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Communication Technology Impact on Underrepresented Minority Students During the COVID-19 Pandemic: Issues and Tentative Solutions

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Abstract: *Started in the Spring 2020, the COVID-19 has dramatically changed the college educational instruction dynamics i.e., switched from traditional in-person learning to distant remote learning. It will take years to fully understand the impact of the shift to remote instruction in higher education forced by the COVID-19 pandemic. There are many challenges college students face including media outlets, food insecurity, and adequate technology. This study focuses on how communication technology affects URM students' satisfaction level with remote learning delivery method, and with the communication technology provided/used during the COVID-19 pandemic, and the possible solutions to the issues identified regarding the communication technology provided/used for remote learning.*

Keywords*: Information Technology (IT), Communication Technology, Underrepresented Minority (URM),First Generation Student, COVID-19, Pandemic, Remote Learning, Online Instruction, Virtual Class,*

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I. Introduction

Almost 20 million students are enrolled in institutions of higher education annually (National Center for Educational Statistics, 2019), comprising 40% of the U.S. population aged 18 to 24 (Institute of Education Sciences, 2020). The college population has become increasingly diverse, with growing numbers of "nontraditional" students, who are older in age and typically have work, family, and other responsibilities that pose added challenges to their academic success (Hittepole, n.d.). 40% of students are now over the age of 25, 44% are students of color, and 34% are first-generation students (i.e., neither parent attended college; Bill and Melinda Gates Foundation, 2020; Higher Learning Advocates, 2018). Underrepresented minority (URM, defined by the National Science Foundation as Black, Hispanic, native American, Alaska native, or pacific Islander) who typically have lower persistence and graduation rates in college compared to White or Asian students (Bowen et.al 2009).

Started in the Spring 2020, the COVID-19 has dramatically changed the college educational instruction dynamics i.e., switched from traditional in-person learning to distant remote learning. It will take years to fully understand the impact of the shift to remote instruction in higher education forced by the COVID-19 pandemic. There are many challenges college students face including media outlets, food insecurity, and adequate technology (Barber et.al, 2021). Previous research prior to COVID-19 shows that Black and Latinx students are disadvantaged in online classes (Kaupp, 2012; Ke & Kwak, 2013; Xu & Jaggars, 2014), the same pattern shows to COVID-related remote instruction particularly for first-generation and low-income students (Soria et.al, 2020; Soria et.al, 2020). Access to computers and the Internet is a long-standing issue in minority populations (Pearson, 2002). As such, minority populations are more likely than Whites to access the Internet via mobile phone (Prieger, 2015), potentially reducing student participation in remote learning. Because technological issues can lower student course satisfaction (Pollock & Wilson, 2002), these temporary pandemic-related challenges could potentially have longer-term impacts on student success. Remote learning hinges on technology, especially the communication technology. As such, universities should provide resources to improve student communication technology access.

Sothern University at New Orleans (SUNO) is an under-resourced Historically Black College and University (HBCU) college. Majority of the student body at SUNO are first generation college students with limited financial resource. During COVID-19 pandemic in Spring 2020, the mandatory stay-at-home orders from the state and local governments precluded any in-person, hands-on instruction at SUNO, just like many other universities across the country. All of the classes at SUNO were converted to either synchronized or asynchronized remote learning mode. Remote learning heavily relies on technology, to be more specific, the communication technology.

As we all know that remote learning and online instruction can offer many advantages for students such as providing students with greater access to courses, and greater scheduling flexibility, and deliver courses safely during the COVID-19 pandemic. However, there are technology obstacles that URM and first-generation students face that can affect their satisfaction of remote learning and their academic performance. Some obvious communication technology obstacles include:

- Affordability - Can I afford the technology needed to communicate with others and stay safe?
- Accessibility - Is my surrounding technological infrastructure sufficient for me to communicate with others?

This study focuses on how communication technology affects URM students' satisfaction level with remote learning and online instruction delivery method, and with the communication technology used during the COVID-19 pandemic, and the possible solutions to the issues identified regarding the communication technology provided/used for remote learning.

This paper is organized as follows: 1) Literature review of communication technology and remote learning and online instruction; 2) research methodology; 3) discussion of the research results; and 4) conclusion.

II. Literature Review

Communication Technology

Remote learning and online instruction hinge on communication technology. As Alhadlaq (2016) states in his study that information technolog plays a significant role in maintaing communication needs. Staying connected during the pandemic is important on many levels. Especially at institutions of higher education. College campuses have been especially hard-hit and COVID-19 cases rose due to super-spreader events (Curley, 2020). For instance, New Orleans colleges and universities have been hard hit because of the large population participated in Mardi Gras festivities during February 2020. SUNO is one of those colleges in New Orleans that is hit hard during the COVID-19 pandemic.

As pandemic information spreads, students are going to go through various stages. At one point, parents and students are going to become concerned, panicked, or scared. To keep people connected and working on the same page, proper communication must be established. Institutions need to understand their role in carrying people through this crisis. Staff and administration should know how they react. School leaders need to take a proactive approach and communicate with faculty, staff, students, and parents alike. Using technology to stay connected and ensure there is adequate communication is the best route for schools.

Ibrahim Almada (Alhadlaq, 2016) states "technology has influenced communication through improved quality, diminished communicating cost, altered nature and style of communication". There are various ways of communication that utilize technology and they include email, blogs, video calls, cellular phones, and online chats. Technology also helps in facilitating recording and storage of verbal communication and retaining old contacts as well. Carter (Carter, 2020) states that the technology "arc of innovative progress has reached an inflection point. Recent technological change that has brought immeasurable improvements to billions around the globe now threatens to overwhelm us. Making this disruption positive for all is the chief challenge of our time". Information technology has provided us with infrastructure and apps that allow us to keep in touch (My Computer Career, 2020).

- **Video and Audio Calls** – The ability to see and hear people, regardless of our physical location, is all thanks to information technology. Numerous software and apps allow us to get into one-on-one calls or even group calls with family, friends, acquaintances, fellow employees, and anyone else we can call. This can allow us to destress, learn important news, and stay connected.
- **Messaging** – Video calls are not always the best form of communication. Sometimes we want to communicate without the hassle of getting on a call. Direct messaging enables us to communicate in real time without speaking and immediate response.
- **Sharing** -There are certain times when words are not enough to convey a message. In these kinds of situations, we can share memories, songs, and events with people we care about. This enables us to share ideas, reminisce about old times, and dream about the future.

However, besides those abovementioned benefits with information technology, there are some barriers to using technology to communicate and study remotely for college students especially for the URM students during the pandemic: the first significant barrier is a**ffordability.** For technology to help us continue to communicate during a pandemic, we must be able to afford to buy the right equipment needed for the job. For example, if Wi-Fi is a requirement to connect to online classes, then we must purchase Wi-Fi service for the home. Low socio-economic opportunities deny a portion of US citizens' equal participation in learning. The digital divide, the gulf between those who have ready access to computers and the Internet and those who do not, is alive and reality during the pandemic. Regardless of how many advances in technology have been

achieved, continued disparity remains present during the pandemic and creates a solid barrier to communicate effectively for individuals, institutions, and businesses.

The second significant barrier for communication via technology is a**ccessibility.** Concurrently, for technology to help us continue to communicate during a pandemic, we must be able to access it. Some regions of the country cannot access Wi-Fi because the local infrastructure does not support it. As residential Internet access in the United States shifts toward high-speed connections, a gap has emerged in rural high-speed access relative to urban high-speed access. Potential causes of this high-speed digital divide include rural vs urban differences in people, place, and infrastructure. "One critical driver of these disparities between school systems again is the digital divide: the inability of students to do schoolwork at home due to lack of internet or device access" (Lake & Makori, 2020).

It is critical important to learn the best way to communicate using information technology in the context of learning, although the changing process was abrupt as a result of COVID - 19. The need for before and after planning in the use of technology in the university is very important in guiding to a set of standards to be implement. This will help enhance quality communication through all channel of networking in the university campus.

Remote Learning

Asynchronous Remote Learning

The asynchronous remote learning means that the students and instructors are not required to be present at the same time. The teaching is online as demanded. Another benefit of it is that the instructors can record the online teaching, and students can play back the teaching at anytime.

There are four crucial advantages of asynchronous remote education. First, it provides the desirable flexibility. The teaching material can be accessed at anytime and anywhere. Second, it has time advantages, which means it allows students more time to ponder over ideas, check references, refer back to previous messages and prepare comments. Third, it also creates a situated learning environment. Students can easily integrate the ideas being discussed in the course with the working environment, or access resources on the Internet as required on the job. And fourth, it is cost effective. It requires low-end computers to operate so global access is more equable. However, the lack of student-teacher and student-student interaction may limit the learning process.

Synchronous Remote Learning

To overcome the limitations of asynchronous remote learning, synchronous learning involves satellite videoconference, desktop videoconference and multi-user domain object-oriented (MOO) learning. Satellite videoconference is usually a one-way video and a one-way audio with a telephone number available for questions. Satellite videoconference is used to cover mass education. Desktop video conferencing technology has become more and more popular today. Desktop videoconferences may be a one-way video and a two-way audio or a two-way video and audio. Video conferencing technology is used to simulate the classroom environment for distance learners. The system supports spontaneous interactive lectures, question and answer sessions and discussions with the students. Multi-user domain, Object-Oriented (MOO) learning allows users to connect from anywhere in the world and enables them to communicate with others in real time. Although, MOO is basically text-based, participants may "make speeches" and "move around" through certain MOO commands. Instructors may use a Web interface over the MOO to interact with their participants. Courses delivered over the MOO require less overhead cost than those via videoconferences.

There are four advantages of synchronous remote learning/distance education. First, it helps stimulate motivation. Second, it encourages cooperation and group recognition. Real time interaction helps to develop group cohesion and the sense of being part of a learning community. Third, it offers a good feedback. It supports consensus and decision-making in group activities. And fourth, it has the pressure of pacing. Synchronous events encourage students to keep up-to-date with the course. It provides a discipline to learning which helps to prioritize their studies. However, it requires user training and coordinated schedules.

Going to school during a pandemic is hard and even more complicated when you lack the means to access, afford, and adapt to the technology. In terms of accessibility, studies (Adelson, 2020) have estimated that somewhere between 22% and 33% of New Orleans households lack a broadband Internet. The city was rated the 14th worst-connected large city in the country in a 2017 report from the National Digital Inclusion alliance. The city of New Orleans considers a pilot program to provide broadband Internet in the city in the following year. This will alleviate the situation for the students and faculty who can gain access to free Wi-Fi in the city.

III. Research Methodology

Sample Selection

A total of 48 students at SUNO participated in this study by taking the survey operated by the second author. The survey link was distributed to the student body via emails sent out by the Public Relations department at the university. Due to the impact of the COVID-19 pandemic, the student response rate was lower than expected. As shown in tables 1 and 2, the sample consisted of 61% female, 35% male, and 4% of other gender students. 70% of the sample students are younger than 35 years old.

***Table 1** Gender*

Gender	Response Rate	Number of responses
Female	60.42%	29
Male	35.42%	17
Other	4.17%	2
Total	100%	48

***Table** 2 Age*

Age	Response Rate	Number of Responses
Under 18	0%	0
18-24	29.17%	14
25-34	41.67%	20
35-44	27.08%	13
45-54	2.08%	1
55-64	0%	0
65+	0%	0
Total	100%	48

Survey

Before the COVID-19 pandemic, 75% of courses were delivered in person in the classroom and 25% of the courses were delivered online at SUNO. Started in March 2020, all of the courses were converted to either online or hybrid modes due to the stay-at-home mandate order by the city of the New Orleans. This course delivery mode change has affected students' learning method and their satisfaction with the communication effectiveness with their instructors and school officials. At SUNO, faculty can use different media/apps such as Cisco WebEx, BigBlue Button, and Online to convey the course contents to students since March 2020. The school has provided means of communication i.e., laptop or Chromebook to students who do not have access to computers. The survey was created on Survey Monkey and distributed to students from Oct. 12 to Nov. 11, 2020. The Public Relations department at SUNO sent out the survey link to students via emails.

Survey Results[1]

After the collection of survey results, we did a preliminary analysis of the data with Excel. There are some interesting findings that worth of discussion.

The set of questions 1 and 2 compares students' level of satisfaction/dissatisfaction with their instructors and their teaching methods before and during COVID-19. As the numbers indicate that the satisfaction rate decreased by 19%, and the dissatisfaction rate increased by 160%, which is a dramatic change regarding students' attitude towards their instructors and the teaching methods before and during COVID-19.

Table 3 Satisfaction Level With Instructors and their Teaching Methods Before and During COVID-19

Q1 vs. Q2	Q1. Before COVID-19	Q2. During COVID-19	# of difference	Percent of difference
Satisfied	36	29	7	19%
Dissatisfied	5	13	-8	-160%

The set of questions 5 and 6 compares students' level of satisfaction/dissatisfaction with course delivery methods before and during COVID-19. As the numbers indicate that the satisfaction rate decreased by 8%, and the dissatisfaction rate increased by 267%, which is a dramatic change regarding students' attitude towards the course delivery methods before and during COVID-19.

[1] *The following tables i.e. table 3-5 didn't include the number of neutral answers from students.
**The satisfied number is the total of satisfied and very satisfied numbers from students.
***The dissatisfied number is the total of dissatisfied and very dissatisfied numbers from students.

Table 4 Satisfaction Level With Course Delivery Methods Before and During COVID-19

Q5 vs. Q6	Q5 Before COVID-19	Q6 During COVID-19	# of difference	Percent of difference
Satisfied	37	34	3	8%
Dissatisfied	3	11	-8	-267%

The set of questions 9 and 10 compares students' level of satisfaction/dissatisfaction with the communication tools available for use at SUNO before and during COVID-19. As the numbers indicate that the satisfaction rate decreased by 18%, and the dissatisfaction rate increased by 13%.

Table 5 Satisfaction Level With Communication Tools Available to Use Before and During COVID-19

Q9 vs. Q10	Q9 Before COVID-19	Q10 During COVID-19	# of difference	Percent of difference
Satisfied	38	31	7	18%
Dissatisfied	8	9	-1	-13%

The set of questions 16 and 15 compares students' preference of means attending school before and during/after COVID-19. As the numbers indicate that the Online method is the most popular means for students attending school by increasing 73%; the mixed method was declined by 70%; and interestingly, the increase of the interest in classroom method is 700%, which reveals students still prefer face-to-face teaching and interaction in the classroom during and after COVID-19 after they tried out the asynchronous and synchronous remote learning methods in the Spring 2020.

Table 6 Preference of Means Attending School Before and During COVID-19

Q16 vs. Q15	Q16 Before COVID-19	Q15 During/after COVID-19	# of difference	Percent of difference
Online	11	19	8	73%
Hybrid	8	8	0	0%
Mixed	23	7	-16	-70%
Classroom	1	8	7	700%
It doesn't matter	5	6	1	20%

Question 3 reveals students' preferred teaching medium in the Fall 2020. After exposing to different virtual teaching media such as Cisco WebEx, BigBlue Button, online (emails), and Face-to-Face in the Spring 2020, students have the equal preference of Cisco WebEx and BigBlue Botton, Face-to-Face is the third favorite choice, and followed by Online medium.

Table 7 Preference of Teaching Medium During/After COVID-19

Teaching Medium	% of students	# of students
Cisco WebEx	33.33%	16
Big Blue Button	33.33%	16
Face-to-Face	18.75%	9
Online (emails)	14.58%	7
others	0.00%	0
total		48

IV. **Discussion of the Research Results**

Based on the data we have collected and analyzed, students at SUNO expressed their concerns regarding the shift of teaching methods from mainly Face-to-Face to hybrid/virtual via the synchronous video conference media such as WebEx and BigBlue Button. The dissatisfaction rate regarding the course delivery methods increased by 267% i.e. increased from 3 students to 11 students. The methods of communication among student-faculty, student-administration, student-school staff were questioned by students as well during COVID-19 pandemic. Although the university provided technology means such as laptop, Chromebook, WiFi hot spots to those students who didn't have access to those computing devices and Internet connection before the pandemic, students' satisfaction rate still decreased by 18%. Another interesting finding is that more

students prefer the face-to-face means of attending school after the COVID-19 pandemic, the rate of increasing of this means of attending school is 700% from 1 student to 8 students among the 48 participants of the survey.

There are some reasons that cause such changes of satisfaction/dissatisfaction level on the abovementioned topics. Among those causes, lack of access to the communication technologies such as computers with audio and video features, the broadband Internet access, quite personal space and environment for studying, and sufficient financial resources, difficulty to keep attention in the virtual classroom, and less interaction with peers and instructor played an important role in the increase of the dissatisfaction rate and decrease of the satisfaction rate. On the other hand, after the practice of handling the emergent situation of the pandemic in the spring 2020, the university gained experience to convert on-ground classes into hybrid or virtual classes effectively, when they put health safety of students and employees of the university as the top priority.

There are some suggested solutions to the issues have been discovered in this study: 1) regarding the lack of attention in the virtual classroom, instructors need to engage students with course material in more innovative ways, such as animation video and more live discussions. 2) Making the class experience more interactive by using emojis or other forms of interactive things will help to deliver information. Initiating interactive programs in all courses to familiarize student with technology such as using simulation and drop boxes in the course's website. 3) University needs to subscribe the Cloud services that can help schools dynamically store teaching contents into the cloud, and students can go back and revisit the contents they need to.

The study has limitations such as the relatively small sample size i.e., 48 students can affect the data analysis results that may not be generalized in other settings. Authors plan to collect more data on this topic in the future. Meanwhile, authors plan to collect data of students' academic performance and investigate how the course delivery mode affects the students' academic performance; another research direction in the future is what are the effective ways to help students narrow down the digital divide.

V. Conclusion

The Pandemic of 2020 will change everything, from how we greet each other to what is on our bucket list. "It's the single greatest disruption of our lifetime," says Jeffrey Cole, director of the Center for the Digital Future at the University of Southern California. What David Hochman (Hochman, 2020) said that "the kind of change that's occurred over a few months will change how we do things for years" is absolutely true in this COVID-19 pandemic crisis.

It is critical important to learn the best way to communicate using information technology in the context of learning, although the changing process was abrupt as a result of COVID - 19. The need for before and after planning in the use of technology in the university is very important in guiding to a set of standards to be implement. This will help enhance quality communication through all channels of networking in the university campus.

The use of technology to act as a temporary solution during the pandemic may prove in the long run that the increased use of technology can be even more beneficial when the pandemic is over, and more people will come to embrace technology and not ignore it.

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