Improving Online Education at The International University of Rabat (UIR)

An Interactive Qualifying Project

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Abstract

L’Université Internationale de Rabat (UIR) is looking to analyze the multidimensional effects of COVID-19 on education. We conducted interviews with WPI faculty, administered surveys, and interviewed UIR students and faculty to understand impacts of remote learning and COVID-19. Based on our findings, we recommend UIR implement an online management system, provide online training for professors, utilize online platforms to improve student-professor communication, and support student wellness through online extracurricular activities. We developed a website with resources to supplement online teaching training.

Acknowledgements

Our team would like to thank the many individuals who volunteered their time and their expertise to support this project. We would like to thank the members of our sponsoring organization, L'Université Internationale de Rabat (UIR) for their time and patience, and for providing us with an important and relevant project.

We would specifically like to thank our sponsor Dr. Mustapha Oudani, Assistant Professor of Mathematics and Operations Research at UIR for creating this project opportunity. This project would not have been possible without his patience and guidance. All while working remotely, he responded to all our questions and found numerous students and professors for us to interview.

Our team would like to give a special thanks to our advisors, Professor Mohammed El Hamzaoui and Professor Rebecca Moody, for their continuous support, understanding, and encouragement while guiding us through the IQP process with their project expertise. We would also like to thank our ID2050 professor, Carol Stimmel, for preparing us to conduct this research.

Additionally, we would like to thank the UIR student group, a group of Computer Science students at the university, for producing tables and graphs pertaining to our survey data and helping us identify correlations. Thanks to their passion and enthusiasm, the students produced all the graphs and figures in this report. Thank you, Yassine T., Dikra M., Hamza N., Hamza B., Yousra S. and the rest of the student group who preferred to remain unnamed. We would also like to give a special thanks to Abdelali El-Kassas and Anass Sebbar for providing context of education in Morocco. Additionally, we would like to thank our cultural partners Anas Farouki and Yassmine El Kholti who dedicated their time each week to help us understand Morocco and its fascinating culture. These meetings, although conducted online, were a highlight of our project experience.

Finally, we would like to express our sincere gratitude to all UIR students, professors, and faculty members who participated in our surveys and interviews. Thanks to your involvement and patience during this pandemic, we were able to collect data relevant to improving online education.

Executive Summary

COVID-19 Impacts on Education in Morocco

From the beginning of the COVID-19 outbreak, like many countries around the world, Morocco introduced strict regulations to contain the initial spread of the virus. Schools and universities closed for a period of three months, eventually transitioning to remote education to reduce the spread of the virus ("Morocco: A case for building a stronger education system in the post Covid-19 era", n.d.). We define remote education and distance education as education separated by time or distance and online education as courses conducted online. The ongoing pandemic negatively impacted the education quality, financial security, and mental health of students and professors all over Morocco. (Coronavirus Disease (COVID-19) - Events as They Happen, n.d.). This shift to remote learning also affected educational institutions because of changes in delivery and communication of educational material. Additionally, the students most vulnerable to these changes were those who had limited access to stable internet or necessary digital equipment for distance learning ("Morocco: A case for building a stronger education system in the post Covid-19 era", n.d.).

Project Overview

Although researchers and universities have completed initial studies evaluating the impacts of COVID-19 on topics such as financial stress, mental health, student motivation, student-professor relationships, and online infrastructure, a gap in knowledge exists regarding the effect of these impacts on education and how institutions can use different solutions to aid students and professors. Through this project, we aimed to address this gap as it exists at L'Université Internationale de Rabat (UIR) which we show in Figure 1, a private university located in Rabat, Morocco.

Figure 1: *L'Université Internationale de Rabat (UIR), a Private University Located in Rabat, Morocco*

Note. This image showcases some of the beautiful buildings and landscaping of the UIR campus. Adapted from Wikimedia, by Université Internationale de Rabat, 2015, https://commons.wikimedia.org/wiki/File:B%C3%A2timent_UIR.jpg

The unexpected shift from face-to-face teaching to remote content delivery that distance learning mandated has deeply affected UIR. The lack of data on the impacts of COVID-19 at UIR provided an opportunity for our team to explore where UIR can make improvements to their remote learning infrastructure. The impacts of these unprecedented shifts in educational delivery may be long lasting considering the growing global movement of online components to education. This is important to our findings because of the emerging benefits of online learning and the possible future necessity or appeal of remote learning.

Our project goal was to develop recommendations for UIR to address the difficulties that the COVID-19 pandemic has created for remote learning and in turn, to improve the quality of education at the school. To achieve this, we established three objectives:

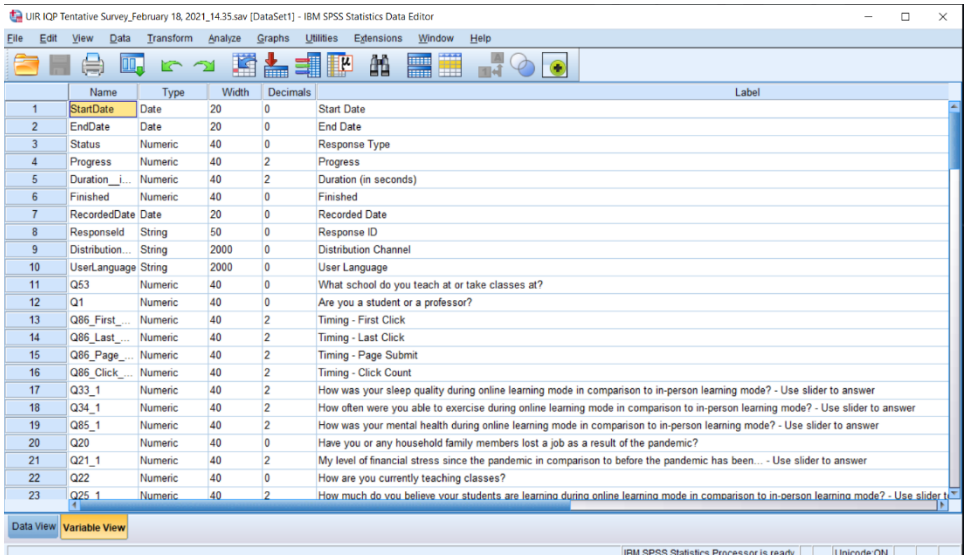
1. Collect information about the impacts of COVID-19 on education at UIR.
2. Analyze the impacts of COVID-19 on education at UIR through qualitative and statistical analysis.
3. Better understand WPI's continued remote education during the COVID-19 pandemic in order to construct recommendations for UIR.

Our first objective was to understand the impacts of the COVID-19 pandemic on education at UIR. We talked with our sponsor Dr. Oudani and the group of UIR students to help

refine the content areas for survey and interview questions. We administered a brief health survey with questions about energy, depression, anxiety, connections, and self-care. We also administered a general survey with questions for professors and questions for students about mental and physical wellbeing, financial impacts, motivation, relationships, integrity, and online learning infrastructure. We administered these surveys to understand the impacts of COVID-19 quantitatively on the UIR student and professor population. Additionally, we conducted interviews with UIR students, professors, and administrators. We obtained more in-depth information relating to the feelings and personal experiences of the UIR community during online education. These interviews were one-on-one and paired depth semi-structured interviews in which we asked open ended questions about the topics also referenced in the surveys. Semi-structured interviews refer to a format in which the interviewer asks structured questions in addition to nonprepared questions. Paired depth interviews refer to a type of interview where there is one interviewer and two interviewees, this style of interview allows peers to discuss responses to questions.

Our next objective was to analyze the data collected in objective one through qualitative and statistical analysis. For the qualitative data collected through interviews, we coded transcripts by themes and subthemes such as mental and physical health, financial impacts, course structure, online infrastructure, and student professor relationships. We used this information and analysis to identify key factors which were affecting students and faculty during this time. We analyzed the survey results though quantitative statistical analysis in collaboration with the UIR student group using SPSS software. See Figure 2 for a visual of the SPSS software. For context, SPSS is a statistical analysis software developed by IBM which was suggested to us by the UIR computer science team. Finally, working with the UIR student group, we created visuals to represent the findings of the interview and survey data analysis.

Figure 2: *Screenshot of SPSS Survey Questions Table*



Note. This image is a screenshot of the SPSS software which was used in combination with the UIR student group to analyze survey data and create graphs and tables. This specific screenshot shows the variable view which has all the questions and any other data recorded from the survey.

Our third objective was to gather information about how WPI developed its comprehensive plans for continuing education remotely during the COVID-19 pandemic. We used this information in addition to our findings from objective two to construct recommendations for UIR to improve its remote learning.

Sponsor – L'Université Internationale de Rabat (International University of Rabat)

We completed this project in collaboration with our sponsor Dr. Mustapha Oudani, an Assistant Professor of Mathematics and Operations Research, and a group of UIR computer science students. Dr. Oudani provided us an initial background on education in Morocco and helped us organize our findings and data analysis.

Project Deliverable

At the conclusion of our project, we provided a website consisting of a training workshop to aid UIR in the implementation of our recommendations. We compiled resources to train professors about how to accommodate technical or internet access issues. Additionally, the website covers how to organize online course structure and course expectations for students with a syllabus. There are resources on creating assessments in online learning environments as well. We adapted content created by Caitlin Keller and Valerie Smedile Rifkin from the WPI Morgan

Teaching and Learning Center for these resources. With this website and resources, UIR should organize a training program and hold department specific discussions so professors can plan online courses for specific curricula.

Findings

Online Infrastructures

Through our data collection process, we found that UIR professors and students lack the online tools, training, and infrastructure necessary to make remote education effective. Nearly 98% of students from our survey said they had internet access at home. However more than 54% of students reported poor internet connection interrupted their online classes at least once a class. We found that students and professors struggled with the logistics of online platforms and internet connection. We found that many professors expressed the need for better online training and resources to best teach their classes in an online format. Additionally, students noted the lack of communication from their professors. Although UIR worked to adjust to remote learning, the speed of the switch to online mode in one week also made it challenging.

Course Structure

Commonly in our interviews, students and professors alike cited a lack of student motivation and interaction when attending online courses. Through our survey data with 227 student responses, we found that 80.84% of students had much worse or worse motivation during online learning compared to during in-person learning, and 75.4% of the 227 student responses reported “much less” or “less” attention during online learning mode in comparison to in-person learning mode. During most of our interviews with students, many felt less motivated during remote learning for numerous reasons. Inconsistent online course structure hindered student learning as many professors did use a variety of online platforms, such as discussion boards, to engage classes. The lack of physical in-person interactions also negatively impacted the class dynamic, the interaction between professors and students as well as students and other students in a class. This change in class dynamic made student competition, which would have motivated students, less frequent. In an interview, one student explained: "I'm a pretty competitive person, like when I see a friend paying attention and starting to understand, well, I need to understand that too” (UIR Student, personal communication, February 21, 2021). We also found that students valued their interaction with other students to be equally important in creating a positive

learning environment online. While some students reported that they found support through close ties to family and UIR motivational emails, surveys showed that student motivation during online learning was impaired compared to in-person learning. Student motivation was also closely related to student-professor relationships.

We found that the switch to remote learning also affected student-professor relationships. Through our interviews with both students and faculty, we learned that UIR does not utilize any kind of learning management system campus wide. In addition, many students cited the lack of interactive material as a reason for decreased motivation to be attentive in class and expressed frustration with the lack of communication from professors regarding grades and class material over email. Although at the beginning of the pandemic professors had better rapport with students, increasing motivation and communication, the online course format eventually prevented professors from connecting with their students. It was hard for them to assess student reactions and body language, especially if students' cameras were off. Class interactions became more strained because of connectivity issues and lack of professor feedback. We heard practically every student and professor discuss their loss of focus and engagement during online lectures. We note that outside of the scope of education and this project, the additional psychological trauma of living through a pandemic may have also impacted a student or professor's focus during remote learning.

We found that more UIR students felt inclined to cheat during online learning as opposed to in-person learning. From our survey analysis of 185 student responses, ~43% of students responded that they felt more inclined to cheat in online classes, while only ~32% felt less inclined. We identified a strong correlation which explains this finding: students who felt less motivated during online learning were more inclined to cheat. A majority of the seven students we interviewed discussed that they were only focused on getting a good grade and did not care much for *what* they are learning, so there was more impulse to cheat during online assessments. Additionally, this lack of motivation is due in part to the lack of class structure and individual feedback from certain professors at UIR according to these same UIR students. In fact, from our survey data analysis, there was a strong correlation between inclination to cheat and student mental health. Students who responded that they felt that their mental health was worse during online learning mode felt more inclined to cheat. We discovered that cheating is very easy to do

during online assessments as there is little to no monitoring and cheating can make assessments less stressful.

Physical, Mental, and Financial Impacts of COVID-19

The mental health and physical wellbeing of both students and professors varied greatly. Some interviewees discussed loneliness and lack of motivation in their everyday lives, while others claimed to be happier spending more time with their families and by themselves. Additionally, some students found that the weekly motivational emails sent by UIR were encouraging and helped foster a sense of community during online learning. Our research from interviews also suggests that many students — even those who reported improvement in mental health over the course of online learning during the pandemic — sorely missed opportunities for interaction with other students both in and out of the classroom. They also reported a lack of work life balance and motivation for activities that they previously enjoyed. According to one UIR student, after remaining in their room for three months straight during the start of the pandemic, they admitted "it's better to actually... do something else than just lay in that bed" (UIR Student, personal communication, February 17, 2021). However, we found that everyone claimed to be stressed to some extent despite improvements in mental health. While both professors and students reported greater financial stress in surveys, they did not discuss financial stress as much during interviews. Everyone reported changes in sleeping, either gaining or losing it. Overall, the physical, mental, and financial impacts created stress for the UIR community.

Recommendations

Improve Online Infrastructures

We recommend that UIR adopt online education software to help address many of the challenges faced during both in-person and online learning. Systems such as Poll Everywhere or other discussion boards provide methods to easily maintain student participation in class, and adoption of an online learning management system would allow UIR professors to provide interactive, detailed course material with built in grading systems. We found that the English department did use Cambridge LMS which was an LMS specifically for English courses. However, we recommend that UIR adopt a learning management system for departments campus wide. Additionally, because internet connection may at times be unstable for students, professors should consider shorter recorded lectures and more asynchronous course activities.

Improve Online Course Structure

WPI implemented a program called FIOT (Faculty Institute for Online Teaching) from which we recommend UIR take inspiration to develop its own online training program. The online training should cover how to use the online tools used at UIR such as Microsoft Teams and other websites and learning management systems. We developed a website with resources to supplement this training workshop to aid UIR in the implementation of this recommendation.

The topics that the training workshop should cover, which we also provided resources for in our website, include how professors can accommodate technical or internet access issues, how to organize online course structure and course expectations for students with a syllabus, how to conduct a more interactive class using discussion forums, active and project-based learning, how to create assessments and give feedback, and how to support student mental health and relationships. Functionally, this training program should include discussion and activities throughout to allow professors to engage with each other about best practices for online teaching programs. Specifically, the last portion of the training workshop should be for specific departments to create a mentorship program to continue discussion of online course best practices beyond the scope of this training and website.

As mentioned in the training that we recommend, professors should engage students and limit the perceived necessity of cheating. UIR professors should strive to make the classroom a collective and welcoming learning environment. They can accomplish this by changing the class structure to modify the class dynamic. In an ideal class dynamic, the course can build an atmosphere of trust with a collective motivation from both groups to do their best. This can serve to improve communication between student and professor, and cheating may no longer be the easiest or most viable option for success. Professors can build trust in the classroom by dedicating a certain portion of the course to assessing the students' educational needs. They can create a safer, more encouraging atmosphere by getting to know students personally. Combatting cheating and improving online education through better student-professor relationships may require a significant cultural shift which will take time and effort from all parties to enact.

Our recommendation is that UIR professors consider project-based learning, as it provides an opportunity for student interaction as well as an obstacle for cheating. Because implementation of large-scale project-based learning can be challenging, we recommend UIR

start on a smaller scale such as assigning one small project in each course. These projects may be individual or group projects and should be created in the format of reports, visual posters or dioramas, presentations, research, or physical projects.

Support the UIR Community's Physical, Mental, and Financial Health

Based on our findings, we recommend that UIR's Student Life Department begin organizing online extracurricular activities to encourage students to maintain a healthy routine between schoolwork and other activities. UIR should implement a wide range of extracurricular online events to provide opportunities for socialization and student interaction outside of the classroom. Events such as movie nights, game nights, club activities, and non-academic seminars are all possible over online platforms such as Microsoft Teams. We find it important to note that such online activities are only possible with stable internet access for participants, which may present a limitation. In implementing this recommendation, UIR should consider this limitation regarding student equity, as investigation into internet access for the whole of UIR's student body is beyond the scope of this project.

We also recommend that the UIR Student Health Center distribute a weekly flier outlining tips to maintain a healthy work life balance and online study tips to support student wellness. Top-down communication methods such as email aliases are a practical way to disseminate these helpful reminders and weekly motivational messages to students to keep their work-life balance healthy. UIR students noted in interviews that they found this helpful, and we ourselves have benefited from the WPI equivalent.

Conclusions

According to our findings, UIR faced many challenges when they converted to remote learning. We have developed several recommendations to address these challenges, drawing upon WPI's plan for remote learning as well as our own experiences. We believe UIR should consider these recommendations to improve their online model of educational delivery for future use. Based on our findings, we recommended that UIR implement an online management system, provide online resource training for professors, utilize online platforms to improve student-professor communication, and support student wellness through online extracurricular activities and engaging class work. Along with our recommendations, we constructed a website

containing resources about best online teaching practices which UIR can use to supplement professor training in order to act on our recommendations.

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Introduction

The ongoing COVID-19 pandemic has impacted education all over the world. The forced school closures and distance-learning have significantly disrupted students and educators. Like many countries around the world, Morocco introduced strict regulations to contain the initial spread of the virus. Moroccan authorities placed a state of emergency which impacted Morocco's economy, employment, education, and quality of life ("Morocco: Stepping Up to the COVID-19 Pandemic Outbreak", n.d.). Many economies, such as that of Morocco, experienced losses due to the social distancing mandates and handling of health needs related to illness. Schools and universities closed for a period of three months, eventually transitioning to remote education to reduce the spread of COVID-19 ("Morocco: A case for building a stronger education system in the post Covid-19 era", n.d.). As a result, the ongoing pandemic negatively impacted the education quality, financial security, and mental health of students and professors all over Morocco. (Coronavirus Disease (COVID-19) - Events as They Happen, n.d.).

This shift to remote learning also affected educational institutions because of changes in delivery and communication of educational material. Additionally, students who had limited access to stable internet or necessary digital equipment for distance learning were most vulnerable to these changes ("Morocco: A case for building a stronger education system in the post Covid-19 era", n.d.). Early studies generally found that, besides lockdown and confinement, the ongoing COVID-19 pandemic situation has increased financial insecurity, boredom, isolation, and negative emotion (Idrissi et al., 2020). Although these studies were not carried out in Morocco, student experiences were similar in the country. The remote learning environments in Morocco have been unstable due to poor infrastructure and increasing financial stress (Average Cost of College, 2020.; Bureau, U.C., 2019). According to Goetz et al., during remote learning in general there is a need for a beneficial student-professor relationship because often, remote learning results in the loss of engaging group work and encouraging feedback (2021). The findings of these studies on various populations give insight into the challenges of remote education for students and professors in Morocco.

Although researchers and universities have completed initial studies, such as the ones mentioned above, evaluating the impacts of COVID-19 on topics such as financial stress, mental

health, student motivation, student-professor relationships, and online infrastructure, there is a gap in knowledge regarding the effect of these impacts on education and the solutions that could aid students and professors. Through this project, we aimed to address this gap in understanding as it exists at L'Université Internationale de Rabat (UIR), a private university in Rabat, Morocco. Distance learning mandated the unexpected shift from face-to-face teaching to remote content delivery, deeply affecting UIR. The lack of data on the impacts of COVID-19 on UIR provided an opportunity for our team to explore where UIR can make improvements for their remote learning infrastructure. The impacts of these unprecedented shifts in educational delivery may be long lasting. According to Pierre Gouëdard and Beatriz Pont, while distance-learning solutions may potentially cause temporary learning loss, "other elements that happen in the absence of traditional schooling, such as the curbing of educational aspirations or the disengagement from the school system, will have a long-term impact on students' outcomes" (2020). This is important to our findings because of the emerging benefits of online learning and the possible future necessity of remote learning.

The goal of this project was to provide recommendations to UIR to overcome the difficulties of distance learning caused by the COVID-19 pandemic and, in turn, to improve the quality of remote education. To support this goal, we developed 3 objectives: First, collect baseline information on the impacts of COVID-19 on education at UIR; second, analyze the impacts of COVID-19 on education at UIR through qualitative and statistical analysis of collected data; and finally, better understand WPI's continued remote education during the COVID-19 pandemic in order to construct recommendations for UIR. We assessed these multidimensional impacts of COVID-19 with research-based strategies to understand how the quality of remote learning at UIR and potentially other universities can be improved. In this report, we discuss the various impacts of distance learning, generally and at UIR, followed by our methodology in which we outline the objectives and analyses we developed to support our findings and recommendations. Furthermore, our team developed a website of online teaching resources for UIR professors to supplement our recommendations about effective online class delivery. Although the pandemic itself may not be permanent, there will likely be lasting effects on education, including education at UIR. The research and findings about recommendations for distance learning from this project may be applicable to such future situations in which educational institutions may choose or need to provide remote education.

Background

Introduction

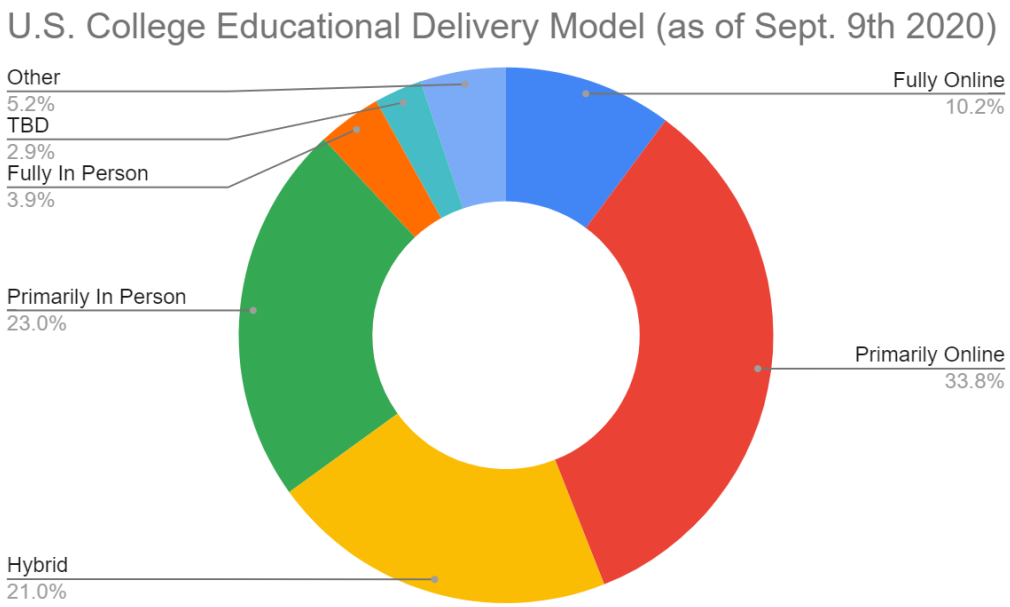
In this background we discuss the effects of COVID-19 on the world and Morocco as well as on education and more broadly. We discuss the effects of COVID-19 on education around the world, COVID-19 in Morocco, economic impacts of the pandemic, and COVID-19's impacts on mental health and sleep, remote learning motivation and attention, and the student professor relationship. In this chapter we also discuss the online infrastructure challenges. To provide context, we discuss the Moroccan education system structure and history and introduce our project sponsor, the International University of Rabat (UIR).

Effects of COVID-19 on Education Around the World

On a global scale, the COVID-19 pandemic and social distancing requirements limited the ability of universities to hold traditional in-person classes. Thus, educational institutions decreased class capacity or shifted classes to entirely virtual delivery. Higher education institutions faced the dilemma of attempting to maintain viability by allowing students to continue their education during the pandemic, while also ensuring that educational delivery methods were safe for students and faculty amid the pandemic. With the shift to remote learning, a main challenge was maintaining the quality of education when teaching in a non-standardized way. Different countries addressed this challenge in different ways.

The educational reform in response to COVID-19 differs by country, each having varying levels of success. As Figure 3 demonstrates, institutions of higher education in the United States generally adopted one of three methods of delivering an education to their students during the COVID-19 pandemic: fully remote, in-person, or hybrid. The hybrid model is a combination of in-person and remote classes. Globally, countries adopted different models.

Figure 3: *Educational Delivery Models at nearly 3000 U.S. Colleges*



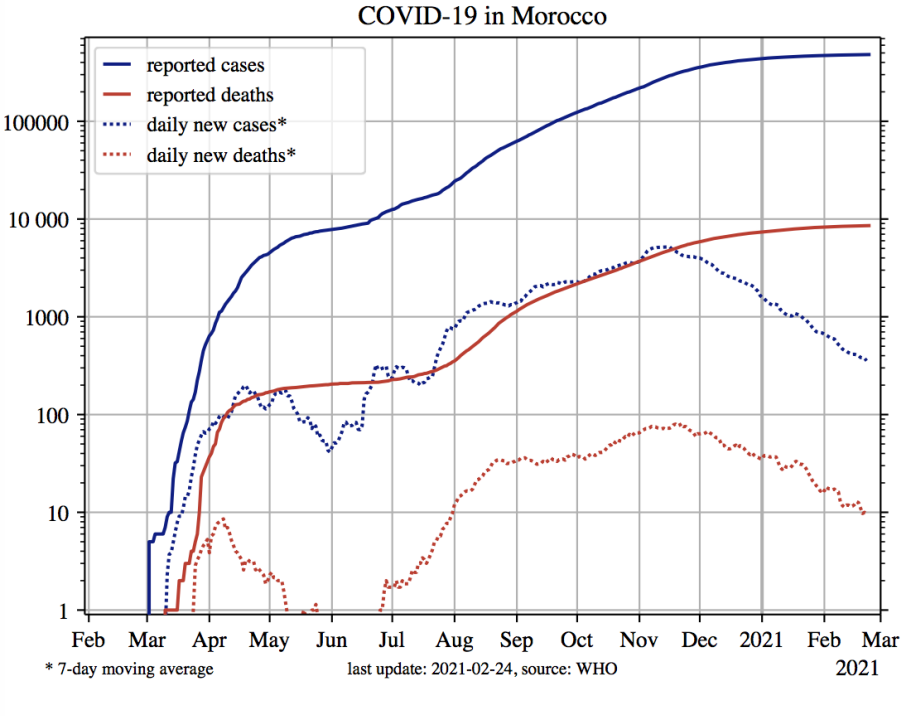
Note: This figure shows the percentages of colleges using different types of educational delivery models to adapt to the restrictions enforced because of the COVID-19 pandemic. Primarily online implies slightly more online than a hybrid format. Primarily in-person implies slightly more in-person than a hybrid format. Adapted from the C2i Dashboard, 2020, https://collegecrisis.shinyapps.io/dashboard/.

Extenuating circumstances of the COVID-19 pandemic have also impacted student life, learning, and experience. Researchers have conducted studies on students around the world experiencing the effects of COVID-19 on their education. One study, *The impact of COVID-19 on student experiences and expectations,* surveyed 1,500 students from Arizona State University in the United States on how COVID-19 affected their educational experience. COVID-19 severely altered student extracurricular learning and student graduation expectations. The survey found that 40% of the sampled students lost an internship, job opportunity, or job offer due to pandemic shutdowns (Aucejo et al, 2020). The American survey also found that 13% of students now expect to delay graduation, and lower income students were 55% more likely to have delayed graduation than high income students (Aucejo et al, 2020). While the American and Moroccan educational experiences are different, these studies helped us consider how to frame our own research with students at UIR.

COVID-19 in Morocco

Prior to discussing the transition to remote learning, it is important to review the pandemic itself and associated restrictions in Morocco that made this transition necessary. As Figure 4 demonstrates, Morocco recorded its first case of COVID-19 on March 1st, 2020. With the spread of COVID-19 into Morocco came numerable challenges for the country's government and people. Much like other countries worldwide, the Moroccan government faced the tasks of limiting the spread of COVID-19, spreading awareness, convincing the public to abide by government mandates in order to control the pandemic, and limiting the economic impacts of the pandemic on the country and individual households (Ait Addi et al., 2020).

Figure 4: *COVID-19 Cases and Deaths in Morocco from March 2020 to March 2021.*



Note: This figure shows the deaths and cases of COVID-19 in Morocco. Adapted from Wikimedia, by User Hbf878, 2020, https://commons.wikimedia.org/wiki/File:COVID-19-Morocco-log.svg.

The Moroccan government implemented a state of emergency on March 20th, 2020, suspending public events, controlling the movement of people within cities, and suspending international and inner-city travel. These measures limited the spread of the virus and reduce stress on the Moroccan health system which is restricted by low government spending and

subsequent limited hospital capacity per capita (Morocco, n.d.). According to the U.S. Embassy in Morocco, on February 16th the Government of Morocco extended the "Health State of Emergency" until March 10th and a curfew remained in place nationwide between 9:00 PM and 6:00 AM until at least March 16, 2021 (*COVID-19 Information*, 2020). In addition to these curfews, many cites prohibited in-person schooling. Prior to and during these restrictions, Morocco experienced a continuous increase in cases since the first case was reported in the country and, at the time this report was finalized, was still facing many challenges related to the pandemic, including those related to education. These nationwide changes and challenges deeply several aspects of Moroccan Society.

Economic Impacts of COVID-19

COVID-19 has impacted lives in many ways. Some of these areas of impact relate to students and education, family and financial challenges, mental health and sleep, the student-professor relationship, and online learning infrastructures. The economic impacts of the COVID-19 pandemic had negative effects across the globe. With the pandemic still ongoing at the time of this report, conclusions about the overall effect on national economies are not yet clear. However, researchers made predictions about the impacts based on historical comparisons and economic trends. Many economies, such as that of Morocco and the United States, have experienced losses due to social distancing mandates as well as the handling of health needs related to illness. The closures of many businesses are expected to negatively impact national economies, which will likely cause an increase in poverty and unemployment rates (Martin, Markhvida, Hallegatte, Walsh, 2020). The pandemic impacted global trade because many counties focused inwards and began to compete for scarce supplies required to contain the pandemic (Ibn-Mohammed et al., 2021). *The Morocco Economic Monitor*, a report from the World Bank economic team, predicts that the Moroccan economy will experience a severe recession for the first time since 1995. In 2020, Morocco's real GDP was predicted to contract by 4%, and it contracted to 6.3%. 66 % of workers lost their jobs in the informal sector, and 19% of households reported income loss. (*Morocco's Economic Prospects and the COVID-19 Crisis Impact*, 2020). The government of Morocco implemented measures to help alleviate some of the impacts. A COVID-19 commission helped to monitor the situation and develop policies, and a COVID-19 strategic investment fund assisted with the incomes of workers and supports

economic recovery. There has not yet been enough information to assess how or whether this fund has ultimately helped overcome these economic impacts.

The broad economic impacts described above have trickled down to impact individual families too. According to a study done on Canadian families with young children, financial insecurity resulting from the pandemic is a key contribution to family stress (Carroll et al., 2020). According to Karpman, Zuckerman, Gonzalez, and Kenney, data from the *Uniform Institute's Health Reform Monitoring Survey* which surveyed nonelderly adults between March 25th and April 10th, 2020 in the U.S. showed that more than 4 out of 10 nonelderly adults stated that family members have lost jobs, hours at work, and income from work due to the pandemic (2020). Many families have had to put off large purchases and reduce spending on food, with almost one-third of adults stating they were unable to pay bills in the month preceding the time of the survey's data collection (Karpman, Zuckerman, Gonzalez, Kenney, 2020). Although this data comes from North American countries, we can infer from it that Moroccan families are facing similar financial challenges since the economic impacts of COVID-19 are being felt globally. According to one of our project advisors, Mohammed El Hamzaoui, paying for a private education in Morocco at a university like UIR is typically a large financial undertaking by the parents of the students. The unforeseen financial stresses that many Moroccan families are likely facing may also impact the educational experiences of UIR students and faculty within those families. Along with financial stress, Moroccan education has also seen impacts following the emergence of the COVID-19 pandemic.

COVID-19's Impact on Moroccan Education

According to our sponsor, Dr. Oudani, universities in Morocco shifted to remote education when lockdown was instated in late March 2020 and lasted through the end of the school year. By late August 2020, Moroccan public universities planned to open in mid-October with a hybrid model, according to a statement given by Morocco's Ministry of National Education and Vocational Training of Higher Education and Scientific Research (Ministry Floats Hybrid Model for Upcoming Academic Year, 2020). COVID-19 cases peaked again in November 2020, and many universities adopted different methods of educational delivery. Yet, the status of Moroccan universities' education plans during the pandemic remains in flux as they adapt to shifting trends in cases. COVID-19's effect on education may have also effected

students' ability to complete project work, a crucial piece of a student's undergraduate experience especially in Morocco. In fact, our project advisors El Hamzaoui and Moody (2020) explained that "typically, STEM and vocational schools in Morocco require a capstone project (projets de fin d'études); this can be an individual or group project related to these students' field of study or career." In our research, we clarified how the pandemic shutdown affected these opportunities in addition to other areas such as mental health and sleep.

Mental Health and Sleep

Mental health and sleep can impact education by affecting student and professor performance, wellbeing, and self-perception. The pandemic and associated stay-at-home orders greatly impacted the mental health quality and sleep quality of students (Azizi et al., 2020). One way of measuring these factors is by studying the Health-Related Quality of Life: impacts on mobility, self-care, typical activities, pain and discomfort, and anxiety and depression (Azizi et al., 2020). A study done on a wide demographic of Moroccans analyzed the effects of COVID-19 on quality of life by comparing 537 participants during lockdown to 484 participants from a previous study done prior to the lockdowns associated with COVID-19 (Azizi et al., 2020). This study found that during confinement, participants had lower scores of Health-Related Quality of Life (Azizi et al., 2020). The pandemic situation has also increased factors such as boredom, isolation, and negative emotion (Idrissi et al., 2020). A separate study conducted on the Moroccan population using a cross-sectional survey found an increase in the prevalence of sleep disturbances in correlation with an increase in prevalence of these factors. In fact, this study found that 56% of participants exhibited insomnia, 9.9% exhibited daytime sleepiness, 29.5% had anxiety, and 35.6% reported depressive symptoms due to COVID-19. The study recommended that people who developed such conditions as a result of the pandemic seek psychiatric support for these conditions (Idrissi et al., 2020).

Furthermore, within our project, we acknowledge the impact of the mental health of professors on the mental health of students in relation to education quality. A cross sectional study conducted in England and Wales found an association between better professor wellbeing and better student wellbeing which can be explained by quality professor student relationships (Harding et al., 2019). This emphasizes a critical point in our project which is the importance of considering the mental health and wellbeing of professors in addition to students themselves

when examining the overall effects of mental health on education. These studies make evident the fact that the confinement or lockdown environment of the COVID-19 pandemic has had several impacts on the quality of everyday life and mental health of the Moroccan population and that the mental health of students and professors alike negatively impact general education. These are far from the only impacts.

Student Remote Learning Motivation and Attention

In addition to the effects of mental health and sleep during remote learning on education, the remote learning environment can have adverse effects on student attention and motivation to complete work. The Self Determination Theory (SDT), developed by Edward L. Deci and Richard M. Ryan, acts as a baseline theory for predicting student educational success in virtual classrooms (*Self-Determination and Intrinsic Motivation in Human Behavior,* 2020*).* This theory addresses two types of motivation: external and internal motivation. *External* motivation refers to the motivation one feels when they do something for a reward or to avoid a punishment. *Internal* motivation is characterized by the drive one feels when they are personally invested or excited to do something. Both internal and external motivation are important for engagement and quality education no matter the educational setting (Salikhova N., Lynch M., Salikhova A., 2020). However, internal motivation is attributed to motivation quality under the SDT and therefore should be taught or encouraged by educators. To raise internal motivation in students, SDT states that the three basic psychological needs - autonomy, competence, and relatedness - must be present (Fraguela-Vale et al, 2020), autonomy referring to the feeling of control over one's own actions and goals. In an educational setting this is the feeling of control over learning topics and outcomes. Competence refers to the feeling of learning and mastery of a topic. In education, whether in-person or online, students need to feel as though they are learning the topics presented to them. Finally, relatedness refers to some type of connection or attachment, such as the sense that students need to have some personal connection to the material they are learning (CSDT, 2020), which can become difficult during online learning due to the pandemic situation.

Furthermore, the sudden shift to remote learning impacted interactions between students and their peers, limiting engagement in virtual classrooms. In the journal *Telematics and Informatics*, Fang, Tang, Yang, and Peng studied students' psychological needs as they relate to

the educational experience in 318 Massive Open Online Courses, or MOOCs, an online university course open to upwards of hundreds of students (2019). This study concluded that in courses where students felt more of their basic psychological needs were satisfied, attention and investment in the course rose. Categorizing social interactions as learner-to-learner, learner-to-instructor, and learner-to-content, the authors demonstrated that social interaction played a large role in study satisfaction, and that when students experienced success within these three areas, they had greater aptitude with the educational content (Fang, Tang, Yang, Peng, 2019). This is crucial for our team to remember prior to our data analysis. In a related study, conclusions from a journal article in *Computers and Education* suggested that occasional quizzes during an online course could increase student engagement in virtual classrooms (Raes et al., 2020). However, such quizzes or other online activities do not guarantee student participation, as students may already feel less comfortable in online settings. Finally, in a 2020 study related to this point, researches administered a national survey to Moroccan university students and professors assessing their satisfaction of distance learning (Benkaraache, et al., 2020). Out of the 200 professors who responded, 65.5% were satisfied with their distance teaching during the lockdown. Out of the 1340 students who responded, only 20.6% were satisfied with distance learning. Additionally, only 10% of all students answered that they had successfully adapted to distance learning (Benkaraache, et al., 2020). Each one of the studies we discussed previously helps demonstrate the challenges in engaging online learners and can therefore be translated to UIR's situation during the pandemic. As we will later explain in our analysis, due to the lack of in-person learning as a result of COVID-19, it is critical for UIR to provide sufficient resources to support student social interactions in order to ensure overall student motivation and engagement in courses taught online. In our methodology we will explain how we can use these conclusions and concepts to interpret UIR's online learning situation in relation to student motivation and investment as well as the student-professor relationship.

The Student-Professor Relationship

A necessary aspect of a student's educational experience is the student-professor relationship. To our knowledge, there has been no formal evaluation of the student-professor relationship at UIR; however, our sponsor reports that student-professor relationships that predate the pandemic have prevented students from engaging their professors about course expectations, which is not uncommon in virtual classrooms as we discuss in this section. Since

there was a significant gap in literature of research completed during the pandemic, we used the variety of scholarly work done on Morocco on this topic predating the pandemic during our research.

One study, "Getting along and feeling good: Reciprocal associations between student-teacher relationship quality and student's emotions," found that student emotions more greatly affect academic achievement than the student-professor relationship quality (Goetz et al., 2021). This highlights that there are several other aspects of a learning environment that can influence the achievement emotions: the emotions related to achievement activities and outcomes such as enjoyment, pride, shame, relaxation, boredom, and anxiety (Goetz et al., 2021). According to the authors, instructors can supplement poor relationship quality between students and professors by encouraging feedback, engaging group work, and providing more engaging material and tasks (Goetz et al., 2021). Even through an online learning environment where remote communication may be less evident than in-person communication, the student-professor relationship remains important in supporting student emotions towards achievement. However, according to a 2014 regional case study at the Hassan II Mohammedia-Casablanca University, developing meaningful learning strategies has always been a challenge to both students and educators (Bouroumi & Fajr, 2014). These scholars found that collaborative and cooperative learning through online platforms such as Moodle (a free, open source, publicly available content management system), discussion forums, and real-time text-based online chats can increase interactions between students and be more effective than traditional approaches in encouraging clear communication. Furthermore, these have also shown a significant increase in student engagement, writing, global communication abilities, and even self-esteem. This study demonstrates that where students show an in communicating and sharing information among online peers, they are encouraged to acquire new knowledge through collaboration (Bouroumi & Fajr, 2014). When utilized effectively, the online forum of education that has taken shape because of the COVID-19 pandemic could potentially create a positive and encouraging learning environment where communication becomes more accessible.

Still, despite the promises and advantages to distance learning, problems persist. These problems were present prior to COVID-19 and are therefore amplified due to the pandemic. Quality of instruction, misuse of technology, and attitudes of students, professors, and

administrators are factors which can impact the overall quality of distance education (Valentine, 2002). Additionally, the context of remote learning during a pandemic will certainly introduce new and perhaps more intense problems. While online learning forums can encourage participation for students, much of the quality "depends on the attitude of the administration and the instructor," as a 1999 study by Elliot Inman and Michael Kerwin showed that certain professors believed technology would improve the quality of their class (Valentine, 2002). However, the study demonstrated that technology does not teach students, effective teachers who have facility with the technology do. This study remains relevant in assessing how professors' conflicting attitudes towards technology could affect classes, especially during a pandemic, from effectively engaging students, such as those at UIR. Additionally, while online discussion forums may encourage collaboration between students, these can only be utilized to their full potential if professors are well-informed and trained in online learning technology (Greenberg, 1998). One clear problem is that a professor's attitude towards teaching in a distance-learning environment can impact the efficacy of distance education as well (Valentine, 2002). Furthermore, a professor's mental health and attitude towards teaching during a pandemic can create additional difficulties for students in Morocco and around the world who were forced to shift to remote learning. Collaborative learning aids students in achieving deeper levels of knowledge, but it is up to the professor to be aware of this in the distance learning environment to effectively encourage collaborative learning and community among students everywhere (Palloff & Pratt, 2000). These studies demonstrate the complex yet important dynamics of student-professor relationships.

Creating these effective remote learning environments may come with additional costs for educational institutions. In 2016, public spending on education in Morocco reached 23.6% of the budget and 4.7% of GDP, making Morocco among the countries with "the highest relative educational spending, but this has not translated into positive outcomes especially in student achievement" (Chroqui, Saoudi, Okar, 2019). However, according to PhD students Chroqui, Saoudi, and Okar from L'Université Hassan 1er in Settat, Morocco, though the term 'student achievement' has been used interchangeably with 'academic achievement' or 'academic success', 'student achievement' should "be defined as the knowledge attained *in relation* to the national curriculum, as well as how students can reapply this knowledge in the context of school" (2019). In certain countries, especially English-speaking industrialized countries,

"reforms focus mainly on curricula, school accountability, governance, market forces, and the status of teachers" (Hopkins & Levin, 2000). However, according to this study, for these reforms to significantly improve the status of Morocco's overall educational success, it is imperative that they first address *the classroom* as a priority, or the interactions between students, teachers, and the content taught — known as "the instructional triangle" (Chroqui, Saoudi, Okar, 2019). Improving classroom environments such that students perceive them as safe and transparent is among the many factors which could significantly improve the condition of students, their achievements, and even the country's economic success especially during this pandemic where Morocco's GDP has already contracted. Since student achievement is directly related to economic growth due to access to attainable jobs, according to Chroqui, Saoudi, and Okar (2019), it is urgent that Moroccan universities' online learning environments be improved by research studies, such as our own, assessing student-professor relationships within universities like those at UIR.

Online Learning Infrastructures

Another area vulnerable to the stresses of a remote learning situation is infrastructure and access to the technical tools required to efficiently conduct education online. In fact, research on the digital transformation in Morocco found that the digital infrastructure is a major obstacle for networks in African and Arab countries (Nachit & Belhcen, 2020). Furthermore, the transition to distance activity due to the COVID-19 pandemic further emphasized the priority digital technology adoption must take for higher education institutions (Nachit & Belhcen, 2020). Another study done on internet connectivity in African universities stressed the importance of African universities recognizing the problem with bandwidth management, as this hinders the satisfaction of students and faculty (Echezona & Ugwuany, 2010). In preliminary research, our team got the impression that Morocco was not prepared for this situation. Our project advisors, Moody and El Hamzaoui, noted that stable internet access through residential Wi-Fi is uncommon in Morocco. They further shared that the most common method of obtaining internet access is to use mobile networks with a SIM card and data plan. Pointing us towards understanding Morocco's internet infrastructure in this way, a study conducted at the University of Hassan II in 2016 reinforced our advisors' conclusions. As part of an effort to determine students' perception of the usage of mobile learning, researchers at the university conducted a survey to find out how many students had access to a mobile device, and of these students, what

type of devices they owned. They found that while 98.8% of students reported having a mobile device, a full 80% of students surveyed reported that their phone was the only mobile device they owned (Zidoun et al., 2016). The Nachit and Belhcen study on the digital transformation in Morocco also notes that households in Morocco often prefer smartphones rather than computers (Nachit & Belhcen, 2020). While smart phones can run many platforms such as Canvas or Microsoft Teams, these are often at reduced functionality, putting the student at a disadvantage. In the same way, phones are limited in their ability to run word processors such as Word or Google Drive, never mind their difficulty to engage in scholarly work. These limitations may not be exceptionally harmful under normal circumstances where students have access to school resources such as computer labs, but in a forced online-learning environment, such as the one put in place at UIR during lockdown, they can be crippling.

At UIR specifically, as we learned from the computer science student group with whom we are collaborating, Microsoft Teams is the main online tool used to take and teach classes as well as where assessments are administered typically through multiple choice questions (UIR Student Group, personal communication, February 2021). Additionally, Microsoft Stream allows professors to record and upload lectures for students to watch asynchronously, however the student group reports that such recordings are deleted from the platform after a week (UIR Student Group, personal communication, February 2021). An additional, newer project at UIR is 'UIR 4.0': a project that would allow some programs to be fully online to expand student access to UIR education. According to our sponsor Dr. Oudani, specific degree programs, such as computer science, could go online first since these are more adaptable to studying online. Although this project is for the future and UIR does not yet have a clear vision for its implementation, the program could encourage African students, and eventually global students, to take classes at UIR remotely. We used this context to understand how UIR utilizes technology during remote learning.

Beyond the technology required to learn remotely, proper student and instructor training is of great significance. Again, in our preliminary research conversations with our project sponsor Dr. Oudani, we learned that an area in which UIR is still struggling to adapt to online learning is the training of its students and staff with online learning platforms. Because of the abrupt nature of the switch to online learning, many staff and students have not received training,

or have received minimal training to familiarize themselves with platforms such as Microsoft Teams. This lack of training is proving to be problematic, as professors are struggling to utilize the technology to present classes and homework, and students are struggling to get the best out of the technology available to them. The long-standing internet access challenges that impact Moroccan education are just one example of why education in Morocco is unique.

Morocco's System of Education

Hayat Diyen explains in the article, "Reform of secondary education in Morocco: Challenges and Prospects", that Moroccan education is structurally different from that of the United States (Diyen, 2004). Morocco's education system is split into preprimary, primary, and secondary education (Bouderga, 2015). Students can then either attend a general secondary school or a technical secondary school. Students who attend a general secondary school receive a *Baccalauréat* diploma, and those who attend a technical secondary school receive a *Baccalauréat Technique* diploma. Obtaining a *Baccalauréat* is important, as it is required to be admitted to public higher education in Morocco (Diyen, 2004). Having completed secondary education around the age of eighteen, students may apply to a vocational school or a university. Students choose a field of study at the university level based on what they studied during secondary school. Some schools, like engineering and business schools, also require a competitive exam to be eligible for admission (Diyen, 2004). In addition to this structure of Moroccan education, the history of Morocco also impacted education specifically relating to language.

Morocco's post-independence school system was structurally the heir of French Protectorate schooling. French Protectorate schooling is considered divisive along linguistic, racial, and economical lines as French administrations instituted an ethnically and economically segregated school system in colonial Morocco driven by a desire "to cultivate elite collaboration while harnessing the economic utility of the nonelite" (Decker, 2010). Because of this, post-independence Moroccans have had difficulties uniting under a common language. By the late 1960s, primary school was taught fully in standard academic Arabic (Fus'ha) while prestigious technical classes in middle and high school, such as science and math, were taught in French. According to Rachel Berets, in 1983 however, the government changed the language of instruction so that all classes be taught in standard academic Arabic (2020). But while students in

sixth grade and above were being taught Arabic in all classes, technical classes in universities remained in French, “causing problems for students who had studied in Arabic their entire lives” (Berets, 2020). Additionally, Beret explains that, in 2020, the Government of Morocco announced that all teachers must switch to French instruction, under “the incorrect assumption that all teachers are already capable of teaching in French and that all students are ready to learn in French” (2020). Later, students must also learn English for job opportunities in the increasing anglophone job market (Boutieri, 2016). In the context of Morocco’s complex language diversity, the country’s educational system points to the need for the development of an educational model which can acknowledge language complexities in order to limit the difficulties Moroccan citizens face in obtaining a quality education from a public or private university (Boutieri, 2016). These structural and linguistic contexts are additionally important in understanding the Moroccan university education at the International University of Rabat as a university with various international partnerships.

The International University of Rabat

Collaboration with various strategic national and international partnerships is a defining characteristic of the International University of Rabat (UIR), a private university founded in 2010 located in Rabat, Morocco. Since its opening, UIR has been working to develop an innovative form of higher education and research for Moroccan and, more broadly, African youth (“President’s Message”, n.d.). With “more than 340 patents at the national level, around 60 at the international level, and dozens of technology transfers to the market” (Haimou, 2020), UIR is recognized today as a national and African leader in innovation. The university consists of five colleges: Management; Political, Social Sciences and Law; Engineering and Architecture; Health Sciences, and Doctoral Studies (UIR Student Group, personal communication, February 2021). It claims to emphasize research and innovation, as well as give an international dimension to improve the quality of education and unite multilingual populations around the world, a strategy which also informs its thinking about online education ("President’s Message,” n.d.). An example of one of UIR’s international partnerships includes the partnership with WPI on WPI’s interdisciplinary qualifying projects (IQP), this very project. The sponsor for this project is Dr. Mustapha Oudani, a professor and researcher in the computer science department at UIR. Additionally, a student group consisting of UIR computer science students collaborated with us alongside Dr. Mustapha Oudani in collecting and analyzing data vital to the goal of the project.

In order to understand the data gathered when working alongside UIR students and professors, our team assessed the current understanding of the multidimensional impacts of COVID-19 on students in Morocco.

Conclusion

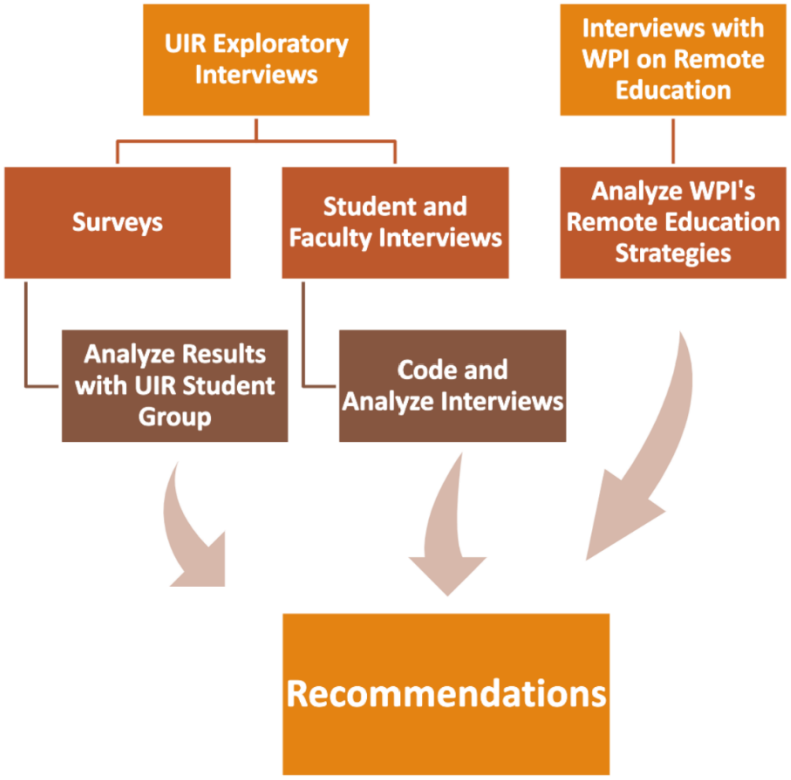
Our background research highlighted the shift in Morocco's education system and day-to-day life caused by the COVID-19 pandemic. At the International University of Rabat, the pandemic and lockdowns are creating financial challenges, mental health and sleep problems, diminishing educational quality, and impacting the student-professor relationship, while struggling under the burden of an insufficient online education infrastructure. Although discussion of these topics reemphasizes their impacts broadly on education in general, we tested and evaluated the effects of the changes at UIR specifically. By understanding the extent and scope of the situation, we can evaluate and analyze the impacts to help create recommendations for change and adaption. We describe our approach to this project in the following methodology chapter.

Methodology

The goal of this project was to provide recommendations to UIR to address COVID-19's effects on distance learning and to improve the quality of remote education at the school. Since we completed this project during a time when travel was restricted due to COVID-19, we conducted all research and project work completely remotely. We hope that UIR and institutions like it can draw on our research and analysis to plan for using remote learning in the future. Wider benefits of our work include opening the possibility of online education as a favorable alternative to in-person education in some cases.

We developed three objectives to accomplish this goal. Through our first objective, we collected information on the impacts of COVID-19 on education at UIR. Objective two was to qualitatively and statistically analyze COVID-19's impacts on education at UIR in collaboration with a group of UIR computer science students. Through objective three, we understood how WPI continued remote education during the COVID-19 pandemic in order to construct recommendations for UIR. Please see Appendix L for our timeline for completing these objectives. We structured our research and data collection around these objectives; we used that data to outline strategic recommendations for UIR to overcome the difficulties of distance learning. We display a process diagram outlining these objectives and their associated methods in Figure 5.

Figure 5: *Visual Representation of Methodology*



Note: This figure provides a visual of the methodology we used for our project. The process diagram outlines the three objectives shown in different colors as well as the methods involved.

Objective One - Collect Information on the Impacts of COVID-19 on Education at UIR

We split the collection of information on the impacts of COVID-19 into four methodological steps: exploratory interviews, designing surveys, administering surveys, and collecting qualitative data through traditional one-on-one semi-structured interviews and paired depth interviews with students and faculty.

1. Exploratory Interviews

As we began our research on UIR-specific impacts of COVID-19 on education, we conducted several semi-structured informal exploratory interviews with UIR faculty and students. For these discussion-based interviews, we came prepared with several open-ended questions to ask at the beginning of the interview and let the answers determine what follow up questions we asked. We conducted these interviews to help us refine the content areas we wanted

to ask questions about in following interviews and our surveys. We gained insight into UIR related to student experience, demographics, and other general university information. We used this information to frame our surveys in a way that made them understandable, applicable, and appropriate for the data we wanted to collect. To understand the student perspective, we interviewed the UIR student group whom we introduced in the Background. We also interviewed our sponsor, Dr. Oudani, for a faculty member's perspective. We refined the content of our surveys using the information we gathered through these interviews and our background research.

In addition to our exploratory interviews, we engaged in open unstructured communication such as Slack messaging and emailing with the UIR student group. The UIR student group helped us understand the context of Morocco during this pandemic so that our questions were relevant to the UIR community. The UIR student group also helped with terminology nuances which arose throughout the course of our research. These nuances related to language fusions between French and Darija (Moroccan Arabic) as well as pandemic terminology. Furthermore, since we could not travel to Morocco, we talked frequently with our cultural partners. Our cultural partners were native Moroccan university students from Casablanca, and they helped us gain a better understanding of Moroccan culture.

2. Design Surveys

We first designed a survey to collect data on the social and psychological climate at UIR, internet infrastructure at participants' homes, and financial stress due to the pandemic. We split the survey questions into several different topic areas: well-being, financial impacts, online teaching/learning and motivation, student/professor relationship, schoolwork integrity, online learning infrastructures, school year, and mental health. Within a single survey we developed two survey paths, one for professors and one for students, so participants got questions tailored to their designation. We used closed-end questions that could be answered on a rating scale or yes or no questions, as well as multiple answer questions when we wanted to offer more than one option for the respondent. Importantly, we were judicious in the framing of questions to assess the social and psychological climate at UIR since the "perception of the expectations of interviewers or the sponsor may influence answers" (Dillman et al., 2014). We wanted to ensure that interview subject, particularly if they were students, felt comfortable sharing information

about their schooling and personal lives with us. We sought to encourage this comfort by making it clear that we were in no way connected to their professors, and that their responses would remain anonymous. The questions of this survey are in Appendix E. We administered this survey along with a written consent form, shown in Appendix A.

During the creation of our additional health-specific survey, we referenced a standard health survey model to increase the validity of our measurements: the EQ-5D-5L health status survey. The EQ-5D-5L is a type of health status measurement that is part of the EQ-5D family of surveys used to quantify participant health (Herdman et al., 2011). The EQ-5D is available in over 130 languages, can be taken through multiple mediums, and has been recommended for use by many Health Technology Assessment Bodies (*EQ-5D*, 2020). The *EQ-5D* website homepage (2020) described the EQ-5D-5L as follows:

> The descriptive system comprises five dimensions: mobility, self-care, usual activities, pain/discomfort and anxiety/depression. Each dimension has 5 levels: no problems, slight problems, moderate problems, severe problems and extreme problems. The patient was asked to indicate his/her health state by ticking the box next to the most appropriate statement in each of the five dimensions. This decision results in a 1-digit number that expresses the level selected for that dimension. The digits for the five dimensions can be combined into a 5-digit number that describes the patient's health state. (para. 2)

The EQ-5D tool has demonstrated usefulness in studies like ours. A 2020 study conducted to analyze the effects of COVID-19 on people living in Morocco used this health status measure in an online survey to collect data on the health of a Moroccan sample (Azizi et al., 2020). Azizi et al drew conclusions about the mental health impacts of the pandemic on the participants using the data collected from this survey along with health-related data collected before the start of the pandemic (2020). This study was like ours in that it was based on a Moroccan sample and concerned the effects of COVID-19. Therefore, Aziz's et al use of EQ-5D-5L led us to believe this would be a good data collection tool for our research. The versatility and streamlined data collection of this survey type also made the EQ-5D-5L an ideal survey for our project. The ability to get easily quantifiable health data from this form of survey would be incredibly helpful for the analysis portion of our project. We could utilize the numerical results

from these surveys to make conclusions about the health of UIR students and faculty. Please see Appendix D for an example EQ-5D-5L survey served as a model for our survey protocol.

Although we initially wanted to use the EQ-5D-5L, we ended up going an alternate route and designed our own health survey that structurally reflected the EQ-5D-5L but asked different questions. We attached this health survey in Appendix F. We went this route for two reasons: we attempted to gain access to the EQ-5D-5L survey and were unable to attain it early enough to implement it as a data collection tool for our project, and we found that there were other areas pertaining to participant health that we wanted to ask about that were not included in the EQ-5D-5L. We therefore designed a seven-question health survey that was better suited to collect data pertinent to our project than the EQ-5D-5L that could be distributed as soon as we completed it.

We refined our questions based on trial runs of draft surveys, in which we asked our peers and members of the UIR student group to take the survey and provide feedback to us about any confusing questions, biases, or areas for improvement. Limitations to these survey questions included our team's inability to generate a valid sample due to challenges getting survey participants especially in the remote research environment. There are also limitations concerning question-framing which may have prevented our team from receiving genuine information. Additionally, offering a 'prefer not to answer' option limited our data for certain questions.

3. Administer Surveys

The goal for the surveys was to create a statistically significant population-level census-style survey that we could send to the whole student body and faculty. We aimed to develop these surveys such that the results would be representative of the UIR student body and faculty respectively. Our team acknowledged potential survey errors, such as nonresponse, sampling, or measurement errors. A disproportionately small number of UIR student and faculty responses to the survey may lead to sampling errors. Don Dillman, a PhD researcher at Washington State University, states that nonresponse errors are situations in which "those who do not respond are different from those who do respond in a way that influences the estimate" (Dillman et al., 2014). Nonresponse errors may have been present in our research if the student sample size was not large enough, resulting in biased estimates. We were careful to design clear questions and test them, structuring our surveys to be effective in collecting the data that we needed to investigate the impacts of the COVID-19 pandemic on education at UIR.

These surveys were snowball surveys aimed at collecting data from as many participants as possible, with a goal of 360 student participants and 20 faculty participants for each survey. To identify these participation goals, we used a built-in calculator on Qualtrics, an online survey tool. This calculator accounted for confidence level, population size, and margin of error to determine a statistically significant sample (*Sample Size Calculator (Use in 60 Seconds) // Qualtrics*, 2020). We received 241 responses to the first survey (14 of these responses were professors and 227 of these responses were students) and 103 responses to the health survey (4 responses were professors, 96 were students, and 3 did not identify as a student or professor). Although this was less than our goal numbers of respondents, our team spoke with our sponsor and agreed it would be sufficient for making conclusions about the UIR student and faculty populations. If we had not gotten enough responses, we would have had to determine an alternative sample, such as administering the survey through a UIR Facebook group which includes UIR students. We identified target UIR student population and used standard survey sampling techniques during analysis in drawing inferences about the population.

During the administration of our two surveys, due to difficulties finishing the design of the health survey, we chose to administer the Qualtrics general survey one week prior to the Qualtrics health survey. We offered these surveys in both English and French to make them more accessible and understandable for the UIR students and faculty. To incentivize survey participation, we advertised them as potentially helpful in improving remote learning at UIR which would in turn benefit the participants. Please see Appendix G for the infographic we created with the platform Canva to offer a more visually pleasing participation invitation. Additionally, we asked the UIR student group to encourage their peers to complete the survey, spreading it online around the campus. We applied the idea of social exchange, the concept that "people are more likely to comply with a request from someone else if they believe and trust that the rewards for complying with that request will eventually exceed the costs of complying" (Dillman et al., 2014). We expected that students and faculty at UIR would be more likely to comply with our request to respond to these questions if they believed that our recommendations would be meaningful. Furthermore, we thought about multiple aspects of how a request from American university students would be viewed, and "what features of that request, which may be communicated in different ways over time, influence whether a questionnaire is completed and

returned" (Dillman et al., 2014). These considerations were key to our process of social exchange.

4. Conduct General Interviews

We aimed to conduct 6-10 interviews with UIR students and 6-10 interviews with UIR faculty. Our sponsor expressed confidence in our ability to interview this number of participants within the timeline of this project. We found this step to be the most logistically challenging of the project, as the physical distance and time zone difference added layers of complexity when conducting research remotely due to COVID-19. Despite this challenge, we conducted a total of 7 student interviews and 7 faculty interviews. Dr. Oudani and the student group helped identify UIR students and faculty who were willing to be interviewed. We communicated and coordinated with UIR students and professors to organize these interviews because they have connections across the student body and with professors. Logistical hurdles notwithstanding, our team conducted these sessions over video calls on Microsoft Teams and Google Meet with both students and faculty members of UIR.

We conducted one paired depth interview because interviews of this style offer an interesting contrast to the traditional interview setting. While traditional one-on-one interviews are widely used in qualitative social science research where there is one interviewee, paired depth interviews involve two or more interviewees. According to Wilson, Onwuegbuzie, and Manning, each method has its benefits and shortcomings (2016). Traditional interviews can allow for more sensitive topics that the interview subject may find difficult to talk about in front of another subject, and they are an easy way to isolate the opinions and experiences of just one subject. Paired depth interviews benefit from the rapport between the two subjects, especially when they already know each other. In these interviews, the interviewer can spark meaningful dialogue between the subjects which can help them elaborate more fully than one person typically tends to alone. A paired depth interview allows the interviewer to gain insight on the dynamic between the two subjects. In many ways, the paired depth interview format allowed for some of the benefits of a focus group while reducing the possibility of a group getting off topic or of one individual dominating the conversation (Wilson, Onwuegbuzie, and Manning, 2016). See questions for traditional one-on-one semi structured interviews with both students and faculty members in Appendix H, and see paired depth interview questions in Appendix I. We

requested permission to record the interviews. See Appendix B for this consent statement for WPI interviews and Appendix C for UIR interviews.

Objective Two - Analyze the Impacts of COVID-19 on Education at UIR Through Qualitative and Statistical Analysis

Our team analyzed qualitative data that we generated through interviews by coding. We analyzed the survey results through statistical analysis. In interviews, we collected data about the psychological ramifications of COVID-19 on UIR students that we gathered to meet the requirements of our second objective. We collected data on the emotions that students and professors experienced while dealing with remote learning. We coded this data using a codebook, shown in Appendix K, of key terms and overarching themes.

We used grounded theory to identify the themes and subthemes in the codebook because we knew the topics of conversation in the interviews before we conduced them. We knew the topics because we identified them in our background research in order to construct the interview questions. A grounded theory is based on and connected to predetermined themes to see how they connect (*RWJF - Qualitative Research Guidelines Project*, n.d.). Our team chose this method of coding because we were aware of the topics of impacts of COVID-19 on education prior to beginning research. We performed this analysis to understand these impacts and how they connect to each other and remote education. Using open coding, we highlighted the text of interview transcripts in different colors to represent the themes and tagged the sub-themes by commenting in the transcript document. We identified key factors which were affecting students and faculty during this time using this information and analysis.

We worked with the UIR student group to conduct a statistical analysis of relevant data using SPSS software. SPPS stands for Statistical Package for the Social Science and can be used to analyze data gathered through surveys. We chose to use this software because of our sponsor's familiarity with it and because data can be directly pulled from Qualtrics into SPSS. After we administered our surveys using Qualtrics, we downloaded the data file in SPSS. We then cleaned the data file and tool out any possible identifying information and send the SPSS file to the UIR student group. The UIR student group created visual representations of the raw data in the SPSS files. The UIR student group produced visuals of the analyzed data in such formats as graphs, charts, and contingency tables. The group displayed the results from individual questions using

frequency charts. They also produced a correlation table to identify the strength of the correlation between any two questions using Pearson correlation coefficients (PCC). A PCC is a way of measuring the strength of the linear correlation between two variables. A PCC can range from +1 to -1. A value of 0 indicates that there is no association between the two variables, and a value greater than 0 indicates a positive association; that is, as the value of one variable increases, so does the value of the other variable. A value less than 0 indicates a negative association; that is, as the value of one variable increases, the value of the other variable decreases (*Pearson Product-Moment Correlation*, n.d.). They then went on to produce contingency tables showing the strongest correlations they could identify using PCCs. Weekly meetings and open lines of communication with the UIR student group proved crucial in producing this advanced analysis of our data. We also used visual depictions of our data to help transcend cultural and language barriers because visual explanations rather than verbal explanations may prove more effective in supporting our findings. As we discuss in the next objective, we used these findings to construct recommendations.

Objective Three - Better Understand WPI's Continued Remote Education During the COVID-19 Pandemic in Order to Construct Recommendations for UIR

Through this objective, we devised relevant recommendations and an actionable deliverable for UIR to improve its remote education. To help us develop recommendations, we gathered information about how WPI developed its plans for continuing education remotely during the COVID-19 pandemic. We conducted expert interviews with WPI administration members involved in implementing remote learning at WPI, including personnel from the Morgan Teaching & Learning Center and Center for Project Based Learning. Through these interviews, we learned what they took into consideration when developing WPI's plan, what was successful, and the limitations and setbacks they experienced. We specifically asked about their plan development, financial considerations, student mental health, and online learning infrastructures. We additionally inquired about the effects of remote education on project-based learning and WPI's history and experience with remote education. See Appendix J for the expert interview questions. Due to the ongoing nature of the pandemic, we do not have a comprehensive metric to define a "successful plan". WPI was able to continue education during the pandemic by developing extensive plans for remote educational delivery ("We are WPI", 2020). WPI was the most accessible university to our group due to its preexisting online learning

infrastructures. We analyzed WPI's plans and strategies according to the results of our data collection established in the second objective to see which of their aspects could be best applied to UIR.

Ethical Considerations and the Institutional Review Board

We submitted this methodology to the WPI Institutional Review Board for approval. The WPI Institutional Review board is a body of WPI faculty who review all WPI research involving human subjects, ensuring that the researchers methods meet ethical standards and regulatory requirements pursuant to federal mandate 45 CFR 46, also known as The Common Rule (*Federal Policy for the Protection of Human Subjects ('Common Rule*, 2009). WPI requires a strict application and review process to gain IRB approval for research projects. We adhered to IRB procedures and completed this application and review process. Additionally, we informed all survey and interview participants that their involvement was voluntary and that they could withdraw at any time. We gained verbal consent to record from interview participants.

Conclusion

We began this project by conducting exploratory interviews and background research to investigate education at UIR and the effects of COVID-19 on Moroccan universities. We used the knowledge we gained to form a structure for our expert interviews and begin drafting our surveys before using the findings of our expert interviews to fully realize our survey material. We coupled the data gathered through these surveys with data we found through a series of UIR faculty and student interviews to inform our overall findings. Then we used those findings to construct our recommendations, as well as to create a deliverable website for professor online teaching training as a route for UIR to begin to address our recommendations.

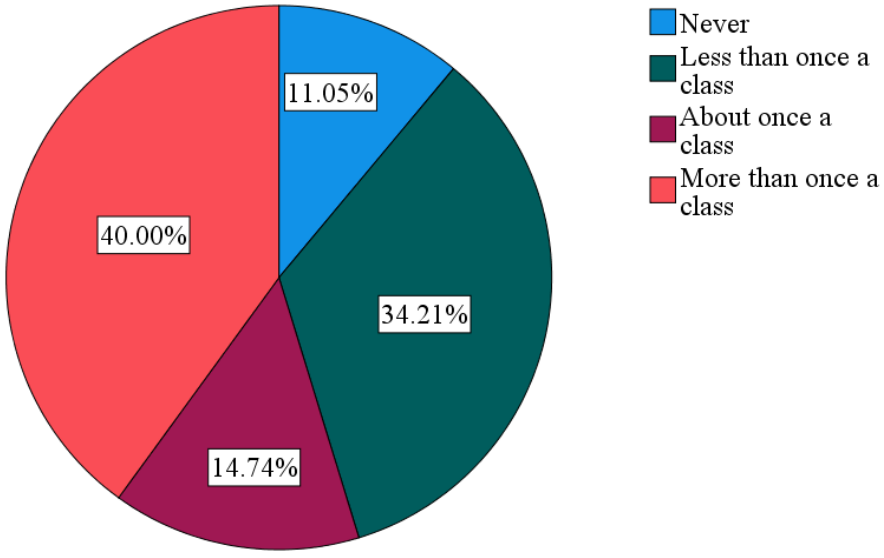
Findings

In this chapter we present the findings and analysis we used to construct recommendations to UIR. We collected data through surveys and interviews, analyzed correlations, and ultimately produced visual representations of this data in collaboration with the student group. The following findings relate to these common themes: online infrastructures, course structure, and physical, mental, and financial impacts of COVID-19.

Poor Internet Infrastructure and Lack of Online Learning Tools

Poor internet connection was an issue for both students and professors. In our interviews, students reported that poor internet connection made it hard to ask questions without interrupting the class. Many students attended class less often because audio or video parts of lectures would be cut out, hindering learning. In fact, some students resorted to telling a classmate to ask a question over WhatsApp (a communication application) during online synchronous classes because poor connection prevented them from being able to ask it themselves. Nearly 98% of students from our survey said they had internet access at home. However, Figure 6 shows that more than 54% of students reported that poor internet connection interrupted their online classes *at least* once a class, with 40% reporting multiple times a class.

Figure 6: *Frequency of Interruptions Due to Poor Internet Connection in Online Classes*



Note. This chart shows the percentages of UIR students surveyed who experienced varying frequencies of class interruptions due to poor internet connection.

According to the contingency table below, Table 1, there is a strong inverse correlation between frequency of class interruptions due to poor internet connection and the quality of the class dynamic during online learning mode. We can conclude that students with more internet interruptions experienced a worse class dynamic, meaning they experienced poorer interactions between themselves and other students and professors.

Table 1: *Contingency Table of Correlation Between Frequency That Poor Internet Interrupted an Online Class and Class Dynamic During Online Learning*

		Frequency That Poor Internet Interrupted An Online Class			
		Never	Less than once a class	About once a class	More than once a class
Class Dynamic During Online Learning Mode	Much worse	7	19	14	42
	Worse	7	18	7	20
	Same	1	9	2	3
	Better	1	5	2	3
	Much better	2	2	0	1

Note. Contingency table of student online class interruption frequency due to poor internet during online learning mode and feeling about class dynamic during online learning mode as compared to in-person learning mode. This table shows the strong correlation between students having more frequent class interruptions due to poor internet and worsening class dynamic. The PCC between these two questions was -.563, one of the strongest correlations we found.

We learned through UIR student interviews that the university offered a service where they would install a Wi-Fi router in student homes with no Wi-Fi access. However, for situations where high speed internet access is required, like using video conferencing software for online classes, Morocco's Wi-Fi infrastructure is not ideal (Echezona & Ugwuany, 2010). According to student interviews, many internet providers in Morocco had to implement bandwidth throttling, reducing the bandwidth available to customers regardless of the price paid for their internet service. According to Echezona & Ugwuany, this is generally because connectivity in Africa is poor, scarce, and expensive, with frequent outages and slow speeds (2010). This bandwidth throttling and the globally increased internet traffic during the lockdown period as a result of government regulations caused internet slowdowns across Morocco, impacting connectivity.

Another large part of this finding, in addition to technical infrastructures in Morocco, is that UIR does not use a campus-wide online learning management system. A learning management system (LMS) is a piece of software that helps a university run the many different aspects of delivering education. The software can include features such as grade tracking, online course delivery, and student-professor communication platforms among other potential components. For example, WPI uses a LMS called Canvas which offers all the features listed above and has been central to WPI's educational delivery, both in-person and online. It is important to note that UIR did not have such an LMS in place prior to the pandemic. Professors gave all feedback and assignments in-person or sent via email. When UIR went fully remote, they started using Microsoft Teams as a platform for online classes. Although this platform has similar functionalities to an LMS, it does not have the necessary tools to be considered an LMS as there is no tool to offer individual feedback. One UIR student reported that, "It was frustrating sometimes... because you know you're working on something that you've learned distance... And you don't know if you learned it well or not. You just did the assignment, and you don't know if it's good... the teacher doesn't say anything" (UIR Student, personal communication, February 18, 2021). Practically every student we interviewed expressed similar complaints.

Although UIR did not adopt a campus wide LMS, the English department had started using Cambridge LMS, an LMS platform specifically for English language teachers containing course content as well as grading and progress tracking functionalities, prior to the pandemic. According to one UIR professor, this was the pilot program for UIR's development of "blended learning" courses, meaning a combination of in-person and online education. Student interviewees reported that the use of LMS Cambridge allowed for a much smoother transition from a blended learning model to a fully online learning model. Additionally, students reported that they enjoyed using an LMS in their English classes and would like to see a similar platform used in more courses beyond the English department. These students expressed the successful use of Cambridge in the English department and UIR's desire to pursue online learning as an educational delivery format.

However, this smooth transition was not the case for the majority of UIR. UIR professors had only a week-long training to prepare for online education delivery. According to our sponsor, this training was led by UIR Professor El Ghazi and his team. They were assigned to

lead this training due to their previous experience with E-learning during the project MarMOOC, which supports Moroccan public and private universities in the process of designing and developing rich and innovative educational materials (*PROJET MarMOOC|UIR*, n.d.). The week-long training included instruction on how to use Microsoft Teams for recording video lectures and organizing course materials. According to interviews, UIR professors had varied experience with teaching using online platforms, and those who did not have prior experience struggled. Many students and faculty members believed that UIR did the best it could to adapt given the abrupt transition. However, they agreed that more online training would have been helpful. Professors also had varied access to physical technology. According to a UIR administrator, UIR bought at least twenty tablets to help professors teach online, however, only some professors received these tools. UIR also equipped classrooms with cameras so that professors had the option to use a blackboard rather than a tablet for visuals. However, the installation of these cameras took a few months and the option to use a blackboard was not available until the end of October 2020. When asked what UIR could do to improve online learning, a UIR student stated:

> "...it was giving tools to the professors, because I know many professors who wanted to do like a great set of classes, great sessions, but they couldn't, because they don't have the facilities. Because buying.... iPad tablets is not an easy thing for anyone, need to [*sic*] be helped by university". (UIR Student, personal communication, February 18, 2021)

As we describe in the findings above, the combination of variable internet access, limited professor training and resources, and lack of a university wide LMS led to an insufficient online education delivery model while UIR was remote. A limitation to this finding may be that UIR may have planned to implement more online tools and resources for students and professors during online learning but did not have reason to implement them because they switched back to in-person learning before they could do this. UIR also had a very short time to convert from in-person to online learning when the COVID-19 pandemic onset; with future applications of online learning, the university may have more time to put together comprehensive set of online tools for student and professor use.

Decreased Student Motivation

We discovered that, in general, students were less motivated during remote learning due to inconsistent online course structure, less face-to-face interaction, and home distractions. In fact, of the 227 surveyed students, 80.84% reported “much worse” or “worse” motivation during online learning compared to in-person learning. Additionally, 75.4% reported having “much less” or “less” attention during online learning meaning students had considerably harder times focusing during online courses. Furthermore, 70.23% of students reported “much less” or “less” learning. In addition to these effects of online learning on student motivation and attention, the survey results showed numerous correlations between survey questions. Table 2 below shows that, during online learning, most students who experienced a worse class dynamic also felt less motivated to do schoolwork.

Table 2: *Contingency Table of Correlation Between Class Dynamic During Online Learning and Motivation During Online Learning Mode*

		Class Dynamic During Online Learning Mode				
		Much worse	Worse	Same	Better	Much better
Motivation During Online Learning Mode	Much less	46	10	4	0	0
	Less	20	14	2	0	0
	Same	4	8	3	1	0
	More	4	10	4	5	0
	Much more	2	2	2	2	3

Note. Contingency table of student perceptions of class dynamics during online learning mode as compared to in-person learning mode and student motivation during online learning mode as compared to in-person learning mode. This table shows that there is a strong correlation between lower student motivation and poor class dynamics.

Through interviews we found that inconsistent online course structure hindered student motivation by affecting the class dynamic. Specifically, lack of student motivation was causing an absence of participation during online lectures. On top of this, because different classes used varying platforms and websites for tasks and assignments, students reported that having to keep

track of these multiple assignment and course platforms decreased their motivation. Additionally, there is inconsistent training on these platforms causing interruptions as professors are unfamiliar with online teaching practices and online education platforms. These distractions impacted student motivation. Studies such as *Attention span during lectures: 8 seconds, 10 minutes, or more? s*how the relationship between learning and forms of teaching and how traditional PowerPoint and lecture formats are less satisfactory as teaching methods for students (Bradbury, 2016). Overall, we found a dissatisfaction with traditional lecture learning in the online course environment. In contrast, in an expert interview with WPI's Center for Project Based Learning, we found how project-based learning (PBL) can encourage students to develop practical skills through their work on an applicable problem, question, or challenge.

During interviews, we also discovered that student motivation was negatively impacted by the lack of face-to-face interaction with professors and peers, which equally worsened the class dynamic. Online learning did not encourage a rich class dynamic; there were less questions from students and less discussions. There was also the absence of a 'studying atmosphere' in which students see each other understanding material, pushing themselves to do the same. This less interactive online environment ultimately hindered student motivation by making practical exercises such as class discussions or professor questions less engaging. Also, several students reported feeling less motivated because of their learning environment at home. It was difficult to balance family relationships and responsibilities with schoolwork. It was also much easier to do something else at home, losing attention and motivation in class.

Although these findings point to a significant drop in student motivation during online learning, it is important to note that motivation levels can vary between different students and professors, as well as from day to day for individuals. This means that responses may not have been entirely representative. Additionally, although students generally felt less motivated, they said that UIR supported them through motivational email messages and some professors helped them with their mental health.

Challenges for Student-Professor Relationships

We found that UIR's online learning formats and procedures created difficulties for students and professors to build and sustain relationships. The student-professor relationship is an important element in driving student focus as it helps students engage with the material, ask

questions, and discuss to facilitate better learning. Our survey data, interviews, and background research support this finding.

During one-on-one interviews with professors, we found that the relationships between students and professors did not immediately suffer from the switch to online learning. Professors expressed high levels of motivation and effort at the beginning of the pandemic which translated into increased student interaction and learning. However, these same professors admitted that as the pandemic continued, their motivation understandably decreased leading to less effort being put into their students. One professor noted: “We get from our students as much energy or even more than what we give them back". Interviewed professors who trusted their students- letting students use notes on assessments or giving students helpful feedback- revealed that students were more motivated in their classes than their peers’ classes. Additionally, according to this interviewed professor, the class dynamic depends on 3 variables: teacher, students, and atmosphere. If students are anxious, it is up to the professor to acknowledge this and put more time aside to speak with them, but this was difficult to do during remote learning.

Another example from interviews is that professors who already had rapport with students before the switch to online learning were better able to maintain relationships. Interviewed students reported that they generally enjoyed classes more where there was an already established relationship with the professor. Furthermore, the type of class dictates the quality of student-professor relationships. Students taking computer technology classes reported less strain on classroom relationships and the online learning experience due to the nature of their classes being less discussion-based than humanity classes. The only reports of positive or no difference in student-professor relationships during the switch to online learning at UIR were the instances mentioned above which came from two interviewed students.

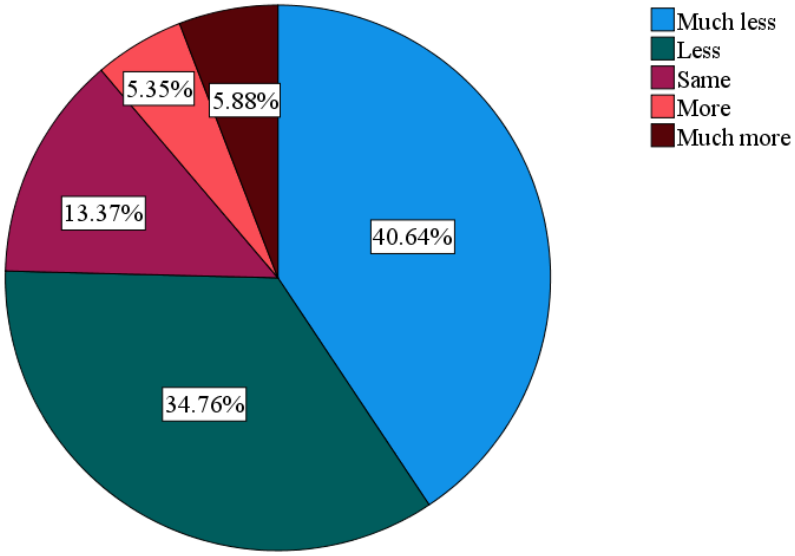
From our interviews and survey data we found a strong correlation between difficulties of student-professor relationships online and the online class formats at UIR. Of all the professors who took part in our survey, 90.91% reported “worse,” and the remaining 9.09% reported “much worse” class dynamics during online mode compared to in-person mode. Many professors had to learn how to use online formats, and with only one week to prepare material, there was little time for an emphasis on class dynamics and student-professor relationships. Not only did professors at UIR have little time to structure their courses using online formats, but the nature of educating

through a screen negatively impacted student-professor relationships, as stated in the previous finding. During interviews, both students and professors expressed concerns with Microsoft Teams. Professors noted that they had difficulties interacting and understanding student body language through the small square screens in Microsoft Teams. Also, students' reluctance to turn on their cameras and microphones only exacerbated interaction issues. Professors reported having a difficult time even remembering students' names due to lack of valuable interaction available teaching through a screen. We found that students and professors did not blame each other or UIR for these shortcomings, rather everyone recognized these symptoms as consequence of a lack of experience with online formats.

To expand on how student-professor relationships struggled due to online formats, we found that online learning at UIR severely affected class interactions, specifically discussions. As we discussed in the first finding, students reported that poor internet connections made class dynamics much worse. The anecdotal evidence we gathered in interviews supports this correlation. We heard from students that poor internet and screen interactions made socializing with other students nearly impossible. Professor interviews also supplemented this data since professors agreed that peer-to-peer learning is an essential part of any educational experience, but online learning made this close to impossible. Student interviews also revealed that online classes made students hesitant to ask questions and interact in discussions due to fear of interrupting the whole class. Because students were barred from working together in the library or meeting outside of class due to pandemic regulations, online learning did not make professors and students feel part of a learning community.

As we note above, the online learning environment negatively impacted student professor relationships, resulting in a decrease in student focus and engagement. In turn, this decreased professor effort in creating and teaching lessons. We found this cycle of deteriorating educational experience in our interview and survey data analysis. As we show in Figure 7, over 75% of students reported paying "less" or "much less" attention in online classes than in-person.

Figure 7: *Student Attention During Online Learning Compared to In-Person Learning*



Note. This pie chart shows how much students paid attention during online learning mode as compared to in-person learning mode. From this chart, we can conclude that most students paid "less" or "much less" attention during online learning mode as compared to in-person learning mode.

From student interviews we identified that the main reasons for lower student attention were online education formats and lack of professor effort. Most students expressed that they struggled to commit to class everyday staring at a screen and had difficulties learning if professors simply lectured the entire class. Professors felt less inclined to put effort into lessons if they could tell their students were not paying attention. This contributed to a cycle of professors and students becoming uninterested in online education and classroom relationships.

Since UIR was back to in-person classes at the time of this research, there has been a long period of time since online learning. Therefore, the severity of the reported student and professor experiences may be dulled. This is one of the limitations to this finding. Additionally, our sponsor accepted our survey sample size as reasonable, but we were still short of our initial goal of 370 survey participants. However, for interviews we were able to achieve our participant goal. Lastly, we believe that it would be hard for some individuals to speak negatively on relationships with students or professors in recorded interviews which could have swayed our resultant conclusions.

Increased Cheating

We found that cheating at UIR became more frequent and appealing during online learning due to the lack of student motivation and class structure. We show the results of the correlation between student motivation and inclination to cheat in Table 3. We concluded from surveys that students who expressed less motivation were more inclined to cheat.

Table 3: *Contingency Table of Correlation Between Student Motivation During Online Learning Mode and Inclination to Cheat During Online Learning*

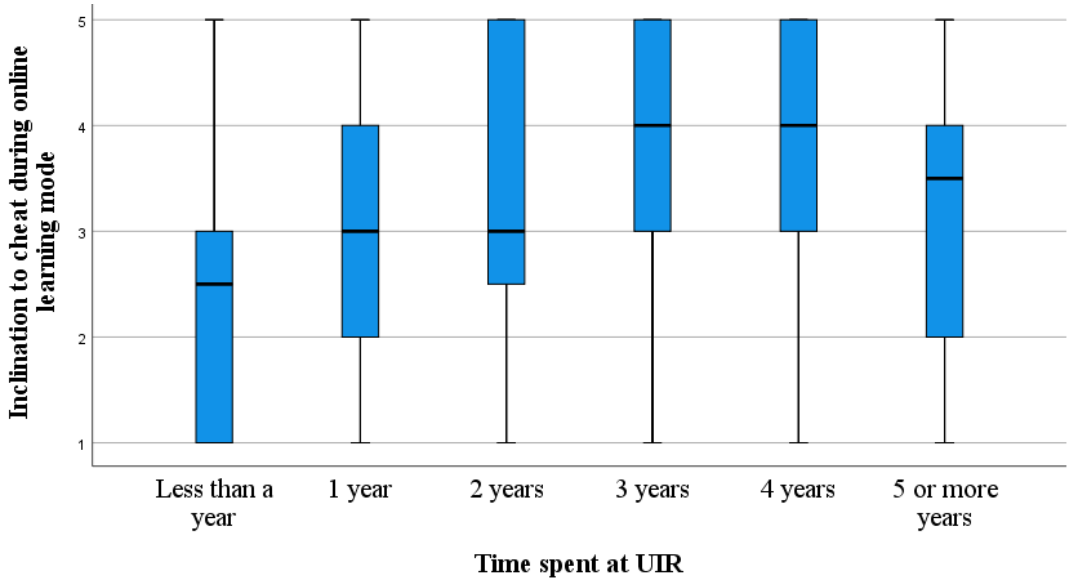
		Inclination to Cheat During Online Learning Mode				
		Much less	**Less**	**Same**	**More**	**Much more**
Motivation During Online Learning Mode	**Much less**	8	2	9	7	13
	Less	4	3	9	9	7
	Same	3	0	6	2	3
	More	3	6	6	4	4
	Much more	3	2	0	1	0

Note. This contingency table shows the correlation between student motivation during online learning mode and student inclination to cheat during online learning mode in comparison to in-person learning mode. This table shows that there is a strong correlation between much less student motivation and a much greater inclination to cheat.

Several students noted that they were more inclined to cheat during online learning because they were motivated by getting good grades rather than learning. Additionally, students felt less motivated to learn online due in part to the previously mentioned lack of class structure and individual feedback from certain professors. Thus, cheating became more appealing to students. There was an additional strong correlation between the mental health of students and their inclination to cheat; students who felt that their mental health was worse during online learning mode felt more inclined to cheat. Although some students said that cheating was not more helpful, it did make classes less stressful, and was easier to do in online assessments. Finally, according to the UIR student group during survey data analysis, one of our project's strongest survey correlations is between cheating and the year of UIR students. Figure 8 shows

that students who have been at UIR longer feel more inclined to cheat than newer students. Whether this is due to loss of motivation through the years, or more comfortable relationships with professors, more senior students cheat more.

Figure 8: *Box Plot of Correlation Between Student Time Spent at UIR and Inclination to Cheat During Online Learning*



Note. This box plot shows the correlation between the time that surveyed students spent at UIR and their inclination to cheat during online learning mode. On the Y-Axis, 1 = Much Less, 2 = Less, 3 = Same, 4 = More, and 5 = Much More. The PCC for this question was .307. From this graph we can conclude that students became more inclined to cheat as they spent more time at UIR.

One student explained that since students are not in-person, they feel less pressure to keep their integrity, and perhaps feel less guilty cheating. Others responded that cheating is very easy to do online, and that even good students were doing it to get good marks. However, while students spoke about the simplicity of cheating, we don't have much evidence on why students believe cheating is acceptable. In a paired depth interview with students, we found that UIR also lacked precautions to stop this cheating — efforts to have timed assessments or conduct them on different days — and so students continued cheating for the duration of remote learning. Many interviewees said that their inclination to cheat depended on the course itself; cheating depends on how difficult a class is, the class dynamic, and a professor's style of teaching.

As far as professors' reactions to students cheating, many admitted that the fact that students think it is okay to cheat disturbs them. However, we consider that certain professor reactions may be biased; no professor would admit that their course is not clearly structured. Furthermore, one professor discussed that students must learn to not cheat as this will significantly affect how they approach problems in life. However, it is up to the professor to motivate them so that cheating doesn't need to become an option. A limitation to this may be that such professors are over-trustworthy claiming that their students don't cheat. The motivation and student professor relationships that impact a class dynamic are also closely related to the overall wellbeing of students and professors.

Physical, Mental, and Financial Impacts of COVID-19

In our research we found different effects of the COVID-19 pandemic on the mental health of the UIR community and different reasons for these effects. Participants reported both positive and negative impacts on different aspects of health during online learning as compared to during in-person learning. On the negative side, over 55% of respondents to our health survey reported more or a lot more feelings of depression during online learning, and over 50% reported more or a lot more anxiety. In interviews, multiple community members noted feeling lonely over the online learning period. On a more positive note, over 71% of respondents reported the same or better connections with friends and family and 72% reported they took the same or better care of themselves during online learning. Others stated that they had grown closer to family members or friends with whom they lived. In terms of correlations, our health survey showed a moderately strong positive correlation between quality of connections with friends and family and energy level as well as quality of connections with friends and family and level of self-care. These had PCCs of .460 and .360 respectively. Predictably with this relationship, our data also showed that there were students who had worse connections with friends and family and experienced less daily energy. Additionally, lack of energy usually predicted worsening mental health according to our health survey. We can conclude that students and professors experienced some negative impacts such as depression and anxiety during online learning, but also saw positive benefits such as better connections with family and improved self-care.

Another correlation that we found through our general surveys was between sleep quality and mental health. In Table 4 below, we show this correlation.

Table 4: *Contingency Table of Correlation Between Sleep Quality and Mental Health During Online Learning*

		Mental Health During Online Learning Mode				
		Much worse	Worse	Same	Better	Much better
Sleep Quality During Online Learning Mode	Much worse	19	4	0	0	0
	Worse	24	17	2	4	2
	Same	4	11	3	3	1
	Better	10	14	4	6	6
	Much better	6	7	3	8	11

Note. This contingency table shows the correlation between student sleep quality during online learning mode as compared to in-person mode and student mental health during online learning mode in comparison to in-person earning mode. This table shows that there is a strong correlation between worse sleep quality and worse mental health.

The table above shows that students who reported worse sleep quality during the online learning period also reported poor mental health. This direct relationship between mental health and sleep is also true for those who reported much better sleep; of the students who reported much better sleep quality during online learning, most of them reported “better” or “much better” mental health. A professor we interviewed also experienced this positive side of the relationship between mental health and sleep, reporting that that he gets “more sleep all of the time now” (UIR Faculty Member, personal communication, February 21, 2021) and that his mental health was quite good during this period. He also cited his family as a support structure. Although the strongest correlation in the table above is the direct relationship between sleep quality and mental health, there was also a significant number of respondents who reported both “better” or “much better” sleep quality but still worse or much worse mental health. This is important to acknowledge, as it shows that poor sleep is not the only cause for worse mental health and vice versa.

Physical wellbeing also varied greatly between individuals. Questions about physical wellbeing did not yield any strong correlation to sleep, mental health, or motivation according to

the Pearson correlation coefficients between them. In interviews with students, we noticed that those who said they were exercising more during the online learning period also noted improved mental health, but the PCC of the survey responses did not show a strong correlation. We also find it important to note that although UIR does have multiple outdoor facilities where students can exercise safely during the pandemic, although access to these facilities should be more widely advertised. Multiple interview subjects expressed desire for such a space, seemingly unaware that it already does. However, a limitation is that our group did not know which specific spaces were or weren't available. Additionally, 43.2% of survey respondents listed their ability to exercise as "less" or "much less" while only 29.9% of respondents listed "more" or "much more". Since we do not have demographic information about where UIR students are from and we know most students took classes from home during online learning mode, we cannot identify if physical distance from the facilities led students impacted the accessibility of these facilities for students. Therefore, we must note that physical distance may have had a significant impact on this survey datapoint but cannot confirm it.

We also found evidence of financial stress in survey responses. 24.83% of students reported increased financial stress during the pandemic, and 25.25% reported that either they or a family member had lost their job due to the pandemic. Meanwhile 71.43% of faculty respondents reported increased financial stress and 9% had a family member who lost their job due to the pandemic. We also learned in our interviews with cultural partners that there was a 25% pay cut, nationwide, for university and college professors *(Ministry Says Private Universities Not Eligible for Bailouts,* n.d.). Interestingly, our interview subjects did not mention this financial stress and 93 of our survey respondents chose not to respond to our financial stress question. We suspect that a potential taboo of speaking openly about financial hardships may have prevented our team from collecting further information relating to this topic. Additionally, in such survey questions with delicate subject matters, such as financial stress and mental health, we offered the option of 'prefer not to answer' or 'not applicable'. While we made this choice available with the participant's well-being in mind, this option limited our total responses to certain questions, limiting our total data.

Finally, many students expressed frustration about working from home during online learning. According to one UIR student, after remaining in their room for three months straight

during the start of the pandemic, they admitted "it's better to actually... do something else than just lay in that bed" (UIR Student, personal communication, February 17, 2021). Students and faculty alike expressed the feeling that a workload becomes heavier when it is omnipresent. One student expressed a feeling of futility, saying that "it feels very different when you wake up at home. And you look two meters away from the bed, and there's a desk." (UIR Student, personal communication, February 21, 2021). As previously mentioned, UIR did send out motivational emails to try to combat this unhealthy balance, and some students did find these helpful.

Conclusion

In this chapter, we presented the analysis of the data our team collected through surveys and interviews. This data helped us identify the major impacts of COVID-19 on the UIR community and draw conclusions from this data. We then used these conclusions to provide recommendation to UIR on how to improve their remote learning infrastructure. In the following chapter, we discuss these recommendations in detail, including their benefits and limitations.

Recommendations

Based on our findings, we constructed several recommendations for UIR to improve its remote learning. The recommendations include improving online infrastructures, improving course structure, and supporting the UIR community's physical, mental, and financial health. These recommendations are comprehensive so the university can make informed decisions about improving remote learning. In order to give UIR the means to act on these recommendations, we have developed a website. To create this website, we compiled resources for professors about online teaching (see Appendix M). We adapted content created by Caitlin Keller and Valerie Smedile Rifkin from the WPI Morgan Teaching and Learning Center for these resources.

Improve Online Infrastructures

UIR should adopt more online education technology, including university-wide implementation of an online learning management platform and other online discussion tools.

We recommend that UIR consider a variety of LMS options and adopt one that best fits their needs to help their university improve their online educational delivery format and ultimately in-person education too. The English department's successful use of Cambridge and UIR's desire to pursue online learning as an educational delivery format shows that adopting an LMS would benefit the university. Learning Management Systems feature course organization tools, assignment submission and gradebook features, and discussion board platforms. These tools would help address many of the problems that we identified in our findings, such as insufficient course structure, lack of individual feedback, and poor student-professor relationships.

UIR would need to conduct a thorough analysis of LMS and consider how much money it is willing to spend on the software before they can decide on a specific LMS. This analysis is beyond the scope of our project. We can, however, recommend from our own experience that UIR begin by investigating the LMS Canvas. Canvas is just one of the many options UIR could consider when looking for an LMS to adopt. A prominent feature of Canvas that would benefit UIR is that it easily integrates other educational tools such as Microsoft Teams, which UIR already uses (*LMS - Higher Ed*, 2020.). According to a *U.S. News and World Report* list of the best online bachelor's programs in 2018, 14 of the top 25 online bachelor's degree programs use Canvas as their LMS, including four of the top five. In fact, the current leader for best online

bachelor's program, Embry-Riddle Aeronautical University, uses Canvas as its LMS (*The Best Online Bachelor's Degree Programs - US News*, 2021). After considering LMS options, UIR could benefit from using an LMS to improve course structure and student-professor relationships.

In addition to an LMS, we recommend adopting other software tools designed to improve online learning. One example is Piazza, a free intuitive online platform that allows instructors to manage class discussions and allows students to post questions and collaborate. Instructors can also answer questions and edit or delete any posted content. Platforms such as Piazza that encourage discussion can help address the challenges of poor student-professor relationships and communication mentioned in our findings. Piazza is also compatible with many popular LMSs including Canvas, making it easy to adopt alongside an LMS.

Of course, implementing online software at UIR will only be useful if both students and professors have sufficient internet access. While in-person, students and professors can get access to on-campus Wi-Fi. However, when accessing this online educational delivery model from locations beyond campus, poor W-Fi may become a problem. Although UIR offers Wi-Fi installment and most students and professors report having internet access, UIR should consider the potential poor internet connection for UIR community members when developing an online learning model.

Improve Online Course Structure

UIR should implement a training program for professors to effectively teach online.

We are aware that UIR has already returned to in person learning, however our sponsor Dr. Oudani has informed us about an initiative by UIR to further integrate online courses at UIR. Considering this, we recommend building upon the training and knowledge about online education UIR professors gained during the pandemic. WPI implemented a program called FIOT (Faculty Institute for Online Teaching) from which UIR can take inspiration. We have developed a website with resources that UIR can use for this online teaching workshop to aid the implementation of this recommendation (See Appendix M). We have compiled resources on this website using content adapted from that by Caitlin Keller and Valerie Smedile Rifkin from the WPI Morgan Teaching and Learning Center. We recommend that UIR create a supplemental asynchronous training workshop using guidance and resources from this website.

We included resources about the following topics on the website, however we recommend that the UIR Online Training Center provide a more interactive training workshop as well. The training should aid professors in organizing their online course structure and establishing course expectations with a syllabus. To address student attention and motivation, professors should learn how to make classes more interactive by incorporating discussion forums, simulation software, video textbooks, and online whiteboards. Although holding synchronous courses and requiring students to have their cameras on can improve attention and motivation, these are not applicable to the UIR and the Moroccan education system because of inconsistent internet access for students and professors. Thus, professors should utilize these various remote discussion tools mentioned to gauge class engagement and understanding.

The training workshop should also cover how professors can test critical thinking through assessments to address the issue of cheating that was evident in our research. In addition, the training program should cover how to provide feedback to increase motivation. This training should also introduce professors to project-based learning to evaluate student learning to supplement more traditional assessment evaluations. We will explain project-based learning and other high impact learning practices our next recommendation. And it should cover the role that professors play in a student's wellbeing and its relation to their education; there should be training for professors on how availability and openness can be a source of this student support.

In addition to using the resources we outlined on the website, the training workshop should incorporate interactive activities for professors in which they can develop materials for their courses and receive feedback to incentivize participation. We recommend that the Online Learning Center identify leaders in each program department who are already teaching well online. We recommend that this leader introduce a mentorship program within each department to allow professors to collaborate beyond the scope of this training workshop and resources provided on the website.

UIR professors should create high impact learning opportunities for students, such as project-based learning to create better class dynamics.

In order to create a more interactive class dynamic, professors can take simple steps to improve the overall class dynamic at UIR, such as spending 5 minutes each class asking how their students are doing. Furthermore, they should anticipate dedicating a certain percentage of their course material to assessing students' needs as this will create a cycle of motivation. In an ideal class dynamic, the course builds an atmosphere of trust: if students trust their professors, and professors trust their students, both groups will be motivated, communication will improve, and cheating will become less attractive. However, we acknowledge that students may not feel comfortable discussing personal matters in great depth — especially to a professor — and that total transparency in a classroom is not plausible. But professors should still put in some effort assessing the needs of their students. Additionally, professors could supplement poor relationship quality with students by giving productive feedback on assignments and assessments.

We recommend inputting some PBL at UIR to alleviate some of the shortcomings outlined within our research as well as to some extent change the culture of learning at UIR. Project-based learning (PBL)- a theory of education in which professors encourage students to develop practical skills through their work on an applicable problem, question, or challenge- is a specific method of teaching which UIR should implement to improve online and in-person learning. PBL is a proven method for creating intriguing educational experiences. Since we found that students are more likely loss interest when the material is presented online in lecture format, UIR should be able to break up the monotony of lectures by implementing PBL. As previously stated, for a school to adopt PBL, a necessary culture change must occur. This change involves professors who must create new lessons and adopt a different style of teaching as well as students who will have to reinvent how they solve problems. We understand these changes alone are difficult to ask of a university, which is why we recommend that UIR try to implement PBL at their discretion and possibly ask for further advice in the form of another IQP project or consultation with the Center for Project Based Learning at WPI.

Support the UIR Community's Physical, Mental, and Financial Health

The UIR Student Life Department should organize online extracurricular activities, encourage work life balance into course work to support community wellness.

UIR should implement a wide range of extracurricular online events to provide opportunities for socialization and student interaction outside of the classroom. Events such as movie nights, game nights, club activities, and non-academic seminars are all possible over online platforms such as Microsoft Teams. Assuming stable internet access, these are easy to attend, simple to run, and provide an outlet for social and creative expression within the confines of life during a pandemic. In implementing this recommendation, UIR should consider the limitations regarding student access to the internet, as investigation into internet access for the whole of UIR's student body is beyond the scope of this project.

UIR should encourage students to take advantage of the exercise opportunities around them. The school should have an easy-to-access system for finding space to exercise, as well as simple guides detailing use of equipment. Additionally, students may find instruction in forms of exercise such as plyometrics or yoga more suited to restricted environments. We also recommend that the UIR Student Health Center organize a weekly flier outlining tips to maintain a healthy routine and for studying online to support student wellness. Simple life structures, such as the 8-8-8 System, in which a student dedicates 8 hours to sleep, 8 hours to school, and 8 hours to free time each day should be outlined in this flier. Top-down communication methods such as email aliases are a practical way to disseminate these helpful reminders and weekly motivational messages to students to keep their work-life balance healthy. UIR students noted in interviews that they found this helpful, and we ourselves have benefited from the WPI equivalent.

Limitations and Equity

There are several notable limitations to our research and recommendations. Within the classroom, suggesting that professors put more effort into assessing the needs of their students to improve the class dynamic is ultimately dependent on the professor; this is not a physical solution which we can suggest. However, professors may find our deliverable a viable option for improving student-professor relationships. As far as encouraging that online programs grade students on participation (geared towards practice and effort rather than correct answers), students may feel less obliged to learn, and may in hindsight lose motivation in class. In addition,

completing projects as opposed to assessments for evaluation may cause students to work together and not individually complete their work. There would be less monitoring involved as opposed to assessments. Finally, UIR may have to dedicate a part of their budget to purchasing successful online learning infrastructures, such as Learning Management Systems (LMS) and other paid software.

In addition to these limitations of our research, it is important to address equity issues regarding our recommendations. We cannot recommend professors require their students' cameras to be on due to privacy concerns or if internet connection may not permit this. In implementing our recommendations, UIR should consider student equity, as investigation into internet access for the whole of UIR's student body is beyond the scope of this project. In addition to the cultural shift in teaching style that implementing PBL would require, PBL may also present equity concerns related to access to materials for projects. Equity issues may also be present if students become distracted by family commitments at home such as responsibilities for supporting the household or supporting the family financially. Lastly, when considering online and remote learning, differences in time zones should be considered.

Conclusion

Although online learning is a relatively new and challenging educational delivery model, there are many benefits to adopting it even beyond situations that necessitate its use. Some of these benefits include convenience, efficiency, and closer student-professor bonds. UIR has certainly seen these benefits through the success of their blended learning pilot program using LMS Cambridge, leading them to pursue the development of classes for fully remote delivery. Schools in the U.S. have been taking advantage of the positive impacts of online learning long before the pandemic started, having developed robust online delivery models that serve as comprehensive alternatives to in-person education (Jones, 2008; Hill, 2000). Our findings showed that UIR faces many challenges when it comes to online learning: poor internet infrastructure and insufficient use of online learning tools, lacking student motivation and student-professor relationships, increased cheating, and general wellbeing impacts. To overcome these challenges, we've recommended that UIR implement an online management system, provide online resource training for professors, utilize online platforms to improve student-professor communication, and support student wellness through online extracurricular activities

and engaging class work. We believe that these recommendations will help UIR turn their pandemic-induced temporary online learning plan into a long-term valuable alternative to traditional in-person education that will enrich the educational opportunities that UIR provides. We provided these recommendations and the supplemental website with online teaching resources to our sponsor for UIR to consider implementing.

References

Ait Addi, R., Benksim, A., Amine, M., & Cherkaoui, M. (2020). COVID-19 Outbreak and Perspective in Morocco. *Electronic Journal of General Medicine*, *17*(4), em204. https://doi.org/10.29333/ejgm/7857

An Innovative Higher Education Model | UIR. (n.d.). Retrieved November 10, 2020, from https://www.uir.ac.ma/fr/page/un-modele-denseignement-superieur-innovant

Aucejo, E. M., French, J., Ugalde Araya, M. P., & Zafar, B. (2020). The impact of COVID-19 on student experiences and expectations: Evidence from a survey. *Journal of Public Economics*, *191*, 104271. https://doi.org/10.1016/j.jpubeco.2020.104271

Average Cost of College [2020]: Yearly Tuition + Expenses. (n.d.). EducationData. Retrieved November 11, 2020, from https://educationdata.org/average-cost-of-college

Azizi, A., Achak, D., Aboudi, K., Saad, E., Nejjari, C., Nouira, Y., Hilali, A., Youlyouz-Marfak, I., & Marfak, A. (2020). Health-related quality of life and behavior-related lifestyle changes due to the COVID-19 home confinement: Dataset from a Moroccan sample. *Data in Brief*, *32*, 106239. https://doi.org/10.1016/j.dib.2020.106239

Basic Psychological Need Satisfaction, and Frustration Scales – selfdeterminationtheory.org. (n.d.). Retrieved November 22, 2020, from https://selfdeterminationtheory.org/basic-psychological-needs-scale/

Benkaraache, T., Benabdelouahed, R., Belafhaili, M., Dafir, A., Nafzaoui, A., & EL Marhoum, A. (n.d.). *Enquête enseignement à distance*. Retrieved February 25, 2021, from http://www.amdafir.com/index.php/2020/05/15/enquete-enseignement-a-distance/

Berets, R. (2020, March 2). The Latest in Language Confusion: Morocco Switches Back from Arabic to French. *Al-Fanar Media*. https://www.al-fanarmedia.org/2020/03/the-latest-in-language-confusion-morocco-switches-back-from-arabic-to-french/

Bouroumi, A., & Fajr, R. (2014). Collaborative and Cooperative E-learning in Higher Education in Morocco: A Case Study. *International Journal of Emerging Technologies in Learning (IJET)*, *9*(1), 66–72.

BOUTIERI, C. (2016). Schools in Crisis. In *Learning in Morocco* (pp. 1–32). Indiana University Press. http://www.jstor.org/stable/j.ctt1bmzmcf.5

Bradbury, N. A. (2016). Attention span during lectures: 8 seconds, 10 minutes, or more? *Advances in Physiology Education*, *40*(4), 509–513. https://doi.org/10.1152/advan.00109.2016

Broadband Facts & Stats | NCTA — The Internet & Television Association. (n.d.). Retrieved March 7, 2021, from https://www.ncta.com/broadband-facts

Bureau, U. C. (n.d.). *Income and Poverty in the United States: 2019*. The United States Census Bureau. Retrieved November 11, 2020, from https://www.census.gov/library/publications/2020/demo/p60-270.html

C2i Dashboard. (2020). https://collegecrisis.shinyapps.io/dashboard/

Canvas. (n.d.). *Canvas Used by Majority of the Top 25 Online Bachelor's Degree Programs Ranked by U.S. News & World Report*. Retrieved March 9, 2021, from https://www.prnewswire.com/news-releases/canvas-used-by-majority-of-the-top-25-online-bachelors-degree-programs-ranked-by-us-news--world-report-300598409.html

Canvas Covers WPI. (n.d.). WPI. Retrieved March 9, 2021, from https://www.wpi.edu/news/canvas-covers-wpi

Carroll, N., Sadowski, A., Laila, A., Hruska, V., Nixon, M., Ma, D. W. L., Haines, J., & on behalf of the Guelph Family Health Study. (2020). The Impact of COVID-19 on Health Behavior, Stress, Financial and Food Security among Middle to High Income Canadian Families with Young Children. *Nutrients*, *12*(8), 2352. https://doi.org/10.3390/nu12082352

Cervone, H. F. (2009). Applied digital library project management: Using Pugh matrix analysis in complex decision-making situations. *OCLC Systems & Services: International Digital Library Perspectives*, *25*(4), 228–232. https://doi.org/10.1108/10650750911001815

Coronavirus Disease (COVID-19)—Events as they happen. (n.d.). Retrieved November 20, 2020, from https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen

COVID-19 Information. (2020a, March 10). U.S. Embassy & Consulate in Morocco. https://ma.usembassy.gov/25161/

COVID-19 Information. (2020b, March 10). U.S. Embassy & Consulates in Morocco. http://ma.usembassy.gov/covid-19-information/

Dickinson, D. L., Wolkow, A. P., Rajaratnam, S. M. W., & Drummond, S. P. A. (2018). Personal sleep debt and daytime sleepiness mediate the relationship between sleep and mental health outcomes in young adults. *Depression and Anxiety*, *35*(8), 775–783. https://doi.org/10.1002/da.22769

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, Phone, Mail, and Mixed-Mode Surveys: The Tailored Design Method*. John Wiley & Sons, Incorporated. http://ebookcentral.proquest.com/lib/wpi/detail.action?docID=1762797

Diyen, H. (2004). Reform of secondary education in Morocco: Challenges and prospects. *Prospects : Quarterly Review of Comparative Education*, *34*(2), 211–222. https://doi.org/10.1023/B:PROS.0000037140.40046.b6

Echezona, R., & Ugwuany, C. (2010a). African University Libraries and Internet Connectivity: Challenges and the Way Forward. *Library Philosophy and Practice*, *2010*.

Echezona, R., & Ugwuany, C. (2010b). African University Libraries and Internet Connectivity: Challenges and the Way Forward. *Library Philosophy and Practice*, *2010*.

Echezona, R., & Ugwuany, C. (2010c). African University Libraries and Internet Connectivity: Challenges and the Way Forward. *Library Philosophy and Practice*, *2010*.

EQ-5D. (n.d.). Retrieved November 18, 2020, from https://euroqol.org/

Fang, J., Tang, L., Yang, J., & Peng, M. (2019). Social interaction in MOOCs: The mediating effects of immersive experience and psychological needs satisfaction. *Telematics and Informatics*, *39*, 75–91. https://doi.org/10.1016/j.tele.2019.01.006

Federal Policy for the Protection of Human Subjects ('Common Rule. (2009, June 23). [Text]. HHS.Gov. https://www.hhs.gov/ohrp/regulations-and-policy/regulations/common-rule/index.html

Fraguela-Vale, R., Varela-Garrote, L., Carretero-García, M., & Peralbo-Rubio, E. M. (2020). Basic Psychological Needs, Physical Self-Concept, and Physical Activity Among

Adolescents: Autonomy in Focus. *Frontiers in Psychology*, *11*. https://doi.org/10.3389/fpsyg.2020.00491

French neo-colonial influence on Moroccan language education policy: A study of current status of standard Arabic in science disciplines | SpringerLink. (n.d.). Retrieved November 21, 2020, from https://link.springer.com/article/10.1007/s10993-015-9398-3

Goetz, T., Bieleke, M., Gogol, K., van Tartwijk, J., Mainhard, T., Lipnevich, A. A., & Pekrun, R. (2021). Getting along and feeling good: Reciprocal associations between student-teacher relationship quality and students' emotions. *Learning and Instruction*, *71*, 101349. https://doi.org/10.1016/j.learninstruc.2020.101349

Gouëdard, P., & Pont, B. (2020). *Education and COVID-19: Focusing on the long-term impact of school closures*. OECD. https://www.oecd.org/coronavirus/policy-responses/education-and-covid-19-focusing-on-the-long-term-impact-of-school-closures-2cea926e/

Greenberg, G. (1998). Distance education technologies: Best practices for K-12 settings. *IEEE Technology and Society Magazine*, *17*(4), 36–40. https://doi.org/10.1109/44.735862

Haimou, M. (2020, March 30). L'Université internationale de Rabat lance plusieurs initiatives. *Industrie Du Maroc Magazine*. https://industries.ma/luniversite-internationale-de-rabat-lance-plusieurs-initiatives/

Harding, S., Morris, R., Gunnell, D., Ford, T., Hollingworth, W., Tilling, K., Evans, R., Bell, S., Grey, J., Brockman, R., Campbell, R., Araya, R., Murphy, S., & Kidger, J. (2019). Is teachers' mental health and wellbeing associated with students' mental health and

wellbeing? *Journal of Affective Disorders*, *242*, 180–187. https://doi.org/10.1016/j.jad.2018.08.080

Hbf878. (2020). *English: Diagram / chart showing the number of COVID-19 ("Corona") cases in Morocco. Logarithmic Scale. For related diagrams and data sources see User:Hbf878#COVID-19.* Own work. https://commons.wikimedia.org/wiki/File:COVID-19-Morocco-log.svg

Herdman, M., Gudex, C., Lloyd, A., Janssen, MF., Kind, P., Parkin, D., Bonsel, G., & Badia, X. (2011). Development and preliminary testing of the new five-level version of EQ-5D (EQ-5D-5L). *Quality of Life Research*, *20*(10), 1727–1736. https://doi.org/10.1007/s11136-011-9903-x

Hopkins, D., & Levin, B. (n.d.). *Educational Reform and School Improvement*. 6.

Ibn-Mohammed, T., Mustapha, K. B., Godsell, J., Adamu, Z., Babatunde, K. A., Akintade, D. D., Acquaye, A., Fujii, H., Ndiaye, M. M., Yamoah, F. A., & Koh, S. C. L. (2021). A critical analysis of the impacts of COVID-19 on the global economy and ecosystems and opportunities for circular economy strategies. *Resources, Conservation, and Recycling*, *164*, 105169. https://doi.org/10.1016/j.resconrec.2020.105169

Janati Idrissi, A., Lamkaddem, A., Benouajjit, A., Ben El Bouaazzaoui, M., El Houari, F., Alami, M., Labyad, S., Chahidi, A., Benjelloun, M., Rabhi, S., Kissani, N., Zarhbouch, B., Ouazzani, R., Kadiri, F., Alouane, R., Elbiaze, M., Boujraf, S., El Fakir, S., & Souirti, Z. (2020). Sleep quality and mental health in the context of COVID-19 pandemic and lockdown in Morocco. *Sleep Medicine*, *74*, 248–253. https://doi.org/10.1016/j.sleep.2020.07.045

Karpman, M., Zuckerman, S., Gonzalez, D., & Kenney, G. M. (2020, April 27). *The COVID-19 Pandemic Is Straining Families' Abilities to Afford Basic Needs*. Urban Institute. https://www.urban.org/research/publication/covid-19-pandemic-straining-families-abilities-afford-basic-needs

Leigh Jones. (2008). NYU law school to offer online degree. *The National Law Journal*, *30*(26), 4-5.

LMS - Higher Ed. (n.d.). Instructure. Retrieved March 9, 2021, from https://www.instructure.com/product/canvas/higher-education/lms

Martin, A., Markhvida, M., Hallegatte, S., & Walsh, B. (2020). Socio-Economic Impacts of COVID-19 on Household Consumption and Poverty. *Economics of Disasters and Climate Change*, *4*(3), 453–479. https://doi.org/10.1007/s41885-020-00070-3

Michael Hill. (2000). UMBC officials announce plan to offer online master's degree School, British institution team up for Web venture: FINAL Edition. *The Baltimore Sun*. https://www.baltimoresun.com/news/bs-xpm-2000-12-12-0012120383-story.html

Ministry says private universities not eligible for bailouts. (n.d.). University World News. Retrieved March 16, 2021, from https://www.universityworldnews.com/post.php?story=20200707073501167

Morgan, H. (2020). Best Practices for Implementing Remote Learning during a Pandemic. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, *93*(3), 135–141. https://doi.org/10.1080/00098655.2020.1751480

Morocco: A case for building a stronger education system in the post Covid-19 era. (n.d.-a). World Bank. Retrieved December 2, 2020, from https://www.worldbank.org/en/news/feature/2020/10/27/a-case-for-building-a-stronger-education-system-in-the-post-covid-19-era

MOROCCO: Covid-19 Impacts Poverty. (2020). *Africa Research Bulletin: Economic, Financial and Technical Series*, *57*(8), 23113B-23113C. https://doi.org/10.1111/j.1467-6346.2020.09667.x

Morocco Economic Monitor – Morocco's Economic Prospects and the COVID-19 Crisis Impact. (n.d.). World Bank. Retrieved November 10, 2020, from https://www.worldbank.org/en/region/mena/publication/morocco-economic-monitor---moroccos-economic-prospects-and-the-covid-19-crisis-impact

Morocco: Stepping Up to the COVID-19 Pandemic Outbreak. (n.d.-b). World Bank. Retrieved November 10, 2020, from https://www.worldbank.org/en/news/feature/2020/06/16/morocco-stepping-up-to-the-covid-19-pandemic-outbreak

Mot du Président|UIR. (n.d.). Retrieved November 10, 2020, from https://www.uir.ac.ma/fr/page/message-du-president

Nachit, H., & Belhcen, L. (2020). *Digital Transformation in Times of COVID-19 Pandemic: The Case of Morocco* (SSRN Scholarly Paper ID 3645084). Social Science Research Network. https://doi.org/10.2139/ssrn.3645084

Pearson Product-Moment Correlation—When you should run this test, the range of values the coefficient can take and how to measure strength of association. (n.d.). Retrieved March

16, 2021, from https://statistics.laerd.com/statistical-guides/pearson-correlation-coefficient-statistical-guide.php

PROJET MarMOOC|UIR. (n.d.). Retrieved March 16, 2021, from https://www.uir.ac.ma/fr/actualite/projet-marmooc

Rabat, U. I. de. (2015). *Français: Bâtiment d'enseignement - UIR*. Own work. https://commons.wikimedia.org/wiki/File:B%C3%A2timent_UIR.jpg

Raes, A., Vanneste, P., Pieters, M., Windey, I., Van Den Noortgate, W., & Depaepe, F. (2020). Learning and instruction in the hybrid virtual classroom: An investigation of students' engagement and the effect of quizzes. *Computers & Education*, *143*, 103682. https://doi.org/10.1016/j.compedu.2019.103682

RWJF - Qualitative Research Guidelines Project | Constant Comparative Method | Constant Comparative Method—Grounded Theory. (n.d.). Retrieved February 9, 2021, from http://www.qualres.org/HomeCons-3824.html

Salikhova, N. R., Lynch, M. F., & Salikhova, A. B. (2020). Psychological Aspects of Digital Learning: A Self-Determination Theory Perspective. *Contemporary Educational Technology*, *12*(2), ep280. https://doi.org/10.30935/cedtech/8584

Sample Size Calculator (Use in 60 Seconds) // Qualtrics. (2020, May 21). Qualtrics. https://wordpressstaging.qualtrics.com/blog/calculating-sample-size/

Saoudi, K., Chroqui, R., & Okar, C. (2020). Student Achievement in Moroccan Student Achievement in Moroccan Educational Reforms: A Significant Gap Between Aspired

Outcomes and Current Practices. *Interchange*, *51*(2), 117–136. https://doi.org/10.1007/s10780-019-09380-2

Sassi, M., Bouderga, S., Ahmed, C., & Hammani, M. (n.d.). *Morocco – TIMSS 2015 Encyclopedia*. Retrieved February 26, 2021, from http://timssandpirls.bc.edu/timss2015/encyclopedia/countries/morocco/

Sawahel, W. (2020, September 7). Ministry floats hybrid model for upcoming academic year. *University World News: Africa Edition*. https://www.universityworldnews.com/post.php?story=20200907144441712

The Best Online Bachelor's Degree Programs—US News. (n.d.). Retrieved March 9, 2021, from https://www.usnews.com/education/online-education/bachelors/rankings

UIR – Université Internationale de Rabat. (n.d.). Retrieved November 10, 2020, from https://www.uir.ac.ma/

Unsplash. (n.d.). *Photo by mehdi lamaaffar on Unsplash*. Retrieved November 12, 2020, from https://unsplash.com/photos/PqX7EELWjh0

Valentine, D. (2002). Distance Learning: Promises, Problems, and Possibilities. *Online Journal of Distance Learning Administration*, *5*(3). https://www.westga.edu/~distance/ojdla/fall53/valentine53.html

We Are WPI | | WPI. (n.d.). Retrieved December 4, 2020, from https://www.wpi.edu/we-are-wpi

Wilson, A. D., Onwuegbuzie, A. J., & Manning, L. P. (2016). Using paired depth interviews to collect qualitative data. *The Qualitative Report*, *21*(9), 1549–1574.

Zhang, H., Chen, X., Dong, Y., Xu, W., & Wang, S. (2016). Analyzing Saaty's consistency test in pairwise comparison method: A perspective based on linguistic and numerical scale. *Soft Computing (Berlin, Germany), 22*(6), 1933–1943. https://doi.org/10.1007/s00500-016-2454-x

Zidoun, Y., Arroum, F.-Z. E., Talea, M., & Dehbi, R. (2016). Students' Perception About Mobile Learning in Morocco: Survey Analysis. *International Journal of Interactive Mobile Technologies (IJIM), 10*(4), 80–84. (N.d.).

Appendices

Appendix A: Survey Consent Statement

Note: This information was provided at the beginning of the student and faculty surveys.

Informed Consent Agreement for Participation in a Research Study

Title of Research Study: Improving Distanced Education at The International University of Rabat (UIR)

Introduction: You are being asked to participate in a research study. Before you agree, however, you must be fully informed about the purpose of the study, the procedures to be followed, and any benefits, risks or discomfort that you may experience as a result of your participation. This form presents information about the study so that you may make a fully informed decision regarding your participation. Taking this survey will take approximately 7 minutes.

Purpose of the study:

(1) Understand the multidimensional impacts of COVID-19 on students and faculty at UIR to ultimately provide recommendations to improve education during the pandemic.

(2) Assess student/faculty reactions and feelings about online learning.

Procedures to be followed:

Please complete the survey in its entirety and respond as truthfully as possible.

Risks to study participants: Minimal risk. Some participants may experience anxiety as a result of the sensitive or delicate subjects asked (i.e., financial situation, mental health, etc.).

Benefits to research participants and others: By participating in this study, you will contribute to research on how to overcome the difficulties of distance education and to improve its quality.

Record keeping and confidentiality: Please remember that your answers will remain anonymous. No names or identifying information will appear on the questionnaires or any of the project reports or publications. If you are interested, we can share a copy of our results with you at the end of the project.

Records of your participation in this study will be held confidential so far as permitted by law. However, the study investigators, the sponsor or its designee and, under certain circumstances, the Worcester Polytechnic Institute Institutional Review Board (WPI IRB) will be able to inspect and have access to confidential data that identify you by name. **Any publication or presentation of the data will not identify you.**

Compensation or treatment in the event of injury: None. You do not give up any of your legal rights by signing this statement.

Should a participant wish to withdraw from the study after it has begun, the participant should contact the UIR-COVID IQP team (gr-uircovid-c21@wpi.edu) if they wish for their data to be removed from the study. There is no consequence for early withdrawal.

For more information about this research or about the rights of research participants, or in case of research-related injury, contact:

Investigator: UIR-COVID IQP team (gr-uircovid-c21@wpi.edu)

IRB Manager: Ruth McKeogh (Tel. 508-831-6699, irb@wpi.edu)

Project Advisors: El Hamzaoui, Mohammed (melhamzaoui@wpi.edu), Rebecca Moody (rmoody@wpi.edu)

Human Protection Administrator: Gabriel Johnson (Tel. 508-831-4989, gjohnson@wpi.edu)

Your participation in this research is voluntary. Your refusal to participate will not result in any penalty to you or any loss of benefits to which you may otherwise be entitled. You may decide to stop participating in the research at any time without penalty or loss of other benefits. The project investigators retain the right to cancel or postpone the experimental procedures at any time they see fit.

By continuing from this page, you acknowledge that you have been informed about the consent to be a participant in the study described above. Make sure that your questions are answered to your satisfaction before continuing. You are entitled to retain a copy of this consent agreement.

Appendix B: Interview Consent Statement -WPI

Note: This consent statement offered participants the option to participate or not, as well as withdraw at any time during surveys and interviews.

We are an IQP Team from WPI looking to conduct interviews with WPI administration and faculty to learn more about the difficulties of distance learning caused by the COVID-19 pandemic and what WPI has done to address these difficulties. We are looking to use this information to help improve the quality of remote education at the International University of Rabat (UIR) in Morocco. This research will be used by our IQP team in order to provide recommendations to UIR to improve quality of online education and better plan future situations that call for remote learning.

The interview will be conducted over Zoom or Microsoft Teams. We would like to get your consent to record the interview for our own records. This recording will not be distributed to anyone outside of the UIR COVID IQP team and its contents will remain anonymous. If you do not wish to have the interview recorded, we will have another member of the team act as a scribe to take notes during the interview.

Your participation in this interview 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 any of the project reports or publications. If you are 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-uircovid-c21@wpi.edu or IRB Manager at WPI (Ruth McKeogh, Tel. 508-831-6699, Email: irb@wpi.edu).

Appendix C: Interview Consent Statement-UIR

Note: This consent statement offered participants the option to participate or not, as well as withdraw at any time during surveys and interviews.

We are a group of students from Worcester Polytechnic Institute (WPI) in Massachusetts. We are conducting an interview of UIR students and faculty to learn more about the difficulties of distance learning caused by the COVID-19 pandemic to improve the quality of remote education. This research will be used by our IQP team in order to provide recommendations to UIR to improve quality of online education and better plan future situations that call for remote learning.

The interview will be conducted over Zoom or Microsoft Teams. We would like to get your consent to record the interview for our own records. This recording will not be distributed to anyone outside of the UIR COVID IQP team and its contents will remain anonymous. If you do not wish to have the interview recorded, we will have another member of the team act as a scribe to take notes during the interview.

Your participation in this interview 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 any of the project reports or publications. If you are 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-uircovid-c21@wpi.edu or IRB Manager at WPI (Ruth McKeogh, Tel. 508-831-6699, Email: irb@wpi.edu).

Appendix D: Sample EQ-5D-5L Health Questionnaire

Note: This standardized survey was not administered for our research. We used this survey as a model for the health survey we developed which we show in Appendix F.

Under each heading, please tick the ONE box that best describes your health TODAY.

MOBILITY

- I have no problems in walking about ❑
- I have slight problems in walking about ❑
- I have moderate problems in walking about ❑
- I have severe problems in walking about ❑
- I am unable to walk about ❑

SELF-CARE

- I have no problems washing or dressing myself ❑
- I have slight problems washing or dressing myself ❑
- I have moderate problems washing or dressing myself ❑
- I have severe problems washing or dressing myself ❑
- I am unable to wash or dress myself ❑

USUAL ACTIVITIES *(e.g. work, study, housework, family or leisure activities*

- I have no problems doing my usual activities ❑
- I have slight problems doing my usual activities ❑
- I have moderate problems doing my usual activities ❑
- I have severe problems doing my usual activities ❑
- I am unable to do my usual activities ❑

PAIN / DISCOMFORT

- I have no pain or discomfort ❑
- I have slight pain or discomfort ❑
- I have moderate pain or discomfort ❑
- I have severe pain or discomfort ❑
- I have extreme pain or discomfort ❑

ANXIETY / DEPRESSION

- I am not anxious or depressed ❑
- I am slightly anxious or depressed ❑
- I am moderately anxious or depressed ❑
- I am severely anxious or depressed ❑
- I am extremely anxious or depressed ❑

Appendix E: Closed-Ended Survey Questions - Faculty & Students

Note: This survey was one of two surveys our team utilized. There was an option to complete in English or French.

General Questions – Responded to by Students and Professors

Variable Title	Question	Response Options
School	What school do you teach at or take classes at?	• School of Aerospace Engineering • School of Automotive Engineering • Ecole Supérieure de l'Ingénierie de l'Energie • Ecole Supérieure de l'Informatique et du Numérique • Rabat Higher School of Architecture Faculté International de Médecine Dentaire • Sciences Po Rabat • Ecole de Droit de Rabat • Languages, cultures, and civilizations • Rabat business school • Doctoral school
Student or Professor	Are you a student or a professor?	• Student • Professor

PROFESSOR SURVEY QUESTIONS

Professor - Well-Being

Variable Title	Question	Response Options
Professor Sleep Quality	How was your sleep quality during online learning mode in comparison to in-person learning mode?	• 1 – Much Worse • 2-Worse • 3 – Same • 4-Better • 5 – Much Better
Professor Exercise Frequency	How often were you able to exercise during online	• 1 – Much Less • 2- Less

	learning mode in comparison to in-person learning mode?	• 3 – Same • 4-More • 5 – Much More
Professor Mental Health	How was your mental health during online learning mode in comparison to in-person learning mode?	• 1 – Much Worse • 2-Worse • 3 – Same • 4-Better • 5 – Much Better

Professor - Financial Impacts

Variable Title	Question	Response Options
Professor Job Loss	Have you or any household family members lost a job as a result of the pandemic?	• Yes • No
Professor Financial Stress	My level of financial stress since the pandemic in comparison to before the pandemic has been	• 1 – Much Less • 2-Less • 3 – Same • 4-Greater • 5 – Much Greater

Professor - Remote Teaching and Motivation

Variable Title	Question	Response Options
Professor Teaching Mode	How are you currently teaching classes?	• 1 - Fully Online • 2 - Hybrid • 3 - Fully In-Person
Professor Perception of Student Learning	How much do you believe your students are learning during online learning mode in comparison to in-person learning mode?	• 1 – Much Less • 2-Less • 3 – Same • 4 - More • 5 – Much More
Professor Teaching Quality	How was your teaching quality during online learning mode in comparison to in-person learning mode	• 1 – Much Worse • 2-Worse • 3 – Same • 4-Better • 5 – Much Better
Professor Motivation	How motivated did you feel doing schoolwork during	• 1 – Much Less Motivated

	online learning mode in comparison to in-person learning mode?	• 2-Less Motivated • 3 – Neither More or Less Motivated • 4-Motivated • 5 – Much More Motivated
Professor Work Location	Where did you do your schoolwork most often during in-person learning mode?	• Home • Office/Classroom • Other

Professor - Student/Professor Relationship

Variable Title	Question	Response Options
Professor Class dynamic Perception	I felt that the class dynamic during online learning mode in comparison to in-person learning mode was...	• 1 – Much Worse • 2-Worse • 3 – Same • 4-Better • 5 – Much Better
Professor Perception of UIR Student Success Priority	I felt that UIR student success was the university's priority during online learning mode.	• 1 – Strongly Disagree • 2-Disagree • 3 – Neither agree not disagree • 4-Agree • 5 – Strongly Agree
Professor Perception of Student Resources	I felt that UIR provided sufficient resources for students to succeed during online learning mode.	• 1 – Strongly Disagree • 2-Disagree • 3 – Neither agree nor disagree • 4-Agree • 5 – Strongly Agree
Professor Perception of Faculty Resources	I felt that UIR provided sufficient resources for faculty to succeed during online learning mode	• 1 – Strongly Disagree • 2-Disagree • 3 – Neither agree nor disagree • 4-Agree • 5 – Strongly Agree

Professor - Schoolwork Integrity

Variable Title	Question	Response Options
Professor Perception of Student Grades	How were your students' grades during online learning mode in comparison to in-person learning mode?	• 1 – Much Worse • 2-Worse • 3 – Same • 4-Better • 5 – Much Better

Professor - Online Learning Infrastructure

Variable Title	Question	Response Options
Internet Access	Do you have internet access at home?	• Yes • No
Poor connection frequency	How often has poor internet connection impacted your ability to teach class?	• Never • Less than once a class • About once a class • More than once a class
Device Ownership	Do you have your own device for doing schoolwork and teaching online?	• Yes • No
Device Used	What device do you use to do schoolwork and teach online? (Check all that apply) What device do you use to do schoolwork and teach online? (Check all that apply)	• Laptop • Phone • Other

Professor - General

Variable Title	Question	Response Options
UIR Pandemic Response	I feel that UIR has responded well to the pandemic.	• 1 – Strongly Disagree • 2-Disagree

		• 3 – Neither agree nor disagree • 4 - Agree • 5 – Strongly Agree

STUDENT SURVEY QUESTIONS

Student - School year

Variable Title	Question	Response Options
Years Studying at UIR	How many years have you been studying at UIR?	• Less than a year • 1 year • 2 years • 3 years • 4 years • 5 or more years

Student - School year

Variable Title	Question	Response Options
Years of Study at UIR	How many years have you been studying at UIR?	• Less than a year • 1 year • 2 years • 3 years • 4 years • 5 or more years

Student - Well-Being

Variable Title	Question	Response Options
Sleep Quality	How was your sleep quality during online learning mode in comparison to in-person learning mode?	• 1 – Much worse • 2 - Worse • 3 – Same • 4 - Better • 5 – Much better
Exercise Frequency	How often were you able to exercise during online learning mode in comparison to in-person learning mode?	• 1 – Much Less • 2 - Less • 3 – Same • 4 - More • 5 – Much More

Mental Health Comparison	How was your mental health during online learning mode in comparison to in-person learning mode?	• 1 – Much worse • 2 - Worse • 3 – Same • 4 - Better • 5 – Much better

Student - Mental Health

Variable Title	Question	Response Options
Use of Student Health Center	How often did you use the Student Health Center and/or Psychological Counseling Service during online learning mode in comparison to in-person learning mode?	• 1- Much Less • 2-Less • 3-Sometimes • 4-More • 5-Much More
Benefit of Health Services	How much did you benefit from these services?	• 1-Not at all • 2- • 3-Somewhat • 4- • 5-Greatly
Accessibility of Health Services	How accessible were these services?	• 1-Not accessible • 2- • 3-Somewhat accessible • 4- • 5-Very accessible

Student - Financial Impacts

Variable Title	Question	Response Options
Paying Tuition	Who is paying for your tuition? Select all that apply.	• Myself • My parents • Another family member • A scholarship • Other source

		• Prefer not to answer
Family Loss of Job	Have you or any household family members lost a job as a result of the pandemic?	• Yes • No
Financial Stress Comparison	My level of financial stress during the pandemic in comparison to before the pandemic has been...	• - Much Worse • 2-Worse • 3- Same • 4-Better • 5- Much Greater

Student - Remote Learning and Motivation

Variable Title	**Question**	**Response Options**
How Taking Classes	How are you currently taking classes?	• Fully online • Hybrid • Fully in-person
Attention Online	How much did you typically pay attention during class during online learning mode in comparison to in-person learning mode?	• 1- Much Worse • 2-Worse • 3- Same • 4-Better • 5- Much Better
Learning Online	How much did you learn during online learning mode in comparison to in-person learning mode?	• 1- Much Worse • 2-Worse • 3- Same • 4-Better • 5- Much Better
Grades Online	How were your grades during online learning mode in comparison to in-person learning mode?	• 1- Much Less Motivated • 2-Less Motivated • 3- Neither More Nor Less Motivated • 4-More Motivated • 5- Much More Motivated
Motivation Online	How motivated did you feel doing schoolwork during	• 1- Much Less Motivated

	online learning mode in comparison to in-person learning mode?	• 2-Less Motivated • 3- Neither More Nor Less Motivated • 4-More Motivated • 5- Much More Motivated
Schoolwork Location	Where did you do your schoolwork most often during in-person learning mode?	• Home • On Campus • Other _____ _____ _____
Schoolwork Location	Where did you do your schoolwork most often during online learning mode?	• Home • On Campus • Other _____ _____ _____

Student - Student-Professor Relationship

Variable Title	**Question**	**Response Options**
Class dynamic Comparison	I felt that the class dynamic during online learning mode in comparison to in-person learning mode was...	• 1- Much Worse • 2-Worse • 3- Same • 4-Better • 5- Much Better
UIR's Priority-Students	I felt that UIR students were the university's priority during online learning mode.	• 1- Strongly Disagree • 2-Disagree • 3- Neither Agree Nor Disagree • 4-Agree • 5- Strongly Agree

UIR Student Resources	I felt that UIR provided sufficient resources for students to succeed during online learning mode.	• 1- Strongly Disagree • 2-Disagree • 3- Neither Agree Nor Disagree • 4-Agree • 5- Strongly Agree

Student - Schoolwork Integrity

Variable Title	Question	Response Options
Cheating Inclination	How inclined did you feel to cheat during online learning mode in comparison to in-person learning mode?	• 1- Strongly Disagree • 2-Disagree • 3- Neither Agree Nor Disagree • 4-Agree • 5- Strongly Agree

Student - Online Learning Infrastructures

Variable Title	Question	Response Options
Home Internet Access	Do you have internet access at home?	• Yes • No
Internet Connection Impact	Has poor internet connection ever impacted your ability to attend class?	• Yes • No
Frequency of Internet Impact	How often has poor internet connection impacted your ability to attend class?	• Never • Less than once a class • About once a class • More than once a class
Own a Device for Schoolwork	Do you have your own device for doing schoolwork and attending class online?	• Yes • No
Device to Attend Classes	What device do you use to do schoolwork and attend class online?	• Laptop • Phone • Other

Student – General

Variable Title	Question	Response Options
Family Opinion on Online Learning	How do your parents/guardians feel about you taking classes online rather than in-person?	• 1- Strongly Against • 2-Against • 3- Neither For Nor Against • 4-For • 5- Strongly For
UIR Response to Pandemic	I feel that UIR has responded well to the pandemic.	• 1- Strongly Disagree • 2-Disagree • 3- Neither Agree Nor Disagree • 4-Agree • 5- Strongly Agree

Appendix F: Closed-Ended Health Survey Questions - Faculty & Students

Note: This survey was one of two surveys our team utilized. There was an option to complete in English or French.

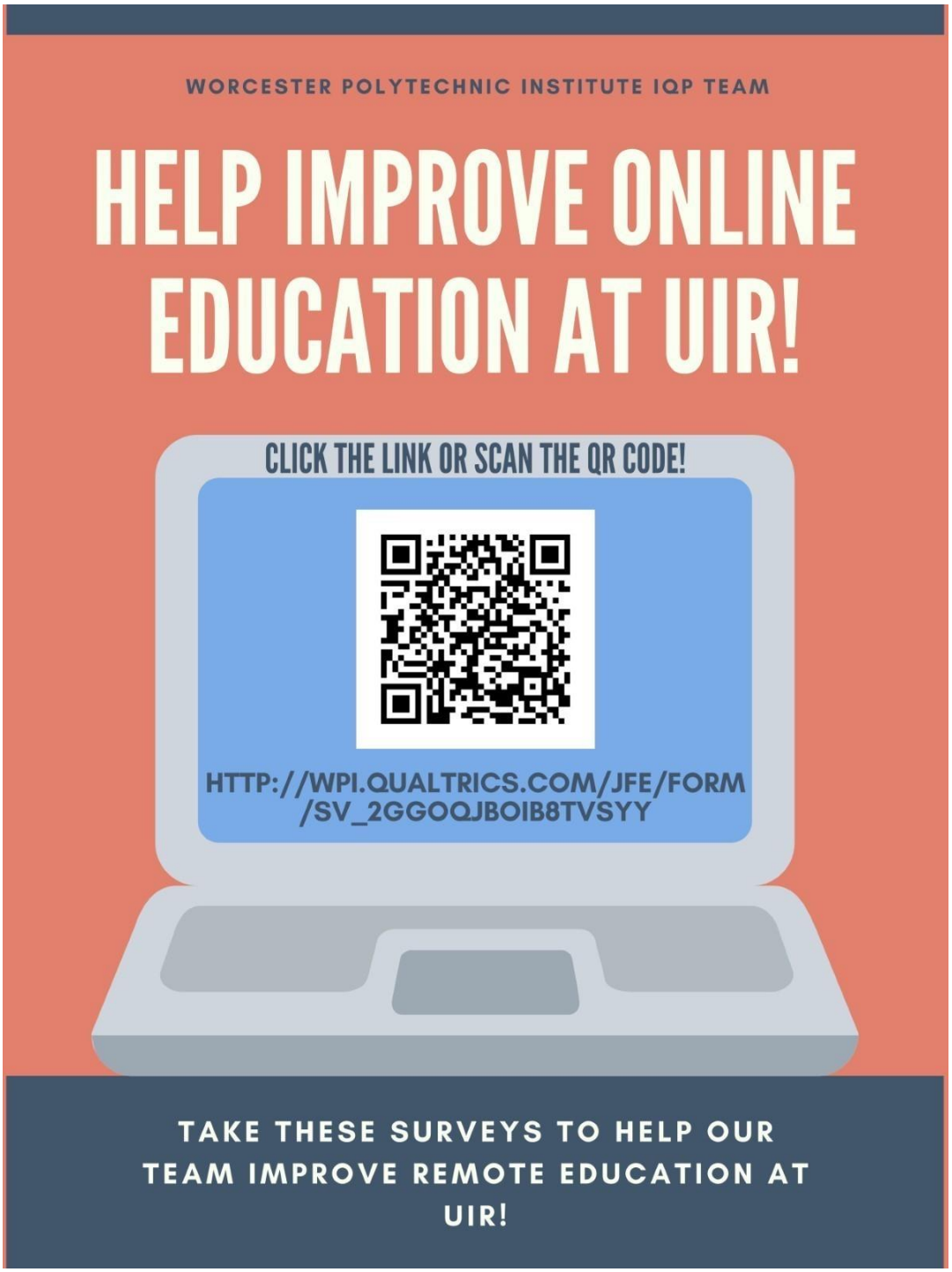
All questions same for students and professors

Variable Title	Question	Response Options
Student or Professor	Are you a student or professor?	• Students • Professor
School	What school do you teach at or take classes at?	• School of Aerospace Engineering • School of Automotive Engineering • Ecole Supérieure de l'Ingénierie de l'Energie • Ecole Supérieure de l'Informatique et du Numérique • Rabat Higher School of Architecture • Faculté International de Médecine Dentaire • Sciences Po Rabat • Ecole de Droit de Rabat • Languages, cultures, and civilizations • Rabat business school • Doctoral school
Energy	Compared to during in-person learning, during online learning...	• I have a lot more energy • I have more energy • I have about the same energy • I have less energy • I have a lot less energy
Depression	Compared to during in-person learning, during online learning...	• I have a lot more feelings of depression • I have more feelings of depression

		• I have about the same amount of feelings of depression • I have less feelings of depression • I have a lot less feelings of depression
Anxiety	Compared to during in-person learning, during online learning...	• I have a lot more anxiety • I have more anxiety • I have about the same amount of anxiety • I have less anxiety • I have a lot less anxiety
Social Connections	Compared to during in-person learning, during online learning...	• I have much better connection with friends and family • I have better connections with friends and family • I have about the same quality connections with friends and family • I have worse connections with friends and family • I have much worse connections with friends and family
Self-Care	Compared to during in-person learning, during online learning...	• I took much better care of myself • I took better care of myself • I took care of myself about the same • I take worse care of myself • I took much worse care of myself

Appendix G: Survey Advertisement

Note: This is the advertisement our team created to incentivize our surveys for UIR students and faculty.



Appendix H: One-On-One Semi Structured Interview Questions

Note: These one-on-one interview questions for Objective 1 allowed us to ask open-ended questions to gain insightful information on the situations of students learning during a pandemic.

Focus Area	**Example of Question Probes**

Student-Professor Remote Learning Motivation	• How are you?
	• Do you feel comfortable with online learning? Why or why not?
	• How much of an adjustment was working at home for you during the lockdown?
	• When working remotely, how do you manage your day?
	• Have you learnt anything new about yourself during this time? If so, what?
	• Did the pandemic change how you see your future? How so?
	• Additionally, for students:
	  ○ How do you feel your grades will be impacted by the pandemic?
	  ○ How motivated are you compared to before the pandemic?
	• Additionally, for faculty:
	  ○ How do you feel teaching online is going compared to in-person? What are some benefits and difficulties?
	  ○ How motivated are you compared to before the pandemic?

Student/Professor Relationship	*Definition of a class dynamic: The interaction between students with their peers and teachers in a classroom community. • What was the class dynamic like *before* the pandemic? (I.e., Did you feel like you could freely ask questions? Would you consider it a good learning environment? Did you have problems with your peers, could you work together?) • How do you feel the class dynamic has changed since the pandemic and the transition to online learning? • Do you feel that UIR responded well to the pandemic and the transition to online learning? Why or why not? • What resources would you like to see from UIR to help improve the class dynamic during the pandemic? Additionally, for faculty:

	• How has your teaching changed since the pandemic? • Do you feel that the class dynamic has improved or worsened after online learning?
Physical Well-Being	• Has your sleeping been affected during the pandemic? • How often have you been exercising since the pandemic? • Do you feel supported? Who do you talk to for support?
Mental Health	• How has this past month been for you? • How did you feel at the very beginning of the pandemic? • Have these feelings changed over the months? • How have you been taking care of your own mental health during the pandemic? *Before the pandemic:* • How often did you use the Student Health Center and/or Psychological Counseling Service? • How much did you benefit from these services? • How accessible were these services? *Since the pandemic:* • How often do you use the Student Health Center and/or Psychological Counseling Service? • How much do you benefit from these services? • How accessible are these services?
Economic Impacts on Moroccan families	• Have you and/or your family felt more financially stressed due to the pandemic? • If you're comfortable sharing, how have things changed financially for yourself or family since the pandemic?
Online Learning Infrastructures	• Do you have stable internet at home or a way to access the internet elsewhere? • Do you have a device that you can work productively on? What device do you have? • Do you feel you have the necessary resources and knowledge to complete your classes online? • Where do you do your schoolwork most often?

Appendix I: Paired Depth Interview Questions

Note: These paired depth interview questions for Objective 1 allowed us to ask open-ended questions to gain insightful information on the situations of students learning during a pandemic. We had both interviewees answer each question, alternating who answers first. We also provided an opportunity for them to discuss their answers after each question.

Focus Area	**Example of Question Probes**

Student-Professor Remote Learning Motivation	• Do you feel comfortable with online learning? Why or why not?
	• How much of an adjustment was working at home for you during the lockdown?
	• When working remotely, how do you manage your day?
	• Have you learnt anything new about yourself doing online learning? If so, what?
	• Did the pandemic change how you see your future? How so?
	• Additionally, for students:
	  ○ How do you feel your grades will be impacted by the pandemic?
	  ○ How motivated are you compared to before the pandemic?
	• Additionally, for faculty:
	  ○ How did you feel teaching online was going compared to in-person? What are some benefits and difficulties?
	  ○ How motivated were you compared to before the lockdown?

Student/Professor Relationship	*Definition of a class dynamic: The interaction between students with their peers and teachers in a classroom community. • What was the class dynamic like *before* the pandemic? (I.e., Did you feel like you could freely ask questions? Would you consider it a good learning environment? Did you have problems with your peers, or could you work together?) • How do you feel the class dynamic has changed since the pandemic and the transition to online learning? • Do you feel that UIR responded well to the pandemic and the transition to online learning? Why or why not? • What resources would you like to see from UIR to help improve the class dynamic during the pandemic?

	Additionally, for faculty: • How has your teaching changed since the pandemic? • Do you feel that the class dynamic has improved or worsened after online learning?

Appendix J: Expert Interview Questions

Note: These expert interview questions for Objective 3 allowed us to gain professional insight on university plans to continue education during a pandemic.

Focus Area	**Example of Question Probes**
General Questions	· What is/was your role in the development of [insert university]'s remote education plan? • Do you or your department have data on your remote education plan that could be shared? · How many students are utilizing remote education at [insert university]? · How do you measure success in delivering a remote education plan? · How successful do you feel [insert university]'s remote education plan has been overall during the pandemic? How do you measure this success? • What have you or others done that has been beneficial to the remote learning situation and what have you or others done that have not been beneficial to the remote learning situation? • What pieces of [insert university]'a remote education plan have been most successful?
Plan Development	· Who was involved in the development of [insert university]'s remote education plan? · What outside parties aided in the development of the plan? · What did the process look like for developing the plan? · What preexisting research or plans did you use to develop [insert university]'s remote education plan? · Are there any changes you would like to see to [insert university]'s remote education plan?
Financial Considerations	· How has the financial situation of the university changed? • How did financial considerations impact what was possible in terms of remote education? · What resources are available to students if they are struggling financially? Are there resources specifically available due to COVID-19 related financial issues?
Student Mental Health	· What considerations were built into [insert university]'s remote education plan to take student mental health into account? · Does [insert university] have a program to support the mental health of the community? How has this changed due to the pandemic?

	· Does [insert university] have on staff or have close associations with mental health professionals available to the student body? If yes, is this access to professional help advertised such that students know it is available?
Online Learning Infrastructures	· What online infrastructure has been crucial to the success of remote education at [insert university]? · Were there existing online tools integrated into [insert university]'s education system before remote education was necessitated by the pandemic? · How do you think necessary online learning due to the pandemic will impact learning in the future after the pandemic ends?

Appendix K: Codebook

Note: This codebook was used for the qualitative analysis of interview transcriptions.

Code Word/Theme	Subtheme/Sub codes
Mental Health (student)	Resources
	Stress
	Anxiety
	Loneliness
	Depression
	Freedom
	Independence
	Social life
Mental Health (faculty)	Resources
	Stress
	Loneliness
	Anxiety
	Depression
	Freedom
	Independence
	Social life
Physical Wellbeing	Eating
	Sleep
	Exercise
	Sickness
Economics	Jobs
	Financial Stress
	Savings
	Paying for School
Student-Professor Relationships	Communication
	Changes
	Improvements
	Hardships
	Expectations
	Contrast to in-person
	Scale of Motivation
	Method for teaching
	Teaching Subject
	Assignment structure changes
Online Infrastructure	Accommodations/Disability
	Internet accessibility
	Working Device

	Knowledge
	Resources
Parental Roles	Parental financial pressure
	Parental academic pressure
Classes/Academics	Projects
	Studying
	Careers
	Academic confidence
Potential Recommendations	Planning
	Collaborating
	Tools
Classroom Integrity	Cheating

Appendix L: Project Timeline

Note: The project timeline will help us organize our objectives to complete all tasks on time.

	Week							
Objective	PQP	1	2	3	4	5	6	7
Collect Information on the Impacts of COVID-19 on UIR								
Analyze the Impacts of COVID-19 on UIR Through Statistical Analysis								
Analyze and Provide Recommendations for UIR's Remote Learning								

Appendix M: Online Professor Training Workshop Website Link

Note: This is the link for the website of the online training resources that we developed for UIR professors. With permission, we adapted content created by Caitlin Keller and Valerie Smedile Rifkin from the WPI Morgan Teaching and Learning Center for these resources.

https://sites.google.com/view/uironlineteaching/home