned the same two resource centers available on campus, one geared towards teaching methods and tools and the other towards technology assistance and training. Anyone who brought them up had only good things to say, expressing how helpful they have been to the teaching staff, especially for those with no previous experience teaching an online course.

HDU instructors yielded different results with an overall average response rating of 3.44 (0.86). 44.0% of respondents agreed or strongly agreed that their university provided help, and another 44.0% felt indifferent to the question. Through our interviews, we learned that HDU has advocated for training instructors for online learning, but their help was insufficient. Instructors get outside help from colleagues who are more familiar with the platform and even occasionally reach out to students.

4.2.8 Student-Instructor Communication Methods

Of the various platforms we asked instructors to rate, email proved to be the one instructors rated as most useful—a similar result to their students. 80.43% of instructors rated email as their most useful way to communicate with their students, the most of any platform (see Figure 3). This was likely attributed to the fact that most are comfortable using email, and it was already widely used to communicate pre-pandemic.

Every student and instructor has a school email account. This means email was readily available and typically the default for communication. Interviews with instructors showed that many enjoy using email because it allows them to write out detailed messages and quickly send them. Outside of emails, live office hours accounted for 63.04% of our responses. This sizable chunk indicates that the advent of Zoom and other video messaging apps has allowed students and instructors to speak with one another in a more convenient and flexible way. Instructors and students can communicate without having to be physically present. This encourages the use of office hours as it was easy to have face-to-face discussions.

We also saw some use of comments on assignment submissions (41.30%). However, assignment submissions tended not to create a dialogue between students and instructors, and if a student wants further feedback on a instructor's comments, they will likely resort to email.

In addition, we found that some classes used forums (34.78%), and instant messaging apps (10.87%). The "Other" category (26.09%), was made up of apps such as Discord, Slack, and Canvas. Our interviews with instructors reported that some believe it was too much effort to learn how to use these numerous communication platforms. Others found that it was far more convenient to use only email and office hours: platforms they know all students have access to. Overall, email was widely preferred for written communication, and office hours was preferred for when face-to-face conversations were necessary.

For HDU instructors, there was a greater preference for live communication over all other platforms, with 88.00% of instructors rating apps like Zoom and DingTalk as most useful for conducting student-instructor communication (see Figure 4). The second largest selection was for instant-messaging apps (44.00%). The most common of these among Chinese students and instructors was WeChat and DingTalk. Email (4.00%) and forums (8.00%) make up only a small portion of responses.

While instructors from both schools make regular use of live sessions to communicate with their students, there was a stark contrast in the use of other methods of communication. WPI instructors favored email, whereas HDU instructors greatly favored instant-messaging apps. This could be explained by the cultural differences between the two countries. In China, WeChat, a popular messaging and social media app, was widely used. In 2020, over half of the Chinese population had WeChat and uses it at least once a month (Kats, 2020). Instructors in China can safely assume most if not all of their students have this app, and its universality was appealing for communication. In contrast, no messaging app in the United States holds the same level of dominance and market share as WeChat does in China, making instant-messaging apps less prominent as a form of communication. The most universal contact method for U.S students and instructors was email, which appeals to the U.S audience due to its universality and professionalism. The fact that there are convenient and useful methods of communication in both countries contributes to the low use of forums and discussion boards in both.
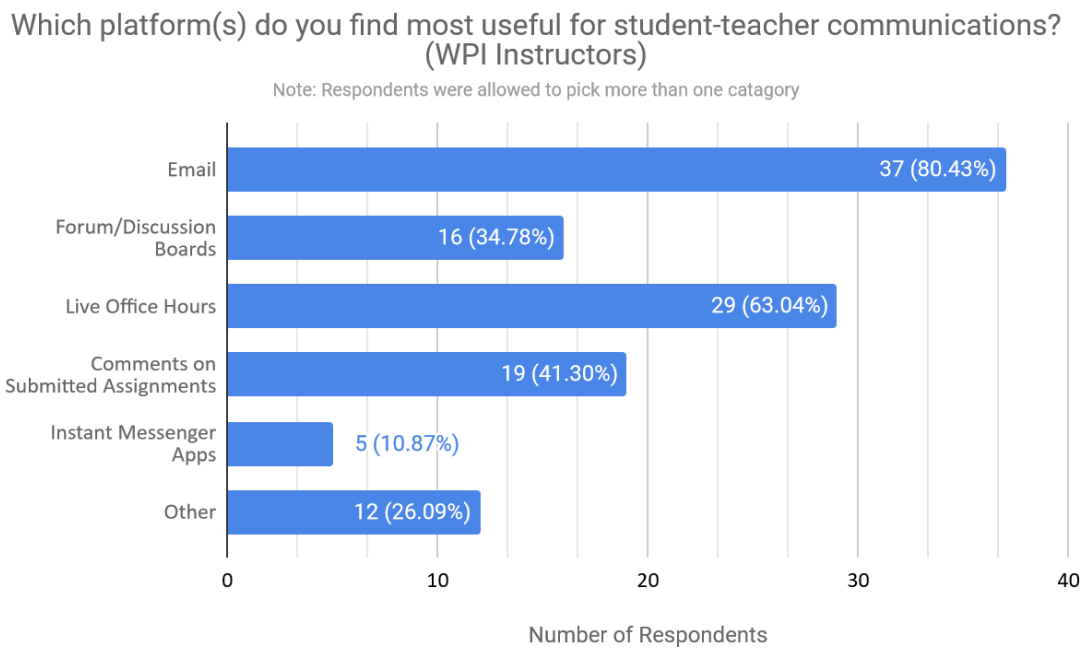

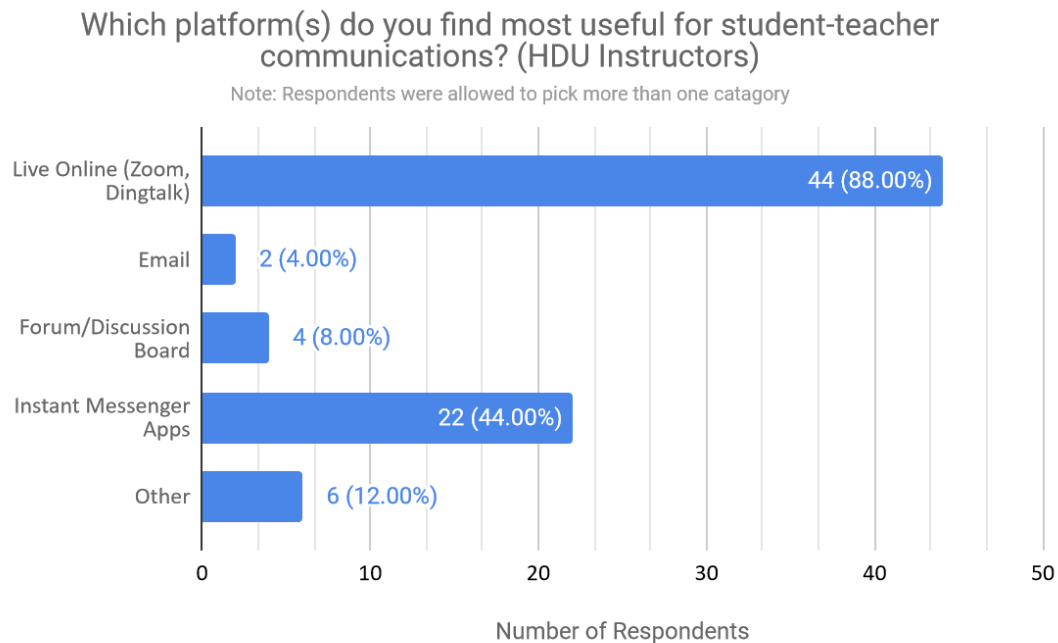**Figure 3: WPI Instructor Survey Communications Results**

Figure 4: HDU Instructor Survey Communications Results

4.2.9 Successful Methods in Online Teaching

The first open response question of the instructor survey asked for a tool or method that they felt successfully took advantage of the online learning platform. From Table 11, at WPI, 45 respondents answered this question, leading to the top three answers being the use of synchronous lectures (18), class discussion boards (9), and some form of consistent interaction with their students (7). In HDU, with 40 respondents, the top answers were consistent/daily interaction with students (20), using lecture recordings (8), and synchronous tests and exams (6). Both consistent student interaction and use of discussion boards, as well as highlighting a synchronous course component, were shared by WPI and HDU instructor responses.

Previously, only students had answered a question regarding the specific mode of material delivery, so in our interviews, we asked instructors if they taught synchronously or asynchronously and why. Almost every instructor from WPI and HDU told us they used some combination of the two approaches of instruction delivery, with varying emphasis on one or the other. There was no overarching trend here other than the idea that instructors should use both forms of delivery, as each has benefits to offer.

The individual responses for use of discussion boards varied greatly as well, with some for and others against. In our interviews, we tried to uncover the reasoning behind using a

discussion board and best practices to follow. We found there to be two main uses, the first of which was to facilitate thoughtful discussion between students. This tool does not have a place everywhere, as it may shine in a philosophy course but sees little utility in a calculus course (cited from the personal experience of one instructor).

The other use was more casual, working as a place for open questions and announcements. At WPI, third-party apps like Slack, Discord, and Piazza were mentioned several times in interviews as places for discussion. They acted almost as forums, where students' questions could be answered quickly by instructors, teaching assistants (TAs), or other students. HDU used WeChat and MOOCs similarly while keeping a more professional discussion environment. This also plays a role in the third most common answer for this question: having consistent interaction with students. Instructors who responded with this felt that it not only helped humanize remote learning but helped keep students on track with the course. A few WPI instructors cited examples of short, ungraded quizzes or problems, or even posts asking students to express questions or concerns. HDU instructors were more concerned with helping students keep up with the progress of the course and having them participate in thinking about the course material.

Between synchronous lectures, consistent student interaction, and discussion boards, the largest commonalities in advice between the two universities involve communication between the instructor and their students.

What is one tool or method that you feel you or another professor has demonstrated to successfully take advantage of the online learning platform?	
WPI Instructor Responses (45)	**HDU Instructor Responses (40)**
Synchronous Lectures (18, 40.0%)	Consistent/Daily Interaction with Students (20, 50.0%)
Discussion Boards (9, 20.0%)	Lecture Recordings (8, 20.0%)
Consistent/Daily Interaction with Students (7, 15.56%)	Synchronous Tests and Exams (6, 15.0%)
Interactive Lectures (6, 13.33%)	Discussion Boards (4, 10.0%)
Recording and Posting Synchronous Lectures (5, 11.11%)	

Table 11: Instructor Survey Open Response Question 1 Top Answers

4.2.10 Unsuccessful Methods in Online Teaching

The second open response question of the instructor survey asked instructors what an example of a poor teaching method for the online platform would be, that they would recommend others to avoid. For WPI, the same 45 respondents from the first open question answered this one as well, giving the top three answers of not adjusting courses for the online platform (12), using only asynchronous lectures (9), and lectures that are too long and non-interactive (8). As seen in Table 12, HDU also had the same 40 respondents as the previous question, with their top answers of giving boring and non-engaging lectures (20), not testing teaching platforms and networks before use (18), and not preparing course materials in advance (4). HDU's preparation issues paralleled WPI's response of not setting enough time aside to teach online courses (8), which may apply more broadly to course preparation in general. Uninteresting lectures also were shared between the two universities, with much more weight at HDU (50.0% of responses).

In terms of course adjustments and adaptation, our WPI instructor interviews revealed that several instructors had strong opinions on the differences between online and in-person teaching. They believe that you cannot just move an in-person course PowerPoint online and

lecture synchronously, or even worse post only lecture recordings. The way students learn online is much different than in-person and requires supporting material that interacts with and supplements lectures. If an instructor was stuck using older methods and does not update their material, it shows, and the students will be able to tell. This was supported in our WPI student interviews, as we heard complaints that paralleled this exact idea: some instructors are not utilizing the online platform correctly, and are stuck lecturing as if they were in a classroom.

As previously mentioned, using strictly asynchronous lectures to deliver course material has also proven detrimental. WPI instructors found that many students will not watch asynchronous lectures. One of the reasons students refuse to watch these lectures is simply due to their length. This applies to synchronous lectures too, as professors have found that "lecturing" quickly loses students' attention (within 10-12 minutes), especially when the professor provides no engagement for the class (Hajhashemi, 2016). Both HDU and WPI instructors noted this. Again, student interviews support this, citing the dullness and length of a lecture as a large contributor to focus issues. Ironically, in some cases where instructors attempted to foster interaction in their synchronous classes, students had little enthusiasm and some even ignored direct engagement.

A considerable number of HDU instructors cited technical difficulties in their classes, hence the common response of not testing platforms and networks before use. Problems ranged from equipment failure, such as a microphone not turning on, to issues moving assignments online, and unreliable network connections. Very few WPI instructors mentioned issues with technology. They explained that programs within their university, such as technology help centers, were great in assisting them with any problems they came across. After further inquiry, we found that HDU does have a technology help program, but it was often unsuccessful in resolving issues.

Between course adjustments, boring lectures, and asynchronous delivery, the largest commonalities in advice between the two universities are proper course preparation and to encourage student engagement.

If you were to give advice to a new teacher going into online learning, what is one thing you would tell them to avoid doing?	
WPI Instructor Responses (45)	**HDU Instructor Responses (40)**
Not Adjusting Course for the Online Platform (12, 26.67%)	Boring Lectures with No Student Engagement (20, 50.0%)
Using Only Asynchronous Lectures (9, 20.0%)	Not Testing Teaching Platforms and Networks for Bugs/Issues (18, 45.0%)
Lengthy and Boring Lectures (8, 17.78%)	Not Preparing Course Materials in Advance (4, 10.0%)
Not Setting Enough Time Aside for Teaching (8, 17.78%)	Unclear Assignment Instructions (3, 7.50%)
Relying Too Much on Discussion Boards (6, 13.33%)	Over-assigning Work (2, 5.0%)

Table 12: Instructor Survey Open Responses Question 2 Top Answer

5.0 Findings and Recommendations

Culminating our entire analysis, this set of recommendations has been designed for instructors to use to improve the quality of their online learning programs. Our dataset has either led directly to or supported these suggestions, giving us a list of what we believe best represents our findings.

5.1 Comparison Between China and the U.S.

One of the distinguishing characteristics of our project comes from the unique opportunity we had to conduct this study across China as well as the United States. As we gathered our data and formed our analysis, we were able to make comparisons between the two countries. This provided further insight into the two universities and allowed us to find any similarities, and any differences, used in the development of our recommendations.

5.1.1 Student Perceptions

Some major comparisons between China and the U.S. that we found in our data were that on both sides, students were easily distracted in their online classes and that they've had to study more independently to keep up in class. Students in China said that online learning has improved their academic performance, whereas U.S. students have reported the opposite. Chinese students also felt they had an easier time communicating with their instructors and performed better in asynchronous classes, two things that U.S. students frequently mentioned were challenges for them. Overall, U.S. students were less satisfied with online learning. Even with all of this, both sides agreed that they felt their instructors and universities are actively trying to improve online learning overall.

5.1.2 Instructor Perceptions

Within comparisons between instructor experiences, we found that they shared the sentiment that online classes required more time and effort in terms of daily preparation. Many cited that they had to prepare new course material for their online courses and take extra time for recordings. Instructors also believed that communication with their students online was not as easy as in-person. Lengthy or boring lectures were a common dislike, as instructors often cited that their students lost focus too easily during online classes. This can all be classified under

instructors being forced to properly adjust their classroom to the online platform, which both universities agreed is important. We did notice that China instructors had little concern for using online asynchronous lectures, while U.S. instructors and even students commonly brought up that they had little success with asynchronous lectures.

5.2 Recommendations

The following recommendations were selected because of the substantial amount of supporting evidence present in our data. Students and instructors from both WPI and HDU acknowledged these issues, and often had similar perspectives. We believe these suggestions will be largely beneficial to instructors in their design and execution of online courses.

5.2.1 Employ Shorter Lectures

Students often complain that lectures can be too long or boring in the first place, but this is justified in online learning. When an instructor lectures for too long, regardless if it is synchronous or asynchronous, they are diminishing their students' ability to learn. Students reported that it became increasingly more difficult to pay attention to a lecture the longer it went. Some instructors noticed this as well, citing that fewer students watched lengthy pre-recorded lectures at all. Considering that most students' focus begins to drop after around 10 minutes of video, we recommend asynchronous lectures be kept to around 12 minutes, (Hajhashemi, 2016). Other studies have found the optimal length for an online lecture to be six minutes, however we believe that this compromise of 12 minutes will be easier for professors to implement (Guo, 2014). This will likely increase the number of lectures or recordings required to cover the same amount of content, however students argued that shorter, yet more frequent lectures were more manageable.

Synchronous lectures can be impractical at a length of only 12 minutes considering it requires attendance of the class. Several instructors advocated for the method of deploying content asynchronously, and using synchronous sessions to review practice problems and answer questions. This style could support a 12-minute lecture followed by other class engagement to fill a time slot. However, if insistent upon lecturing for the entirety of the class, we recommend still shortening closer to 30 minutes of content, assuming the instructor provides more engagement than a recording. While students' attention spans remain within 10-12 minutes, these

spans may cycle and reset dependent on certain triggers. One study suggests that students retain the most knowledge not in the first 15 minutes of a lecture, but in the time between the fifteenth and thirtieth minutes of the lecture (Bradbury, 2016). This is a compromise where the instructors can effectively use their time, but they are not droning on for so long that they lose their students' attention.

As mentioned above, there are concerns with the ability of instructors to create several shorter lectures instead of fewer longer ones, especially within limited time. This is the main reason we recommend 12 minutes instead of 6, as it is more practical for the instructor. It should be acknowledged that not every lecture will be exactly 12 minutes, but they may fluctuate around this value within a few minutes. For longer synchronous lectures, it can be difficult to present the same amount of content in 30-minute lectures without increasing their frequency. We simply recommend that as lectures increase in length, instructors must foster class engagement. More than 12 minutes of lecturing alone may deter students, but anything longer can be supplemented by the instructor's involvement.

5.2.2 Require Students to Keep Cameras On

We would say simple encouragement to keep cameras on would be enough, but instructors have reported that this leads to looking at the same three students' faces every class. However, keeping cameras on benefits both students and the instructor. Despite students generally avoiding and even loathing turning their cameras on, it puts responsibility on them for personal sources of distraction; it makes it more difficult to get away with being on their phone or working on another activity when everyone is watching them. Just the idea alone that other people can see you also helps students focus, as they want to appear attentive like the rest of the class. In one of our interviews, one student even said, "I've found that forcing myself to keep my camera on has been nice for [staying focused] 'cause then the teacher can see if my eyes are wandering down to my phone, or anything like that". In addition, students agreed that the absence of face-to-face interaction during class decreased their focus, and cameras could fix this.

For instructors, a major missing component of online classes was the ability to gauge the class's facial expressions. Many instructors cited this tool as necessary in determining if they should slow down and confirm that the class understands the material, or move on to something more engaging, like an example problem. Having cameras on is a good step to help instructors

measure their classes' understanding. And if students are more focused in the first place, they are more likely to ask questions, and facilitate a more responsive class environment. In general, a more attentive student should learn more too, and therefore perform well in a course.

Students will not always agree with this decision. Especially in larger classes, it can be very difficult to manage every student's camera, and there may be some who ignore the requirement altogether. However, it is expected to reap the same benefits with only a majority of the class participating, and those who do not could be hurting their own learning experience.

5.2.3 Fully Transition to Online Learning

In the course of our interviews, students reported that some of their instructors have not adequately transitioned to online learning. Some students said that instructors have basically copied and pasted previous class formats where they record a lengthy lecture and post it online as a video. This approach does not change much from a real in-person lecture and is detrimental to retaining student attention and focus online. This format of delivery fails to be engaging and does not give students an opportunity to interact with their instructor, which is crucial in an online platform.

In a research study on asynchronous lecturing styles, researchers presented various types of asynchronous lectures to students and measured their performance and satisfaction (Choe et al., 2019). Some of the different styles of lectures included a recording of a classic in-person lecture, demonstrations, lecturing by writing notes with a pen and tablet, and showing PowerPoint slides. Of these styles, the ones with the least adaptation to an online learning environment: such as the classic in-person lecture recording, PowerPoint slides, and the pen and tablet, did very mediocre in terms of student satisfaction. Interactive and well adapted ones, such as video demonstrations fared much better. The results of this study suggest that students are dissatisfied when their lectures attempt to parrot in-person learning styles online, and instructors must make adjustments to better their courses. We advise that instructors make various adaptations to their courses to suit online learning.

Examples of improvements include making use of online tools, such as discussion boards and forums, modifying the type and amount of content that can reasonably be covered in the new online format, and finding ways to interact with students outside of lectures. Students reported that adaptations like these helps accommodate and improve their online learning experience.

Some instructors explained that they are unfamiliar with the online learning environment and the various software that one needs to keep up, since for many instructors, moving online is a new experience. We recommend that instructors use the available tools provided by their institution to transition their classes to online. This includes taking advantage of online learning workshops, training sessions, and other resources to fully adapt to online learning. In any case, more experienced colleagues will likely be willing to help.

5.2.4 Universities Should have Effective Help Centers

In our instructor open response questions and interview questions regarding issues in online learning they would like to see resolved, we discovered that both WPI and HDU have help centers dedicated to helping instructors fix technology issues. WPI instructors who have used their help center mentioned that it was proficient at fixing any problems that they came across, as well as predicting and mitigating problems before they even occurred. One WPI instructor said in an interview, "Our university is taking the problem seriously. Our tech center is constantly nagging me the whole time with some useful hardware recommendations".

Students (especially at HDU) have noticed their instructors struggle with technology issues, despite the existence of these help centers. From further inquiry, we discovered that HDU's help center was often unsuccessful in resolving issues. Instructors at HDU cited that their colleagues and even some students were consistently more assistive than their university's program. A helpful recommendation would be to make sure that a university's help center is well trained to assist the instructor in any problems that they run into, as well as making the help center clearly known to all of campus.

Further developing a help center can be difficult, perhaps due to training costs and time, but we believe it is necessary in a university teaching environment. Through our instructor interviews, we also discovered that HDU had assigned trainers to the HDU instructors, but they too were insufficient in helping with any online learning issues. Again, they found more success with outside help from their colleagues who had worked with and were more familiar with teaching platforms. Another recommendation we make is to be open to suggestions from your colleagues and students, and to seek out their help when necessary.

5.2.5 Consistent or Daily Interaction with the Class

Many instructors and students feel disconnected from one another while learning on the online platform. From our interviews, sufficient interaction between students and instructors was missing from their classes, becoming the source of many negative perceptions of online learning. Many believe that this exchange between students and instructors is important to students' learning and development (Johnson, 1981). Our recommendation to resolve this issue is for instructors to maintain consistent or daily interaction with the class, which was the third most common answer from the instructor open response question in our survey asking instructors what has been successful in their courses. This can be done during synchronous lectures, frequent office hours, or announcements or posts on an organized course page.

It may be a daunting task for many instructors who teach large classes to interact daily with all of the students. Smaller class sizes online could help with this. Because there are no physical seats in an online class, many classes have gotten larger. In one instance a instructor from our interviews had to switch from a large meeting to multiple smaller ones because the class size made it too difficult for meaningful discussion. We suggest the instructor try their best, and if they cannot individually interact with each student then at least circulate something that all the students can see.

Another recommendation for instructors is to have occasional check-ins with students. From our surveys and interviews, students reported having a difficult time focusing in their online classes while also juggling staying on track with course material without a set schedule. By checking in with students in a smaller, more manageable class, instructors can provide support to help make sure students are keeping up with their work as well as confirm the student's well being. Again, individual check-ins may not be possible in larger classes, but we still recommend reaching out to students to assure their health and happiness.

5.2.6 Avoid Using Only Asynchronous Lectures

The most common response in our survey when asking students what instructors have done that hurt their online learning experience was using strictly asynchronous lectures. Students found that asynchronous lectures are difficult to keep up with since they do not have a regular schedule. In addition to having the same length issues mentioned above, asynchronous lectures also offer no student-instructor interaction, which does not help the already low focus levels of

students on the online platform. Students are more engaged with discussion in synchronous classes whereas discussion is more one sided in asynchronous ones (Chou, 2002). From our survey we found that the majority of students in the U.S. learn more from synchronous lectures. Students also said that when synchronous lectures were recorded and posted, they became more successful in an online course. This blends the convenience of being able to watch and rewatch an asynchronous lecture at leisure while still having the interaction and normality of a live lecture. Because levels of focus are so low in the online environment, it is easy for students to miss points made in the lecture. This is why posting recordings of synchronous lectures is beneficial and was one of the most common answers in our student open responses.

5.2.7 Recommended Coursework Schedules for Students

Students found that time management was one of the biggest challenges that they faced during online learning. Brought up constantly throughout our student interviews, this was especially prevalent in asynchronous courses where there were no scheduled watch times.

Providing a schedule to follow would be beneficial to this student issue. This schedule could include day-by-day recommendations for what material needs to be reviewed and worked on. One interviewee from WPI stated that "The biggest challenge [of online learning] is actually time management… it was hard to make a plan, but once I had it, it was easy to follow".

A 2019 study was conducted that found that instructors are able to increase student academic performance in the first week of a course by implementing a scheduling intervention (Baker et al., 2019). While managing time for online classes is ultimately up to the student, a recommended schedule would be beneficial to the many students who benefit from sticking to a plan, but struggle to think of an effective one on their own.

5.3 Further Advice

While the following recommendations were not as heavily supported by our data, we still believe they are valuable. Each came up several times in our surveys and/or interviews, but could have been lacking enough support from both instructors and students, or both WPI and HDU.

5.3.1 Increase Student Engagement in Lectures

Fostering student engagement during lectures is another way to increase student attention and focus. With distraction being one of student's biggest issues in online learning, any method to assist them should be used.

We believe that there are two ways to increase engagement in an online lecture, the first of which is to employ some degree of active learning. Video conferencing apps, like Zoom and DingTalk, have integrated tools such as class polls and breakout rooms. Instructors could also give an interactive question or assignment to the class, as long as students are participating.

The second way to increase engagement comes from the lecturing style of the instructor. As a lecturer, if you simply read over notes to the class like it were a textbook chapter, you are not doing your students' education justice.

A study from the *Journal of Learning Design* gathered some tips on making effective video lectures. Aside from citing shorter lectures as beneficial (similar to our own analysis), the authors said that an authentic presentation of the material was just as important as the material itself, recommending instructors to come prepared with an in-depth knowledge and appropriate adaptation of their course's content for the online platform (Thomson, 2014). They also suggested that it is fundamental to bring personality and enthusiasm to a lecture, projecting oneself through the camera, and that these skills may require practice to achieve.

5.3.2 Commit Sufficient Time to Daily Class Preparation

An additional recommendation we would make to instructors is to commit enough time to the daily preparation of their online classes. Many instructors, especially ones who have taught their classes multiple times before in an in-person setting, believe that their wealth of experience will be sufficient for teaching the same exact course in an online setting. This is not always true.

In our interviews and survey feedback, many instructors advise their peers to edit their courses and teaching styles to better reflect the fact that online courses do not always run as smoothly as in-person ones. Most instructors also reported in interviews that they have to commit additional time to the execution of their online classes compared to in-person ones. Students in our surveys and interviews also report that they can recognize when their instructors have not adequately prepared for their lectures.

We would recommend that instructors set aside time for their daily class preparations. Instructors who jump in with the assumption that their time commitment will remain the same as before may be surprised by the additional work they have. We suggest instructors make adequate preparations. This includes accounting for technical issues, making sure that the content the plan to cover the next day is reasonable, planning out how they will use the limited amount of lecture time they have, and preparing their lecture materials. These steps will increase the quality of a instructor's lectures.

5.3.3 Maintain Clear and Responsive Lines of Communication

Communication between students and instructors is essential when teaching remotely. We recommend that instructors maintain clear and responsive lines of communication with their students when conducting an online course. This was the most common answer when students were asked what instructors have done to make online learning successful for them, with poor communication also being among the top three answers for worst practices.

While it is unrealistic for an instructor to check their emails every moment of the day, they should regularly check for any messages and respond in a timely manner. Instructors must go out of their way to have forms of communication that make students feel comfortable in an online classroom to lead to a successful environment (Dickenson, 2017).

While communication by email is the most common method, it can also be conducted over communication apps such as Slack and Microsoft Teams. Students have positive perceptions of these apps because it allows them to easily ask questions and communicate with other students as well as the teaching assistants (TAs). Instructors also support these apps because the TAs can answer many of the students' questions and lighten their workload. Instructors in China use the messaging app WeChat to directly communicate with their students, making communication quick and simple. By having clear and responsive lines of communication, instructors are able to improve the quality and success of their online courses.

5.3.4 Effectively Employ Discussion Boards

Many instructors we came across during our study employed discussion boards in some capacity, however many students mentioned through our survey that discussion boards were not very effective. This does not imply that discussion boards are useless, as there were some

students and instructors who explained that they were a considerate learning method. Discussion boards are in fact one of the strongest indicators of student performance for instructors in an online classroom (Coldwell et al., 2008).

From further investigation in our instructor interviews, we found two instructors in particular who explained these differences in our findings. They told us that discussion boards can be a valid learning method that encourages thoughtful conversation, but only when executed properly. The more work put into creating a discussion board, the better results they were able to achieve. If the questions are not carefully crafted to suit the material, or are not made with deliberate purpose, students will not find them helpful. Some instructor interviewees even admitted they employed discussion boards in a manner that could have been improved. When online learning became the default method, they had to reconsider how they were using their discussion boards and how they should adjust it to suit their material.

5.3.5 Post Recordings of All Synchronous Materials

Posting recordings of synchronous lectures is a simple yet powerful method to benefit students. In our student surveys and interviews, anyone who argued for the use of asynchronous lectures cited that the most attractive feature was the ability to rewind and watch the recording several times, at their leisure.

While we have found that delivering content exclusively through asynchronous methods is not effective, the same benefits can be drawn from synchronous methods. Video conferencing software often contains built-in recording capabilities, making it straightforward for instructors to upload synchronous lectures after their completion. These posts would utilize the advantages of asynchronous lectures while keeping all the benefits of synchronous lecturing.

6.0 Conclusion

The goal of this project was to study and understand student and instructor perceptions of online learning in both China and the United States, and then use our understanding to formulate recommendations for the future direction of online education. Through conducting surveys and interviews, we were able to gain an understanding of the difficulties of online learning as well as some of the best and worst practices of students and instructors.

Students faced many challenges in their classes such as maintaining focus in an online class and formulating a schedule for themselves in an environment where so much material is left for them to manage. Both students and instructors agreed that communication can lead to both the best experiences in online learning as well as the worst, depending on its application. This data was used to develop suggestions that address these issues and negative trends we observed. Our recommendations were also created while taking into account the differences discovered in our comparison of online education in China and the United States.

Recommendations to help students with the issues of focus and scheduling were instructors employing shorter lectures, requiring students to keep their cameras on, increasing student engagement during a lecture, and providing a recommended coursework schedule for the class. These can all help students remain focused on lectures as well as on track with their course material.

To improve the quality of classes, we recommend that instructors avoid using only asynchronous delivery methods, commit enough time to the daily preparation of their classes, and employ discussion boards. To help with the issues of student-instructor relationships and communication, instructors should maintain clear and responsive lines of communication, as well as have consistent or daily interaction with the class. Universities should have effective help centers to aid their teaching staff whenever technological issues arise. This can also help instructors fully transition their courses to an online platform, since typical in-person methods are not found to be successful online. We believe these recommendations can greatly improve the satisfaction within an online course considering how frequently these issues were expressed in our data.

Within this report contains all our collected research, findings and recommendations. We hope that our work will be helpful in providing both students and instructors with a higher quality online education experience.

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APPENDICES

Appendix A: Student Survey

Informed Consent Preamble

We are a group of students from <Worcester Polytechnic Institute in Massachusetts // Hangzhou Dianzi University in Hangzhou>. We are conducting a study of online learning to learn more about the adaptation of online learning methods since the start of the coronavirus pandemic. We strongly believe that this kind of research will ultimately help to formulate valuable recommendations for the future directions of online learning.

Your participation in this quick five minute survey is completely voluntary and you may withdraw at any time. Please remember that your answers will remain anonymous. No names or identifying information will appear on the questionnaires or in any of the project reports or publications.

This is a collaborative project between Hangzhou Dianzi University in Hangzhou, China, and Worcester Polytechnic Institute in Massachusetts, United States, and your participation is greatly appreciated. If interested, we can share a copy of our results with you at the end of the project.

For more information about this research, contact gr-hangzhou-iqp-hdu-online@wpi.edu or IRB Manager (Ruth McKeogh, Tel. 508-831-4989, Email: gjohnson@wpi.edu).

Questions

Opening classifiers (drop down list selection):

1. What is your age?
2. What's your major?
3. What graduating class are you in?
4. Which university are you attending?
5. Have you taken an online or partially online course?
6. Rate how much you agree/disagree with the following (on a scale from strongly disagree to strongly agree):
    6.1. I am satisfied with the current state of online education at my university
    6.2. My academic performance in school has improved with online learning

6.3.   I feel easily distracted/less focused when taking online education courses

6.4.   I learn more from synchronous (live) classes than asynchronous (pre-recorded) classes

6.5.   I have to independently study more than usual to do well in my online classes

6.6.   I feel that my teachers have adjusted their methods for online education

6.7.   I find communication with my professors in online classes as easy as in-person classes

6.8.   I feel that my university actively attempts to improve our online learning accommodations in hardware/software

7.   Which platform(s) do you find most useful for student-teacher communication?

7.1.   Email, forum/discussion boards, live office hours, comments on submitted assignments, instant messenger apps, other

8.   What is one thing a Professor has done to make online learning successful?

9.   Is there anything a Professor has done that you felt worsened your experience with online classes, that would not have the same effect in-person?

10.   Would you be willing to participate in a follow up interview at a later date to help collect more data for this research?

10.1.   Please provide your email for future contact

11.   Are you interested in being entered into the raffle for a $50 gift card (of your choice to Amazon or Dunkin)?

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Your participation in this quick five minute survey is completely voluntary and you may withdraw at any time. Please remember that your answers will remain anonymous. No names or identifying information will appear on the questionnaires or in any of the project reports or publications.

This is a collaborative project between Hangzhou Dianzi University in Hangzhou, China, and Worcester Polytechnic Institute in Massachusetts, United States, and your participation is greatly appreciated. If interested, we can share a copy of our results with you at the end of the project.

For more information about this research, contact gr-hangzhou-iqp-hdu-online@wpi.edu or IRB Manager (Ruth McKeogh, Tel. 508-831-4989, Email: gjohnson@wpi.edu).

Questions

Opening classifiers (drop down list selection):

1. What is your age?
2. Which department are you in?
3. Which university do you teach at?
4. Have you taught an online or partially online course?
5. Rate how much you agree/disagree with the following (on a scale from strongly disagree to strongly agree):
    5.1. I am satisfied with the current state of online education at my university
    5.2. My students' academic performance in school has improved due to online learning
    5.3. My students participate in my online classes as often as my in-person classes

5.4.   I typically commit more time to the daily preparation and execution of my online classes than with in-person classes

5.5.   I was able to smoothly adapt my in-person classes to an online platform

5.6.   I find it as easy to individually communicate with my students in online classes when compared to my in-person classes

5.7.   My college administration provides assistance as I run my online courses

6.   Which platform(s) do you find most useful for student-teacher communication?

6.1.   Email, forum/discussion boards, live office hours, comments on submitted assignments, instant messenger apps, other

7.   What is one tool or method that you feel yourself or another professor has demonstrated to successfully take advantage of online teaching?

8.   If you were to give advice to a new instructor going into online teaching, what is one thing you tell them to avoid doing?

9.   Would you be willing to participate in a follow up interview at a later date to help collect more data for this research?

9.1.   Please provide your email for future contact

Informed Consent Preamble

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Introduction

Hello, thank you for taking the time to meet with us. We are the <WPI // HDU> Hangzhou IQP team and we are hoping you would be able to help give us feedback on student perspectives in online learning. Our project is exploring how we can potentially improve online learning.

We would first like to get permission to record your answers via notes and audio/video recording for our team's review and analysis post-interview. Is that okay with you?

Questions

Question 1: How are online classes going? (WPI) / How were online classes? (HDU)

Question 2: Are you satisfied with the current state of online education at your university? Why?

Question 3: How does your academic performance in online classes compare to in-person classes? Why? If not, why has it gotten worse (personal factor, changes in classes, instructors)?

Question 4: Do you feel easily distracted/less focused when taking your online courses? If yes, why so (is it a personal factor or something with your instructor)?

Question 5: During the previous semester, do you have to independently study more than usual to do well in your online classes compared to in-person classes? Why? (again, is this a personal factor or more to do with your instructor's course)? (if not already mentioned, what are your specific study habits?)

Question 6: During your online semester, did you learn more from synchronous (live) classes or asynchronous (pre-recorded (WPI) // MOOC (HDU))? What about your answer (sync or async) do you believe causes this? Do you believe a combination of the two works best? Why?

Question 7: What learning platforms/apps have you used in your online classes? Please be specific. Do you think that this software is adequate? Are there any aspects of this that you like? What about aspects you do not? Is there anything that could make them easier or more convenient for you? (HDU question only)

Question 8: What are the biggest challenges in class that you have faced so far in your online learning experience? What challenges outside of the classroom have you encountered?
(if not already brought up on their own) Are there more adjustments your professors could make to make their courses more suitable for an online platform?

Question 9: Do you feel that communication with your instructors for online classes is as easy as in-person? Why? Which methods of communication are your instructors using and how do you wish they could improve?

Question 10: Do you feel that your university actively attempts to improve your online learning accommodations? Are there any factors in online learning that you wish your university could improve in?

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Introduction

Hello, thank you for taking the time to meet with us. We are a WPI Hangzhou IQP team looking for feedback on teacher perspectives in online learning. Our project is exploring how we can potentially improve online learning and education.

We would first like to get permission to record your answers via notes and audio/video recording for our team's review and analysis post-interview. Is that okay with you?

Questions

Question 1: How long have you been teaching at WPI // HDU and in what field/department?

Question 2: Are you satisfied with the current state of online education at your university? Why (more specifically what aspects make it good/bad)? (past tense for HDU)

Question 3: How have you adapted your methods of teaching as you have transitioned online? Which of these methods have you found successful and unsuccessful and why? How did you handle the initial transition? (past tense for HDU)

Question 4: Do you currently teach synchronously or asynchronously (or a combination of the two)? Why did you choose this method over the other? (past tense for HDU)

Question 5: Do you typically have to commit more time to the daily preparation and execution of your online courses? What is different about it than in-person classes (challenges or easier)? (HDU past tense)

Question 6: How often do your students (actively) participate in online classes compared to in-person ones? Have you taken any steps to try to increase/keep high levels of participation? Has this affected aspects of your class such as the lesson plans? (WPI question only)

Question 7: Do you think that individual communication with your students is important for online education compared to in-person, or is there no difference? Why?

Question 8: We've found that most teachers employ discussion boards in their classes, but have had both good and bad things to say about them. Do you use discussion boards, and why or why not? If so, what are the best practices?

Question 9: What are your opinions on how your university has handled the transition to online learning? What did the university do to support the teaching faculty in online learning?

Question 10: What policies has the university implemented surrounding online learning? How have they affected you? Do you believe that your university is actively trying to improve its online learning environment?

Question 11: What do you think about the future of online education? Do you believe it will continue to play a role in the future of education? Why?

Appendix E: Project Timeline

Tasks	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7
Finalize Survey Questions and Create Survey	X						
Release Pilot Survey, Gather Feedback and Make Adjustments		X					
Determine and Contact Interveiwees, Set up Interviews		X	X	X	X		
Survey Students and Teachers			X	X	X		
Use Survey Results to Adjust Interview Questions			X	X			
Conduct Student and Teacher Interviews				X	X	X	
Begin Drafting Project Report				X	X	X	
Data Organization and Analysis					X	X	
Formulate Recommendations Based on Collected Data						X	X
Write Final Project Report						X	X
Create Sponsor Presentation							X
Sponsor Presentation							X