

Understanding the role that non-academic factors play on students' experience during the COVID-19 pandemic

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Abstract—The outbreak of COVID-19 has forced universities across the USA to close their campuses and quickly transition their classes to an online format. The pandemic caused many students to lose income, health care access and connection to their friends. This paper analyses the role that non-academic factors played on students experience in an aerospace engineering department at a public, Hispanic serving institution during the initial outbreak of the COVID-19 pandemic. The results show that the pandemic is impacting vulnerable groups of students the most, therefore worsening an already existing equity gap.

Keywords—COVID-19, pandemic, engineering, non-academic factors, aerospace, equity gaps

I. INTRODUCTION

The fast spread of the COVID-19 pandemic has created a national emergency in the U.S., with most higher education institutions canceling in-person classes and moving to online-only instruction in March 2020 for the remainder of the Spring 2020 semester [1]. In the author's university, the transition to online-only instruction was very rapid, and students and faculties were given a week notice about the change. This requirement meant that faculty changed their teaching practices from in person to online very quickly, and students had to rapidly adapt to the situation mid-semester. Many students were required to leave in-campus housing, and moved back with their family.

Before the coronavirus pandemic of 2020, research has shown that non-academic factors play a substantial role in post-secondary students' retention and performance [7]. The major factors that affect students' retention and performance are: level of commitment to obtaining a degree, level of academic self-confidence, academic skills such as time management skills, study skills, study habits, level of academic and social integration into the institution, socioeconomic status and social involvement. Lotkowski et al. [7] indicate that different factors affect retention and performance differently; students' retention is mostly affected by academic-related skills, academic self-

confidence, and academic goals; institutional commitment, social support, the contextual influences of institutional selectivity and financial support, and social involvement had a moderate effect. Students' performance is mostly affected by academic self-confidence and achievement motivation, and moderately affected by contextual influence of financial support, academic goals, academic-related skills, social involvement, institutional commitment, and social support.

This paper represents an effort to participate to the discussion on the role that non-academic factors that students' experienced during the COVID-19 outbreak. Current literature on the effect of COVID-19 on higher education mostly focuses on teaching strategies and effective delivery of instructional material in an online environment to improve learning [5], [6], but few studies focus on the role of non-academic factors during the pandemic. The outbreak of coronavirus resulted in significant changes to college life with students losing access to in-campus resources related to housing, food and educational material. This lack of resources has impacted vulnerable students the most, and has exacerbated existing equity gaps between wealthier students and students from less privileged backgrounds, and may have had a lifelong impact on students' success, as well as their emotional well-being [2], [3].

This time provides a unique, one-time opportunity for groundbreaking research to study how non-academic factors affected higher education students during the COVID-19 pandemic. Specifically, the research questions that the author would like to answer is how students responded to the rapid transition to online instructions, and how non-academic factors affected students' experience and well-being at the beginning of the COVID-19 pandemic. In addition, the author would like to investigate whether the pandemic has deepened the equity gaps in engineering education, by comparing the survey results with Daniels et al. [8], which analyzed the early results of a survey sent to students at multiple elite-institutions about the impact of COVID on their experiences. Many respondents reported feeling "worse" or "much worse" than before COVID 19, and

that they felt that their ability to pursue their academic goals was “worse” or “much worse” than before the coronavirus outbreak [8]. The authors also discuss how worse mental health could arise from general feelings of anxiety due to the uncertainty and stress of the pandemic, as well as from specific changes to the students’ own situation [8]. The data presented in this paper is collected at a public Hispanic Serving Institution, with the intention of showing how a vulnerable student population has been affected.

II. DESCRIPTION OF SURVEY

The survey has been distributed to all students in the department of aerospace engineering, which offers a 4-year BS degree and a MS degree. In order to capture how the switch to online modality affected students’ learning in aerospace engineering classes in Spring 2020, an in-depth survey was distributed to all aerospace engineering students in June 2020 after the end of the spring semester. The author feels that this analysis is crucial in understanding how students are coping to this unprecedented crisis, and to define support strategies for the student body. The author’s university will offer classes primarily online for Fall 2020 and Spring 2021, and this data has proven to be helpful in planning for the new semester.

The questions contained in the survey explore the following aspects: (1) changes in living condition, (2) psychological well-being, (3) access to technology. These aspects are directly related to non-academic factors linked to students’ retention and performance during regular times. In addition to the quantitative data collected through the questions in the survey, the author allows for free-form comments to provide more in-depth representation of the students’ experiences. The questions contained in the survey are listed in Table 1.

Table 1. List of questions in survey

Question
What is your work environment?
- I work fulltime in a job outside of campus
- I worked fulltime in a job outside of campus but I lost my position or my hours were cut
- I work part-time in a job outside of campus
- I worked part-time in a job outside of campus but I lost my position or my hours were cut
- I worked on campus before the COVID 19 pandemic and still work at a distance
- I worked on campus before the COVID 19 pandemic but lost my position
- I did not work during Spring 2020
- Other
Are you currently living or staying with anyone over the age of 65, or with anyone over the age of 60 who also has one of the following risk factors? (heart conditions, diabetes, hypertension and/or obesity)
Are you or anyone living or staying in your household currently in a medically imposed quarantine?
Do you currently have to care for children or elderly while under quarantine?
After the shelter-in-place order in March 2020, what was your living situation? - Selected Choice
Relative to your life before and after COVID 19, how would you rank your current (Much worse than before/ Worse than before/ Same as before/ Better than before/ Much better than before):
- Health care access
- Time management
- Ability to socialize with my fellow students

- Ability to socialize with my friends
- Overall psychological wellbeing, including feelings of anxiety and/or depression
Overall, how much stress are you feeling about the consequences of COVID 19?
- A little or no stress
- A moderate amount of stress
- A great deal of stress
Relative to your life before and after COVID 19, is there any change in the following for you this semester in (Decreased/ About the same/ Increased):
- Expenses
- Income
- Financial Aid
- Debt
- Having a safe place to sleep each night
- Having enough to eat each day
Do you have access to the following resources to support your remote learning?
- Computer, laptop or tablet
- Enough Internet Access for doing your classwork online
- Physical space for studying and doing assignments
- Library resources (including books, articles, etc)
- Scanner
- Webcam
- Printer
Please reflect on the following aspects regarding your learning experience during the online transition (Strongly disagree/ Disagree/ Somewhat disagree/ Neither agree nor disagree/Somewhat agree/ Agree/ Strongly agree)
- I need to share the computer I use to attend classes
- I have an online learning community
- I have witnessed an increase in academic dishonesty due to exams offered online
Given the unexpected changes in course instruction after the spread of COVID 19, how often do you worry about the following (Never/ Sometimes/ About half the time/ Most of the time/ Always)
- Doing well in your classes now that all of them have moved online
- Accessing and using the technology required for your online classes
- Your ability to do internships, field studies or projects as an undergraduate
- Your progress to obtaining an undergraduate degree

III. ANALYSIS OF RESULTS

A total of 35 aerospace engineering students agreed to respond to the survey, distributed as 86% male, 11% female, 3% other, which is in line with the major composition. Responses represented all levels in the major, with 17% freshman, 6% sophomore, 34% junior, 26% senior and 17% graduate student respondents. The majority of the students (63%) took 4 or more classes in Spring 2020; 74% of the respondents have a GPA higher than 3.0/4.0.

The ethnicity of the respondents is divided as 26% Asian-American, 14% Hispanic or Latinx, 37% White, 6% international students, 17% other ethnicity, thus representing a good mix of ethnical background. In addition, 31% of the respondents are first generation students.

A. Changes in living conditions

Students have been affected by changes in their living condition, and 21% of the students reported difficulties due to these changes. Many of the respondents worked part-time and full-time outside the university or in campus before the

pandemic (69%). Among the students that were working before the pandemic, 52% either lost their position or had their hours cut due to COVID-19 closures. This job loss affects mostly upper division students, with 33% of junior, 44% of seniors and 66% of graduate students that experienced cut of hours or loss of position. It also affects students from different backgrounds unequally: of the students that were working before the pandemic, all of the Hispanic or Latinx respondents lost their job/had their hours cut, 80% of the Asian-American students, while only 44% White students found themselves facing the same challenges. No international students experienced job loss.

About 12% of the students “always” need to care for children or elderly during shelter in place, and 15% “sometimes”. This need fell mostly on the shoulders of Hispanic-Latinx students (40% - “always” and “sometimes” responses combined) and International Students (50% - “always”), while 22% of Asian-American students (“always” and “sometimes” responses combined) and 8% of White students (“sometimes”). Female students also reported to have responsibilities in the family, with 33% of the female students that need to “always” care for family members, versus 10% of male students that “always” have to care for dependents, and 17% “sometimes”.

Health care access has also changed due to COVID-19: 42% of the students report their ability to access health care “worse than before”, and the remainder 58% reported as “same as before”. This decrease in health access affected male students only, and affected 25% of students identifying themselves as Asian-American, 60% of Hispanic, 30% of White students, 67% of students from two or more ethnicities, 50% of International students.

Many students (42%) reported a decrease in their expenses due to the coronavirus outbreak, but 55% of the students experienced a decrease in their income as well. The loss of income especially affected Hispanic-Latinx students, with 80% reporting a loss of income, see Fig. 1. Some students reported a decrease in financial aid (8%), with Hispanic-Latinx and International students mostly affected by the change, as well as an increase in debt (27%). Selected free-form responses highlight stories behind the financial challenges exacerbated by the COVID-19 outbreak :

Student 1: "Family income is from a family owned small business, zero-very little business due to shelter in place closure and COVID-19. Personally lost my position at my place of work for the foreseeable future. Currently threatened by landlord with eviction with no understanding on their part about not being able to pay rent properly, but others have it the same or much worse."

Student 2: "My father is a high risk to covid so I decided not to go home after the spring semester ended. I am paying rent, car insurance, phone bills, groceries, you name it, all while trying to save up money for higher living expenses in the fall."

Student 3: "Before the government stimulus check and unemployment checks, it was very hard in mid-March to Early April to have enough to eat or travel due to financial constraints."

B. Socialization and psychological wellbeing

Students report a deterioration in their overall mental health. To the question: “Relative to your life before and after COVID 19, how would you rank your current overall psychological wellbeing, including feelings of anxiety and/or depression”, 19% of the students responded that they feel “Much worse than before” and 50% “Worse than before”. Hispanic-Latinx students’ mental health was hit the hardest, with 100% reporting “Much worse than before” or “Worse than before”, 91% of White students, 50% International Students, 37% Asian-American, 33% Two or more ethnicities. As a consequence, 28% of the students reported to have experienced a little or no stress 28%, a moderate amount of stress 47%, a great deal 25%.

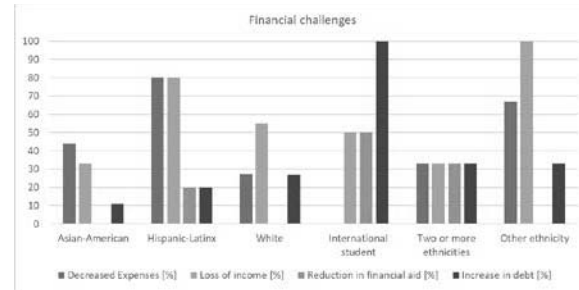


Fig. 1. Percentage of students affected by financial challenges in percentage for different ethnicities

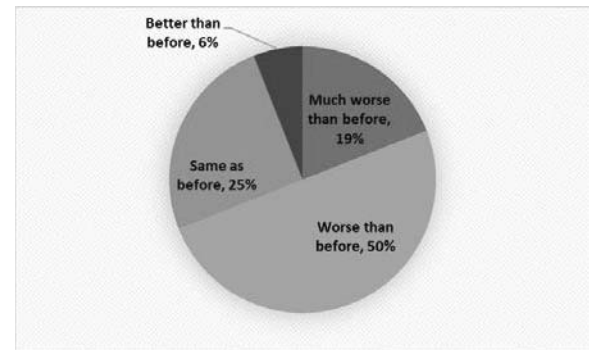


Fig. 2 Overall psychological wellbeing as a result of COVID-19

Only upper division students (junior, senior, graduate) reported a “great deal” of stress.

Students’ well-being has been greatly affected by the lack of socialization during shelter in place restrictions: 85% of the students report a “much worse” or “worse than before” ability to socialize with fellow students, and 78% with their friends. Most of the students feel less connected to their peers (85%).

As the survey asked students to reflect on the statement “I have an online learning community”, 50% express a negative response, with 12% “strongly disagree”, 25% “disagree” and 13% “somewhat disagree”, and 9% “neither agree nor disagree”. Please reflect on the following aspects regarding your learning experience during the online transition

Selected free-form responses highlight stories behind the worsening of students’ well-being as well as loss of social life due to COVID-19:

Student 1: "One of my parents might lose their jobs in the future. This has caused a lot of stress as it would cause me to lose access to health care."

Student 2: "Lack of regularly available gyms has put a lot of stress on me"

Student 3: "I have anxiety which flares when I am at the store getting groceries or other essentials and I hear someone cough, or when people are standing close to me. This had effected my interaction with people which resulted in me going out less and less."

Student 4: "Mental health and physical health is definitely the issue. There is no motivation to do anything especially school work. [...] Humans are social animals and not being able to see your friends for an extended period of time really messes with your mental state. To top it all off, since you're home all day, you're not really moving much unless you make an effort to do so."

Student 5: "I got depressed living at home and it greatly impacted my grades"

Student 6: "The stress of remaining isolated at home is wearing my mental health to a very unhealthy state."

C. Access to technology

Access to technology represented a challenge for many students. Most of the students (97%) had access to a computer, laptop or tablet, and 84% had always access to internet for doing online classwork. The remaining 16% of the students defined their ability to access the internet as "sometimes". Hispanic-Latinx students are mostly affected by this occasional internet access, with 60% of them having access "sometimes". More students reported a lack of physical space for studying and doing assignments: 9% of the students did not have an available space, and 25% only "sometimes". Hispanic-Latinx students are more affected by the lack of physical space, with only 20% of them reporting consistent availability of a space to study. It also affected upper division students more than freshman and sophomore students.

Students also reported a lack of library resources (19% reported a consistent lack, and 25% an occasional lack of library resources), of scanners (25% reported a consistent lack, and 12% an occasional lack of scanners), of webcams (16% reported a consistent lack, and 16% an occasional lack of webcams) and printers (22% reported a consistent lack, and 17% an occasional lack of printers). As a consequence, only 26% of the students reported that they "never" worry about accessing and using the technology required for their online classes.

Selected free-form responses highlight the technological needs of the students during COVID-19:

Student 1: "Scanner and Printer would help immensely when submitting assignments."

Student 2: "I needed a printer."

D. Overall perception

Given the unexpected changes in course instruction after the spread of COVID 19, many students often you worry about their ability to do well in their classes (73% worry at least "about half

the time to do internships and field studies (73% worry at least "about half the time").

Students worry about their ability to do well in their classes in Spring 2020: overall, 77% of the students in aerospace engineering worry at least "half of the times: 100% of Hispanic-Latinx and International students worry at least "half of the times", 67% of Asian-American and 60% of White students.

As a consequence, more than half of the students (52%) worry about their ability to progress to obtaining an undergraduate degree at least "about half the time": 66% Hispanic-Latinx students worry "about half the time", 43% of the Asian-American students, and 40% of the White students. Only 8% of the students report that they never worry about their degree as a result of COVID-19.

IV. DISCUSSION

Students well-being has deteriorated due to COVID-19, due to changes in their financial situation, ability to work and access health care and in their social connections. The overall results of this survey are in line with the initial results presented in Daniels et al. [8], as can be seen in Table 1. However, students in the author's department experienced a more widespread loss of income. However, these results differ largely when Hispanic-Latinx students are considered: 100% of these students experienced a deterioration in psychological well-being, a loss of income and a negative feeling about being able to pursue their long-term goals.

Table 2. Comparison of results between current survey and Reference [8]

Factor	Source		
	Overall student respondents	Hispanic-Latinx students	Reference [8]
Psychological well-being: "worse" or "much worse"	85%	100%	79%
Loss of income	55%	100%	30%
Access to healthcare: "worse" or "much worse"	42%	60%	40%
Ability to pursue long term/academic goals: "worse" or "much worse"	45%	100%	78%
Worry about ability to obtain degree at least half of the times	52%	66%	N/A

It is also important to compare how the analyzed non-academic factors related to students' retention and performance before the pandemic. Half of the respondents to the survey declare that they are worried about their ability to obtain their degree at least half of the times, and they worry about their ability to pursue their academic goals. Both these statements can be summarized as lack of academic self-confidence and academic goals, which have been shown to be strongly correlated to students' retention and performance by Lotkowski et al. [7]. Many students in their answers describe a lack of social

involvement and financial support, which has also shown to have an effect on students' retention and performance [7].

V. CONCLUSION

Students have been strongly affected by the pandemic, and non-academic factors such as challenges in their living conditions and financial status, and access to technology. In particular, students belonging to vulnerable groups such as Hispanic-Latinx have been deeply affected by the COVID-19 outbreak, resulting in an increase of existing equity gaps in their education.

It is yet to see how these students will progress in their academic career, and whether the anxiety of this new reality will have long term effects. As the coronavirus pandemic progresses, and online instruction and social limitations become the new norm in most of the United States, universities are defining new strategies to support their students during these difficult times. It will be possible to understand whether the difficulties of Spring 2020 will progress into the following semesters and affect the academic progress of our students indefinitely only in the months and years to come.

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REFERENCES

- [1] "Higher Education Responses to Coronavirus (COVID-19)."

- [Online]. Available: <https://www.ncsl.org/research/education/higher-education-responses-to-coronavirus-covid-19.aspx>. [Accessed: 15-Aug-2020].
- [2] "The pandemic has worsened equity gaps in higher education and work." [Online]. Available: <https://www.insidehighered.com/news/2020/06/17/pandemic-has-worsened-equity-gaps-higher-education-and-work>. [Accessed: 14-Aug-2020].
- [3] "The Challenge of Equity in Higher Education Under COVID-19 | Learning Innovation." [Online]. Available: <https://www.insidehighered.com/blogs/learning-innovation/challenge-equity-higher-education-under-covid-19>. [Accessed: 14-Aug-2020].
- [4] J. L. Malisch *et al.*, "Opinion: In the wake of COVID-19, academia needs new solutions to ensure gender equity," *Proceedings of the National Academy of Sciences of the United States of America*, vol. 117, no. 27. National Academy of Sciences, pp. 15378–15381, 07-Jul-2020.
- [5] "Supporting student wellbeing during COVID-19: Tips from regional and remote Australia - NCSEHE." [Online]. Available: <https://www.ncsehe.edu.au/student-wellbeing-covid-19-regional-remote-australia/>. [Accessed: 14-Aug-2020].
- [6] G. K. Saw, C.-N. Chang, U. Lomeli, and M. Zhi, "Gender disparities in remote learning during the COVID-19 pandemic: A national survey of STEM faculty and students," 2020.
- [7] V. A. Lotkowski, S. B. Robbins, and R. J. Noeth, "The Role of Academic and Non-Academic Factors in Improving College Retention ACT POLICY REPORT," 2004.
- [8] B. Daniels, J. Das, A. Hamza, and B. Leydier, "Covid-19 Diaries: Early Impressions from an Online Questionnaire," *Covid-19 and Student Focused Concerns: Threats and Possibilities*, Veena Das and Naveeda Khan, eds., *American Ethnologist website*, 2020. .