UC Riverside

UCR Honors Capstones 2021-2022

Title
STUDENT STRESS LEVELS IN ONLINE INSTRUCTION VERSUS IN-PERSON INSTRUCTION

Permalink
https://escholarship.org/uc/item/8n21p86r

Author
Kapadia, Sasha V

Publication Date
2022-05-06

Data Availability
The data associated with this publication are not available for this reason: N/A

STUDENT STRESS LEVELS IN ONLINE INSTRUCTION VERSUS IN-PERSON INSTRUCTION

By

Sasha Viren Kapadia

A capstone project submitted for Graduation with University Honors

May 06, 2022

University Honors

University of California, Riverside

APPROVED

Dr. Jack Eichler

Department of Chemistry

Dr. Richard Cardullo, Howard H Hays Jr. Chair

University Honors

ABSTRACT

The lives of students in higher education were dramatically impacted over the past two years due to the Coronavirus pandemic and the impact it has had on the world. The shift to online learning for students has proven to be difficult, and hard to adjust for many. The sudden transition to online classes can impact a student's learning experience and stress levels. In-person versus online classes have obvious differences, but the impact on the students has been examined further in this study. This has been explored through individual interviews with each student, and the interviews were conducted in a semi-structured approach. Before the interview, the students were asked to complete a google form with questions regarding their demographic background, in which their current class load, cumulative GPA, whether they receive financial aid, and generational status were analyzed and assessed. The interview questions were structured in such a way that the beginning questions were more open-ended and unbiased, and as the interview progressed, the questions became more pointed and targeted. The participants consisted of 30 students: 15 students from CHASS and 15 students from CNAS. The original hypothesis was that because there was such an unforeseen shift to remote learning, online instruction will increase the stress levels of students, which impacts their overall performance. However, the results suggest the opposite might be true; in-person instruction seems to result in higher stress levels. These results lay the foundation for future research and it helps to gauge students' perceptions of online instruction as well as understand more about how their stress can change in a different learning environment.

ACKNOWLEDGEMENTS

TABLE OF CONTENTS

INTRODUCTION/BACKGROUND

College students experience stress on a daily basis, with their classes, extracurricular activities, full/part-time jobs, and/or other life situations. The typical method of instruction that college students experienced before the Covid-19 pandemic was in-person instruction. This was seen as the one and only method of instruction, with no other alternative. As a college student in the pandemic, there has been an obvious and tremendous impact on the effect of Covid-19 on the method of instruction in various universities across the world. Though online instruction was incorporated into some courses across campus, the need to cease in-person instruction during the Covid-19 pandemic resulted in the widespread adoption of remote instruction. Remote instruction was abruptly introduced into thousands of students' lives around March 11, 2020, when the World Health Organization declared Covid-19 a pandemic. With the sudden shift from in-person to remote instruction, students were given little to no time to prepare for this change in instruction. In this research paper, I will be analyzing and discussing how student stress levels differ with in-person versus online instruction, how financial/family background plays a role in student method of instruction preference, and how student responses may differ depending on their field of study (e.g., STEM versus non-STEM).

For some students, learning online is not that much different from learning in-person, but for others, there is a drastic difference between the two. With technology continuously improving in our day-to-day lives, it is important that students adapt to the online environment (Gorman & Staley, 2018). However, learning through a computer screen may be a challenge for some of them. This project will not only look at the stress levels between online and in-person instruction, but also how the students rated their level of understanding with in-person versus online instruction.

The shift to online instruction may be difficult for everyone, including students, teachers, and the administration. In order to smoothly transition from in-person to online learning, a number of requirements are needed, such as access to online learning platforms, internet connectivity, etc. Without these items, the transition to online instruction becomes much more difficult for both the teachers and students. Online instruction has been difficult for many schools, and as shown in an academic article by Jonathon Monareng, schools in South Africa have had to deal with various disadvantages, including boycotts against online learning, limited access to online learning platforms, and low quality of interaction through remote learning (Monareng, 2020). However, these schools in South Africa have adapted to this new method of learning, and the article explains how the teachers have become more tech-savvy and better able to teach their students. There are pros and cons to both methods of instruction. Although in-person instruction is more interactive and helps to keep students more accountable for their school work, it is more expensive and takes more time to commute to and from campus compared to online instruction. Both methods of instruction differ in many ways, but due to the global pandemic, individuals were forced to adapt to a new way of learning that ended up having some advantages compared to traditional learning.

The stress levels and mental health state of the participants have been studied further in this study. However, in previous studies, it has been found that female students have higher stress levels than male students, and this may be because of the hormonal variation with the gender difference (Patkar *et al*., 2016). Even though stress can differ between different sub-populations of college undergraduate cohorts (e.g., gender, racial identity, etc.), this study will focus on three primary groups: field of study (STEM versus non-STEM), first-generation college status, and socioeconomic status (viewed through the proxy of financial aid status). If a student receives

financial aid, they will be classified as having a lower socioeconomic status, for the purpose of this observational study. In this study, the students' stress levels will be analyzed and looked at further to determine possible correlations between the different groups of students and to see what is most impactful on their mental health. There are many different causes of an increase in student stress levels, which is what this study will look at.

MATERIALS AND METHODS

Due to the unexpected nature of the COVID-19 pandemic, this study was conducted completely online. The participants consisted of 15 students from the College of Agricultural and Natural Sciences (CNAS) and 15 students from the College of Humanities, Arts, and Social Sciences (CHASS). Since this study utilizes human subject responses, it was approved by the UCR Institutional Review Board Socio-Behavioral as Exempt under HS 21-049. All of the participants were either juniors or seniors in college; this is because these students experienced both online and in-person instruction at the University of California, Riverside (UCR). Students were recruited by email announcements sent out by faculty from a variety of departments in both CHASS and CNAS. Prior to their interview, the students completed a Google Form with questions asking about their demographic information, such as name, major, year, college, cumulative GPA, course load, financial aid status, and generational status. These responses were kept completely confidential and only the research team had access to the answers. For this study, the independent variables were the type of college the student was a part of (CNAS or CHASS) and financial aid/generational status. The dependent variables were the general student performance, stress levels, and the perception of the quality of instruction.

Next, the students were interviewed via Zoom where they participated in a 10-15 minute interview. Students were interviewed by the main researcher and it was conducted as a semi-structured interview. Semi-structured questions are very useful when investigating a specific research question, and they have a predetermined set of questions to ask the individuals participating. Semi-structured interviews also ask follow-up questions according to the participant's responses, in order to dive deeper into their answer choices (Herrington & Daubenmire, 2014). This type of structure was the best suited for the observational study conducted because the questions were more open-ended and unbiased at first, and then slowly transitioned into more pointed and opinionated questions after.

The first question for all of the participants was, "How would you describe your quality of learning with remote learning at UCR?". After they answered, they were asked multiple follow-up questions regarding their answer choice. For example, some of the follow-up questions include "How would you rate your level of understanding/learning on a scale from 1-10 (1 being a low level of understanding/learning, 10 being the highest level of understanding/learning)?", "Well, you mentioned this (negative/positive thing) could you elaborate on other negatives/positive aspects of remote learning?", and "Now that you've reflected on your remote learning experience, could you please rank your stress levels on a scale from 1-10 during remote learning (1 being least stressed and 10 being most stressed)?". The 0-10 scale was used in order to try and get more fine-grain responses from the students. The questions are geared toward finding out more about the different opinions on the quality of remote learning, as well as rating their level of understanding and stress levels during remote learning. Once those questions were answered, the students were then asked about their online learning environment, if they have issues with technology often, if they have an isolated workspace or not, and how often they were

distracted at home. This was to learn more about any outside factors that could have contributed to their remote learning experience.

Once the questions about their online instruction experience were completed, they were asked questions about their in-person instruction experience. The same questions were asked from the online section, except they just had to answer them about their in-person experience. One added question to the in-person section was, "How would you say the campus environment contributes to your learning ability?" The purpose of this question was to see if the campus environment played a role in their learning experience, and how it either negatively or positively impacted it. Additionally, when asking about their housing, they were asked if they live on or near campus or at home, if they have an isolated workspace there, and how often they were distracted there.

Finally, the students were asked to reflect on the two methods of in-person and online instruction and which they preferred more. Specifically, the question stated, "So now that you've thought about remote and in-person learning, do you prefer remote learning or in-person learning and why?" After they answered this question, the interview ended with a two-parted question: "Do you see value in having both remote and in-person learning (hybrid style)? If so, what would be the advantages of having both online and in-person courses?" Since hybrid instruction is a viable method of instruction, the students were able to express their interest or disinterest in this style of learning and any additional comments they had on it. At the end of the interview, the students were compensated for their time with a $10 UCR Dining Dollars gift card.

After the responses were collected from both the Google Form and the interview, the categorical data (preferences for online versus in-person instruction, stress levels, and self-assessment of overall learning in online versus in-person learning) were analyzed using

SPSS statistics. The descriptive statistics were organized by a variety of groups: comparing the number of students who preferred online versus in-person instruction for three categories of students (CNAS and CHASS, financial aid versus non-financial aid, and first-generation versus non-first generation), looking at the distribution of stress levels for two categories of students (CNAS and CHASS, and financial aid versus non-financial aid), and comparing the levels of understanding during online and in-person instruction for both CNAS and CHASS students. Next, a Chi-square ($\chi2$) analysis was conducted to determine if any of the distributions were statistically significant. A Chi-square analysis is used to test the probability of independence of the distribution of a categorical dependent variable between groups, and it is particularly useful to interpret qualitative data (Rao, 2002). The analyses were interpreted in the following manner: the adjusted residuals represent a Z score in which the observed counts are compared to the expected counts (i.e., a negative adjusted residual indicates there were fewer observed counts than expected). A negative adjusted residual means that the observed counts were below the expected counts and a positive adjusted residual means that the observed counts were greater than the expected counts. The p-values represent the probability that the difference in observed and expected counts are different simply due to random chance. The threshold for rejecting the null hypothesis, which states there is no difference between observed and expected counts, is 5% (e.g., if $p < 0.05$ the null hypothesis can be rejected).

In addition to the quantitative data, the qualitative data from the individual interviews were analyzed. The student interview responses were reviewed to see if there were any trends about why students preferred online learning versus in-person learning, and vice versa. The students who preferred online, in-person, and hybrid learning were split into separate groups to see if there were any similarities between their reasons for picking a specific method of

10

instruction. Additionally, the students who received financial aid and the first-generation college students were also split up into separate groups to see whether they had similar opinions on their preferred method of instruction. The quantitative and qualitative results can provide a more accurate and well-rounded analysis toward the student preference of method of instruction.

DATA AND RESULTS

Section A: Responses Based on College (CNAS/CHASS)

The Google Form responses were transferred to a Google Sheets spreadsheet, in which all of the demographic information was listed next to each student. To organize the results, different codes were assigned to different items. For example, if a student was from CHASS, they were given a blue asterisk, and if a student was from CNAS, they were given a red asterisk. There were also codes for the following responses: receives financial aid, first-generation student, prefers online learning, prefers in-person learning, and prefers hybrid learning. Next, the results were analyzed using SPSS statistical software, and the responses were grouped into eight different categories. The categories consisted of CNAS/CHASS Instruction Preference, Generational Status Instruction Preference, Financial Aid Instruction Preference, CNAS Stress Rating, CHASS Stress Rating, Financial Aid Stress Rating, CNAS Level of Understanding Rating, and CHASS Level of Understanding Rating. The first grouping that was analyzed was the CNAS/CHASS Instruction Preference, and the data shows that students in both CNAS and CHASS prefer in-person instruction compared to online or hybrid instruction.
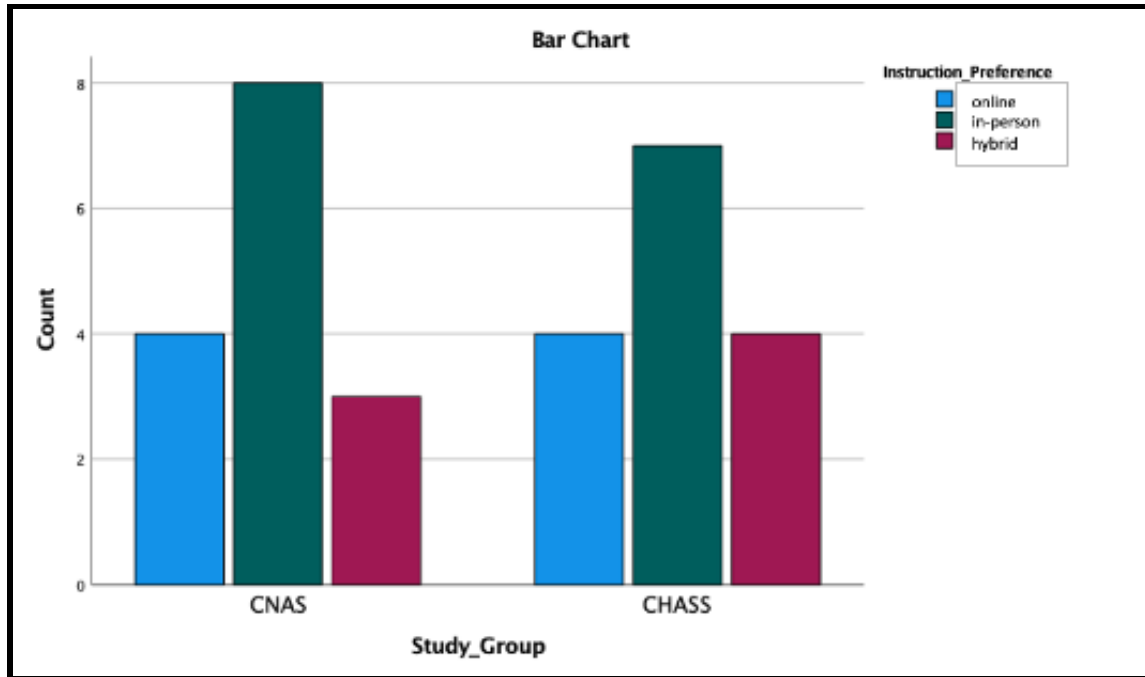
Figure 1: *Bar Chart illustrating the instruction preference with students in CNAS and CHASS.*
($\chi2$ = 0.210, p-value = 0.901)

Table 1: *Post-hoc analysis of Chi-square test in which the actual and expected counts of the*
categorical variables (instruction preference) are summarized.

Study Group	Statistic	Instruction Preference		
		Online	In-Person	Hybrid
CNAS	Count	4	8	3
	Expected Count	4	7.5	3.5
	% within Score	26.70%	53.30%	20.00%
	Adjusted Residual	0	0.4	-0.4
	p value	**1**	**0.689**	**0.689**
CHASS	Count	4	7	4
	Expected Count	4	7.5	3.5
	% within Score	26.70%	46.70%	26.70%
	Adjusted Residual	0	-0.4	0.4
	p value	**1**	**0.689**	**0.689**

Table 1 shows the similarities and differences between the number of students that preferred online, in-person, and hybrid instruction. The table also shows the p-value, the overall statistical measurement used to validate the null hypothesis against the observed data, of each instruction preference data set from both CNAS and CHASS. The p-value for the in-person and hybrid instruction preference data sets was 0.689, and the p-value for the online instruction preference data sets was 1. The p-value for all of these data sets is greater than 0.05, indicating that the data is not statistically significant. This shows that the difference between the values is only due to random error and not due to the effect they were experiencing. Although there are no significant differences between the two treatment groups, it is reasonable to say that the majority of the students from both groups preferred in-person learning.

During the interviews, students were asked to elaborate on their instruction preference and why exactly they chose it. For those that preferred in-person instruction, some of the students mentioned that in-person learning is necessary for the college experience and it is more motivating. They also mentioned that their attention span behind a screen is not the best, so in-person instruction is beneficial for their ability to pay attention in class and grasp the material better. One student mentioned that they "prefer in-person learning, but online learning is do-able until we reach safe circumstances". This response indicates how the pandemic has affected these students; they want to be able to study in a safe environment without the risk of exposure to COVID-19. However, one of the biggest reasons that students preferred in-person instruction was due to the interaction with their professors, TAs, and fellow peers. They enjoy the social interaction and feel as if they are able to stay more motivated and determined to do well in this environment.

Section B: Socioeconomic Status

Socioeconomic status is defined as the social standing of an individual, and it is measured based on one's income, occupation, and education. In this study, students were asked to indicate their generational status and whether or not they received financial aid. In this study, generational status is referred to as the college status of the student and their parents. If a student indicates that they are a first-generation college student, this means that they are the first in their family to attend college. In the Google Form, students were asked how many of their parents went to college. If they indicated that neither of their parents attended college, then they were classified as first-generation college students. Financial aid is used to help pay for a student's college education; in the Google Form, students answered either "Yes" or "No" about whether they received financial aid.

In this observational study, one of the goals was to see if first-generation college students had a different opinion of their instruction preference compared to non-first-generation college students. Out of the 30 participants, only 5 participants were identified as first-generation students. 4 out of 5 of these students preferred in-person instruction compared to hybrid or online instruction. 1 of the 5 students preferred online instruction.
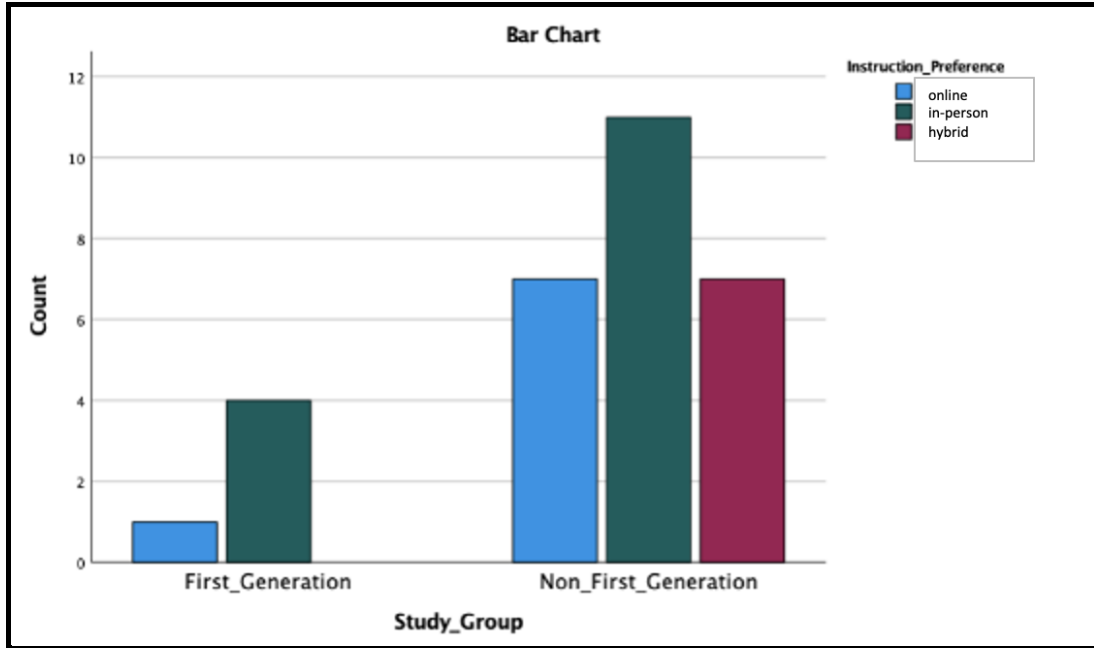
Figure 2: *Bar Chart illustrating the instruction preference with first-generation students versus non-first-generation students.* ($\chi2$ = 2.580, p-value = 0.275)

Table 2: *Post-hoc analysis of Chi-square test in which the actual and expected counts of the categorical variables (instruction preference) are summarized.*

Study Group	Statistic	Instruction Preference		
		Online	**In-Person**	**Hybrid**
First-generation	Count	1	4	0
	Expected Count	1.3	2.5	1.2
	% within Score	20.00%	80.00%	0.00%
	Adjusted Residual	-0.4	1.5	-1.4
	p value	**0.689**	**0.134**	**0.162**
Non-First generation	Count	7	11	7
	Expected Count	6.7	12.5	5.8
	% within Score	28.00%	44.00%	28.00%
	Adjusted Residual	0.4	-1.5	1.4
	p value	**0.689**	**0.134**	**0.162**

With the two study groups, there does not seem to be a big difference between the two. However, it is shown that in-person instruction is preferred by the majority of the students in both groups. The p-value is shown in Table 2 of each separate data set, and it can be used to indicate if the observed data is statistically significant. The p-value in the online instruction preference data set is 0.689, the p-value in the in-person instruction preference data set is 0.134, and the p-value in the hybrid instruction preference data set is 0.162. These values are all greater than 0.05, indicating that the data is not statistically significant. This suggests that the two treatment groups do not exhibit significant differences, but the data does show an obvious preferred method of instruction for both groups.

As previously mentioned, 4 out of the 5 first-generation college students preferred in-person instruction. Those that preferred in-person instruction from the first-generation college status group indicated that the campus does have "a very welcoming, engaging, and inclusive environment", and that the campus community establishes a welcoming environment where they are able to study and thrive. These students also explain that they feel they have more opportunities to succeed while being on campus. However, the 1 student in this group that preferred online instruction indicated that online instruction helps his mental and physical health, and he feels as if there are no constraints. He also indicated that he prefers to learn at his own pace while being able to do other things if he needs to. Multitasking is more doable with online instruction.

The next factor of the socioeconomic status that was studied was the financial aid status of the students. Out of the 30 participants, 12 of them indicated that they receive financial aid from the school. Figure 3 shows that the majority of students that receive financial aid prefer

in-person instruction, while the students that do not receive financial aid have a mix of responses regarding their instruction preferences.
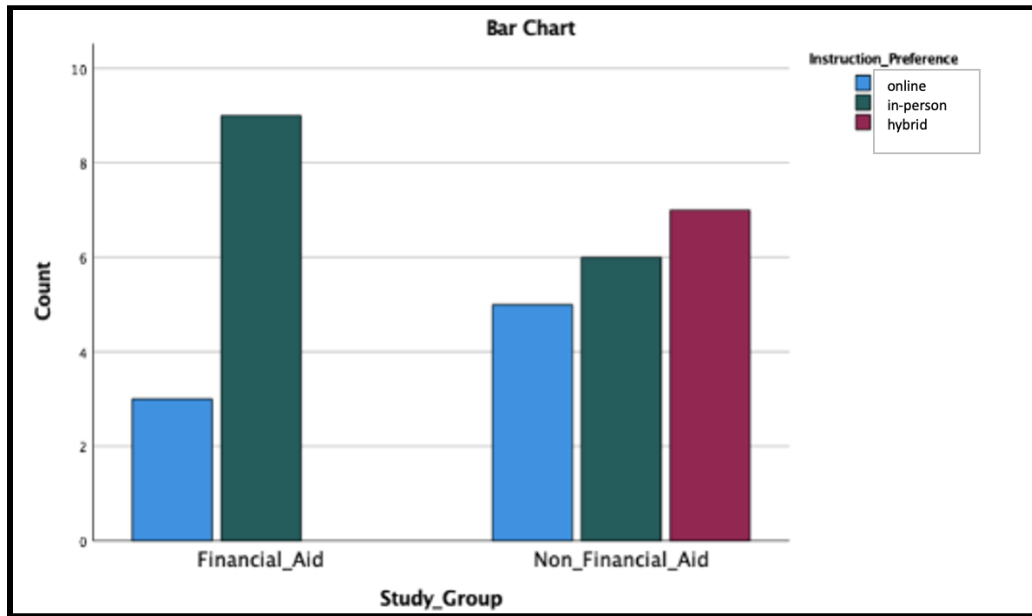

Figure 3: Bar Chart illustrating the instruction preference of students who receive financial aid versus those who do not. ($\chi2$ = 7.187, p-value = 0.027)

Table 3: Post-hoc analysis of Chi-square test in which the actual and expected counts of the categorical variables (instruction preference) are summarized.

Study Group	Statistic	Instruction Preference		
		Online	In-Person	Hybrid
Financial Aid	Count	3	9	0
	Expected Count	3.2	6	2.8
	% within Score	25.00%	75.00%	0.00%
	Adjusted Residual	-0.2	2.2	-2.5
	p-value	**0.841**	**0.028**	**0.012**
Non-Financial Aid	Count	5	6	7
	Expected Count	4.8	9	4.2
	% within Score	27.80%	33.30%	38.90%
	Adjusted Residual	0.2	-2.2	2.5
	p-value	**0.841**	**0.028**	**0.012**

Table 3 shows the post-hoc analysis of the data collected from the student responses. The students who receive financial aid have an obvious preference for in-person instruction, with 9 out of 12 students preferring in-person. However, there does not seem to be a trend in the responses of the students who do not receive financial aid: 5 prefer online, 6 prefer in-person, and 7 prefer hybrid. The p-value in the online instruction data set is 0.841, which shows that the data is not statistically significant, meaning that the difference in values is not due to the effect they were experiencing, and the results are random. The p-value in the in-person instruction data set is 0.028, and the p-value in the hybrid instruction data set is 0.012. These values are both less than 0.05, which indicates that this data is statistically significant. This means that the difference between the values in the data is due to the effect they were experiencing, and the results are not due to error. There is sufficient evidence to say that those who receive financial aid do have an obvious preference for in-person instruction, due to what they experience at school.

The students that receive financial aid may have a more pleasant experience with in-person instruction compared to online instruction, which is why it is favored over the latter. To analyze the qualitative results, the students who received financial aid were grouped into a separate category to see if they had similar opinions about their reasons for picking their preferred method of instruction. Out of the 9 students who receive financial aid and prefer in-person learning, 6 of them mentioned that in-person instruction is necessary for the college experience and it adds more structure to their day, giving them more motivation to work and study. Overall, a majority of the students said that the interaction and engagement is a crucial factor in their learning experience, and it makes them happier and more diligent students. All of the factors that were mentioned may create a more inclusive environment for the students, ultimately impacting their level of understanding and their motivation to succeed.

Section C: Stress Levels and Levels of Understanding

During the Zoom interview, each student was asked to rate their level of stress on a scale from 1 to 10, with 1 being least stressed and 10 being most stressed, for both online and in-person instruction. Additionally, they were asked to rate their level of understanding on a scale from 1 to 10, with 1 being the lowest level of understanding and 10 being the highest level of understanding. The data was split into 5 different categories, where Financial Aid stress rating, CNAS stress rating, CHASS stress rating, CNAS level of understanding, and CHASS level of understanding were analyzed separately.

Due to the statistically significant data between the students who receive financial aid and their preference for instruction, another chi-squared test was done to see if there is significant data between students who receive financial aid and their stress levels during online and in-person instruction.
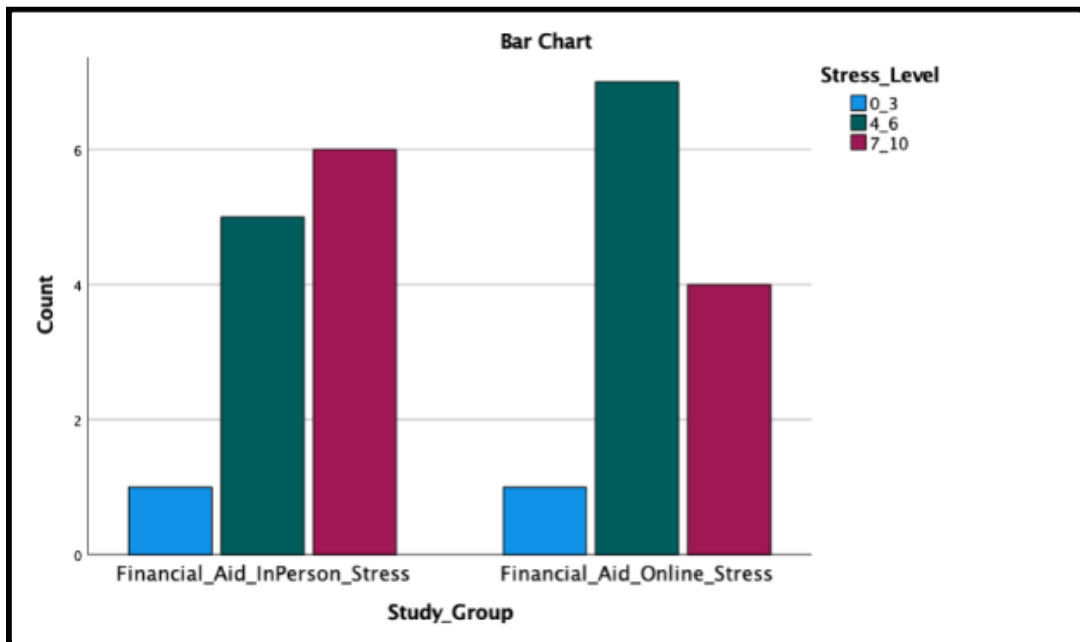

Figure 4: *Bar Chart illustrating the stress levels of students who receive financial aid during online and in-person instruction. (χ2 = 0.733, p-value = 0.693)*

Table 4: *Post-hoc analysis of Chi-square test in which the actual and expected counts of the categorical variables (stress levels) are summarized.*

Study Group	Statistic	Stress Level		
		Low	Medium	High
Financial Aid; In-Person	Count	1	5	6
	Expected Count	1	6	5
	% within Score	8.30%	41.70%	50.00%
	Adjusted Residual	0	-0.8	0.8
	p-value	**1**	**0.424**	**0.424**
Financial Aid; Online	Count	1	7	4
	Expected Count	1	6	5
	% within Score	8.30%	58.30%	33.30%
	Adjusted Residual	0	0.8	-0.8
	p-value	**1**	**0.424**	**0.424**

Figure 4 suggests that financial aid students experience higher stress levels during in-person instruction, as the 7-10 rating is higher in in-person instruction and lower in online instruction. Additionally, there are more medium stress level ratings during online instruction than in-person instruction. The chi-square test conducted in Table 4 shows the p-values for each data set. For the low-stress level data set, the p-value was 1, and for both the medium and high-stress level data set, the p-value was 0.424. Both of these values are greater than 0.05, which means the data is not statistically significant.

The next group that was studied was the CNAS students and their stress level ratings with online and in-person instruction. The same method was used as previously mentioned, where a 0-3 rating indicated low stress, a 4-6 rating indicated medium stress, and a 7-10 indicated high stress.
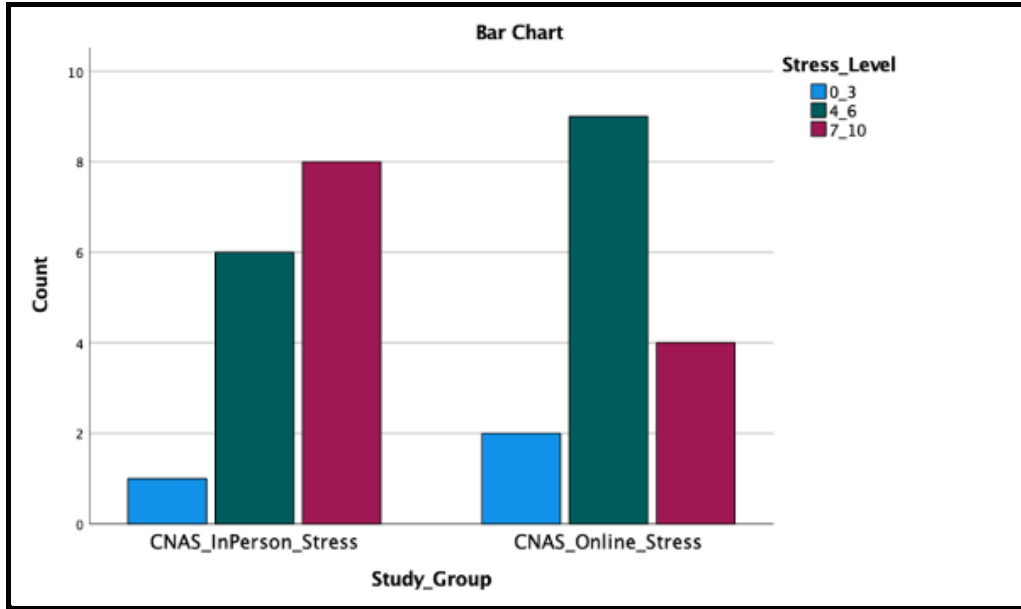
Figure 5: *Bar Chart illustrating the stress levels of CNAS students during online instruction versus in-person instruction. (χ2 = 2.267, p-value = 0.322)*

Table 5: *Post-hoc analysis of Chi-square test in which the actual and expected counts of the categorical variables (stress levels) are summarized.*

Study Group	Statistic	Stress Level		
		Low	Medium	High
CNAS In Person	Count	1	6	8
	Expected Count	1.5	7.5	6
	% within Score	6.70%	40.00%	53.30%
	Adjusted Residual	-0.6	-1.1	1.5
	p-value	**0.549**	**0.271**	**0.134**
CNAS Online	Count	2	9	4
	Expected Count	1.5	7.5	6
	% within Score	13.30%	60.00%	26.70%
	Adjusted Residual	0.6	1.1	-1.5
	p-value	**0.549**	**0.271**	**0.134**

Figure 5 shows the breakdown of the stress levels of CNAS students with in-person and online instruction. The key in the graph shows how the stress levels were broken down and analyzed. If the students rated their stress levels anywhere from 0 to 3, this was classified as low-stress levels. Stress level ratings from 4 to 6 were medium-stress levels, and ratings from 7 to 10 were high-stress levels. The data in Figure 5 indicates that in-person instruction had a higher level of stress for the majority of students compared to online instruction. For online instruction, the majority of students rated their stress levels as medium, and significantly fewer students rated their stress levels as high. In Table 5, the p-value of the low-stress level data set was 0.549, the p-value of the medium-stress level data set was 0.271, and the p-value of the high-stress level data set was 0.134. All of these values indicate that the data is not statistically significant, therefore, the results were random.

The next group that was analyzed was the CHASS students and their stress level ratings with online and in-person instruction.
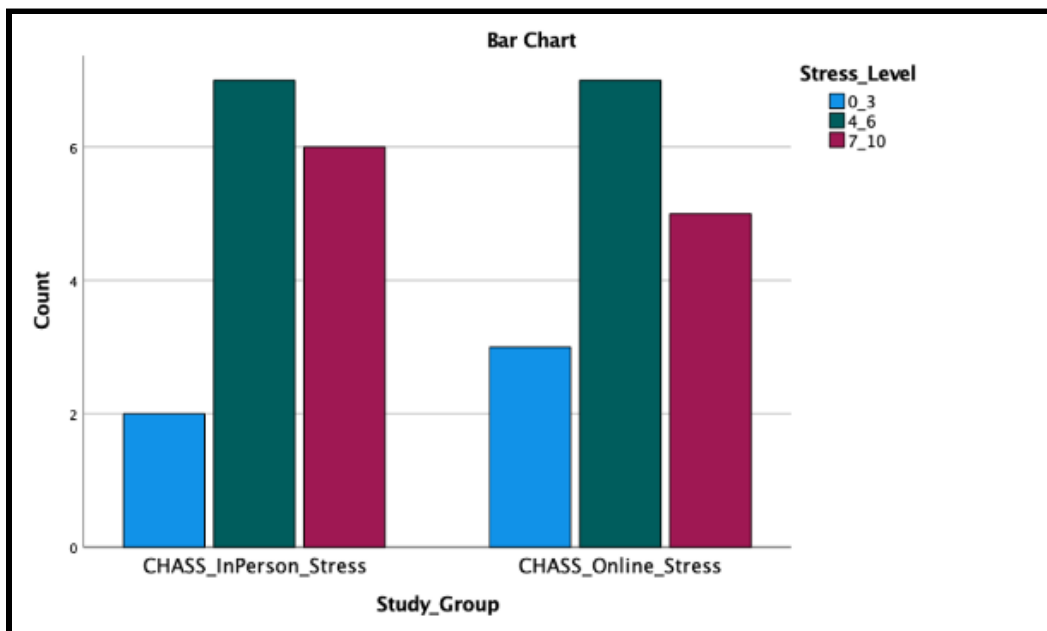

Figure 6: Bar Chart illustrating the stress levels of CHASS students with online instruction versus in-person instruction. ($\chi 2$ = 0.291, p-value = 0.865)

Table 6: Post-hoc analysis of Chi-square test in which the actual and expected counts of the categorical variables (stress levels) are summarized.

Study Group	Statistic	Stress Level		
		Low	Medium	High
CHASS In Person	Count	2	7	6
	Expected Count	2.5	7	5.5
	% within Score	13.30%	46.70%	40.00%
	Adjusted Residual	-0.5	0	0.4
	p-value	**0.617**	**1**	**0.689**
CHASS Online	Count	3	7	5
	Expected Count	2.5	7	5.5
	% within Score	20.00%	46.70%	33.30%
	Adjusted Residual	0.5	0	-0.4
	p-value	**0.617**	**1**	**0.689**

In Figure 6, the 4-6 (medium stress level) ratings seem to dominate over both in-person and online instruction. The CHASS students appear to rate in-person stress as a bit higher compared to the high-stress level with online instruction. The low-stress level in online instruction is a bit higher compared to the low-stress level in in-person instruction. Overall, these results indicate that in-person instruction seems to cause higher levels of stress in CHASS students. Table 6 shows the calculated p-value for each of these data sets: the p-value of the low-stress level data set was 0.617, the p-value of the medium-stress level data set was 1, and the p-value of the high-stress level data set was 0.689. The p-value of the medium stress level data set as 1 indicates that there is no obvious or significant difference between the responses with in-person instruction and online instruction, other than due to chance. The other p-values are also greater than 0.05, so the rest of the data is also not statistically significant.

The next part of the study looked at the level of understanding rating with online and in-person instruction. Students were asked their opinions on each method of instruction, and then

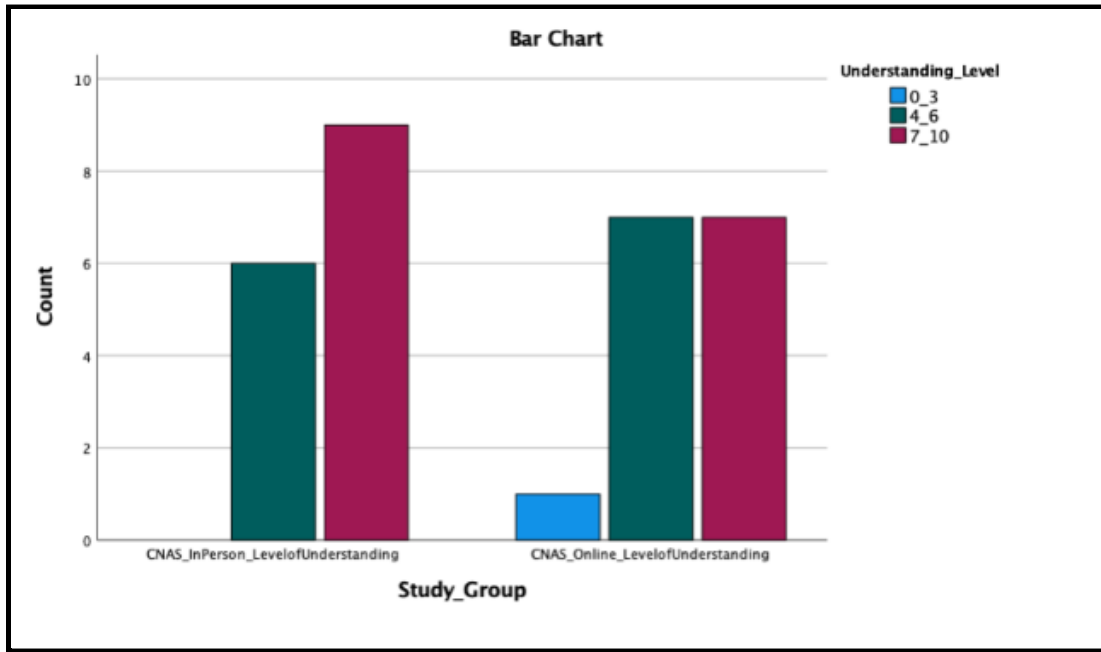rated their level of understanding based on their experience with both in-person and online instruction.

Figure 7: Bar Chart illustrating the levels of understanding of CNAS students with online instruction versus in-person instruction. (χ2 = 1.327, p-value = 0.515)

Table 7: Post-hoc analysis of Chi-square test in which the actual and expected counts of the categorical variables (levels of understanding) are summarized.

Study Group	Statistic	Level of Understanding		
		Low	Medium	High
CNAS In Person	Count	0	6	9
	Expected Count	0.5	6.5	8
	% within Score	0.00%	40.00%	60.00%
	Adjusted Residual	-1	-0.4	0.7
	p-value	0.317	0.689	0.484
CNAS Online	Count	1	7	7
	Expected Count	0.5	6.5	8
	% within Score	6.70%	46.70%	46.70%
	Adjusted Residual	1	0.4	-0.7
	p-value	0.317	0.689	0.484

Similar to the way stress levels were broken down and analyzed, a 0-3 rating signified a low level of understanding, a 4-6 rating signified a medium level of understanding, and a 7-10 rating signified a high level of understanding. According to Figure 7, CNAS students experienced a higher level of understanding with in-person learning compared to online learning. This could be because of the engagement, social interaction, and campus community by studying with peers and seeking in-person help from professors and TAs. For online instruction level of understanding results, CNAS students had an even split between medium understanding levels and high understanding levels. However, none of the students gave in-person instruction a 0-3 level of understanding rating, while 1 student did rate online instruction as a 3 for their level of understanding. In Table 7, the p values for low, medium, and high levels of understanding data sets as 0.317, 0.689, and 0.484, respectively. All of these values are greater than 0.05, meaning that the data is not statistically significant and the results are due to random chance.

Finally, the last grouping that was analyzed was the CHASS students' level of understanding of both methods of instruction.
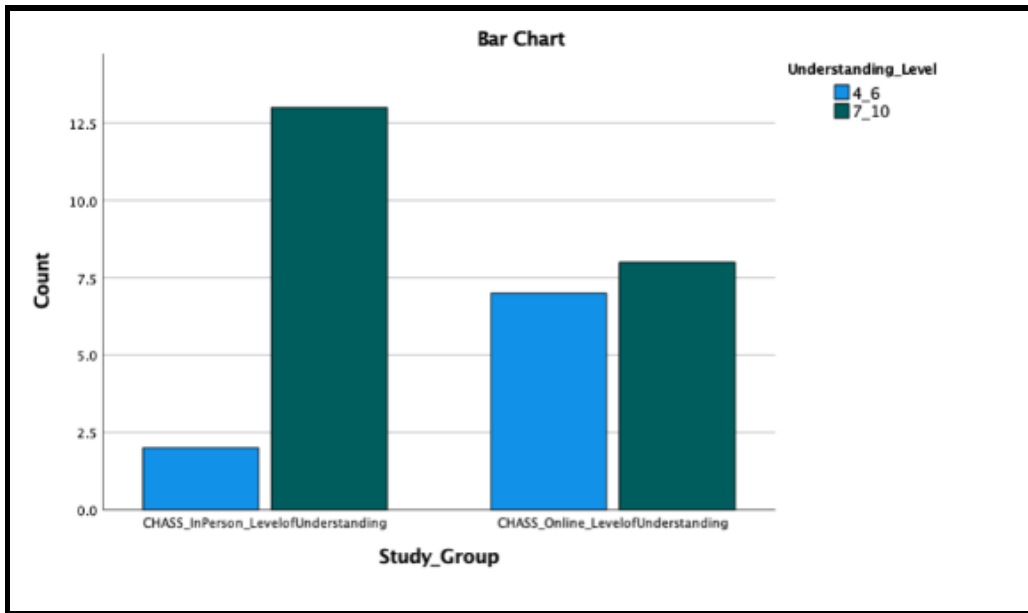
Figure 8: Bar Chart illustrating the levels of understanding of CHASS students with online instruction versus in-person instruction. ($\chi2 = 3.968$, p-value = 0.046)

Table 8: Post-hoc analysis of Chi-square test in which the actual and expected counts of the categorical variables (levels of understanding) are summarized.

Study Group	Statistic	Level of Understanding	
		Medium	High
CHASS In Person	Count	2	13
	Expected Count	4.5	10.5
	% within Score	13.30%	86.70%
	Adjusted Residual	-2	2
	p-value	**0.046**	**0.046**
CHASS Online	Count	7	8
	Expected Count	4.5	10.5
	% within Score	46.70%	53.30%
	Adjusted Residual	2	-2
	p-value	**0.046**	**0.046**

In these results, none of the students gave their level of understanding rating as less than 4 for both methods of instruction. This means that there was no low level of understanding rating at all for either online or in-person instruction. Figure 8 shows a significant difference in the level of understanding ratings with in-person and online instruction. The majority of CHASS students rated their level of understanding to be much higher during in-person learning, with the 7-10 rating being much larger than the 4-6 rating on the graph. However, for online learning, the 4-6 rating is just slightly lower than the 7-10 rating. In Table 8, the p values of both data sets are 0.046, which is less than 0.05. This means that these results are significantly significant, and they are based on the effect the students were experiencing.

DISCUSSION AND ANALYSIS

Based on the results, it is reasonable to conclude that in-person instruction is favored by the majority of students, and first-generation college students and students who receive financial aid prefer in-person learning. Additionally, data suggests that student stress levels are higher during in-person instruction, as well as their levels of understanding. Although in-person instruction may be more difficult and stressful for students, it is shown to be more effective and students are able to grasp the material better.

For the qualitative analysis, responses were grouped by students who preferred different methods of instruction to see if their reasoning was the same. Among the 15 students who preferred in-person instruction, 9 of them stated that this was primarily due to the interaction with peers, TAs, and professors on campus. Additionally, among these 15 students, 5 of them stated that they enjoy walking to class or riding their bike to campus. This is due to the simple exercise that transportation to class/campus gives them. More reasons why students prefer

in-person instruction compared to online instruction is that there is a better learning environment, higher work ethic, more focus/engagement in classes, and a good balance of being around your peers and being involved with your studies.

Among the 8 students who preferred online learning, 5 of them talked about how it is much more convenient and easier to plan other activities/events within their schedule. 2 out of the 8 students also explained that commuting is an issue for them, so the no-commuting factor is a huge positive aspect of online instruction. A couple of students also mentioned that some professors became more lenient and understanding during the Covid-19 pandemic, which influenced their online instruction experience in a very positive way, as assignments, exams, and quizzes were a bit easier. In addition, 3 out of the 8 students stated that they enjoy working at their own pace and self-learning is a much more suitable style of learning for them. These results indicate some of the positive aspects of online learning, and how there are a variety of different aspects that go into a student's decision of their preferred method of instruction.

There were about 7 out of the 30 students who preferred hybrid instruction compared to both online and in-person instruction, and almost all of these students indicated that it is very beneficial to be given a choice for having a class either in-person or remote. Another big reason why hybrid learning is preferred is the large access to a variety of lecture material, and the ability to go back and watch recorded lectures without missing any information. 4 out of the 7 students stated the convenience as a huge advantage to hybrid learning, since you are able to get the benefits of both online and in-person learning.

The two categories of analyzed data with the biggest observed differences were the financial aid vs non-financial aid status for instruction preference and the level of understanding during online and in-person instruction for CHASS students. Both of these groups had

statistically significant data, with the p-value being less than 0.05, meaning that the null hypothesis was rejected. Since there was a significant difference between the financial aid students and their preference for in-person learning, another analysis was conducted to look at the stress levels of these students. However, there was not a significant difference with this data set. Although there was no significant difference with this stress level analysis, it was still important toward the study to see if there was a drastic difference in stress levels with those that received financial aid. There were more high stress ratings during in-person learning compared to online learning, which is interesting to note, since in-person instruction was favored. However, the qualitative responses from these financial aid students indicate that their reason for choosing in-person learning was because of the campus environment, motivation, and engagement aspects, rather than easier or more convenient learning with remote instruction. Although learning in-person may be more difficult and stressful, it gave the students a better sense of campus community and a better college experience.

Some of the key takeaway points from this study are that in-person instruction is preferred in all of the different categories of students, even though both stress levels and levels of understanding seem to be higher in in-person learning. In the interviews, one of the main points that a majority of students brought up is that they enjoy the hands-on learning experience as well as the interaction with peers, professors, and teacher assistants. It creates a more welcoming environment for these students and the socializing aspect of in-person instruction also helps with mental health.

At the end of the interview, the students were asked whether they see the benefit of hybrid instruction, where some aspects of both online and in-person instruction are incorporated. Almost all of the students said that hybrid has many benefits, such as more flexibility,

convenience, saving money, and the social interaction of having some classes in person while still taking some classes online. Some students mentioned that due to the pandemic, some professors became more understanding and considerate of student schedules, which helps the students focus their time and energy on other activities. Additionally, the students commented on the wide variety of resources that are available with hybrid/online learning, one of the biggest resources being the recorded lectures and being able to access them whenever necessary. All in all, hybrid instruction allows the students to achieve a balanced lifestyle in terms of their schoolwork, extracurricular activities, jobs, and more.

The descriptive statistics used with the SPSS software provided very useful insight into the potential differences between the study groups. For future work, some recommendations for a similar study could be using a larger sample size to increase the possibility of revealing even more significant differences, including more questions to elaborate on student stress in the interview. With these recommendations, we might see more statistically significant data, both qualitatively and quantitatively. Furthermore, this same study could be conducted with students that are a part of different colleges (e.g., Bourns College of Engineering [BCOE], School of Medicine [SOM], etc) to see if it yields the same results as studying CNAS versus CHASS.

CONCLUSION

The purpose of this study was to analyze the stress levels, levels of understanding, and instructional preferences of several different study groups of students (CNAS versus CHASS, Financial Aid versus Non-Financial Aid, and First generation versus Non-first generation). The original hypothesis for this study was that online instruction has increased the stress levels of students in all different categories, however, the data suggests that the opposite may be true.

30

In-person instruction seems to increase stress levels in all different categories of students, and it is the preferred method of instruction, compared to online and hybrid learning. Additionally, levels of understanding seem to be slightly higher in in-person learning than in online learning, indicating that students are getting a better grasp of the material in a lecture hall rather than through a screen. There are many advantages and disadvantages to both methods of instruction, but the student responses point to in-person learning being more effective and enjoyable. These results can be useful to give students the opportunity to pick and choose which classes they want online and which they want in person, in order to give them more flexibility. Having this choice may also decrease their stress levels, but this can be analyzed further in future studies. It is important that student stress levels with different forms of learning continue to be studied and researched, in order to create an ideal learning environment for students in higher education settings.

REFERENCES

Gorman, E.F., & Staley, C. (2018). Mortal or Moodle? A Comparison of in-Person vs. Online Information Literacy Instruction. *Journal of Library & Information Services in Distance Learning*, *12*(3-4), 219–236. https://doi.org/10.1080/1533290x.2018.1498635.

Herrington, D.G., & Daubenmire, P.L. (2014). Using Interviews in CER Projects: Options, Considerations, and Limitations. *ACS Symposium Series*, *1166*, 31–59. https://doi.org/10.1021/bk-2014-1166.ch003.

Monareng, J., Ramraj, A. B., & Mashau, P. (2020). The Rise in Online Learning in South African Schools Due to the Coronavirus Pandemic. *Gender & Behaviour*, *18*(4), 16753–16762.

Patkar, U. S., Patkar, K. U., & Patil, S. K. (2016). Assessment Of The Prevalence Of Stress And Its Levels In Students Of A Medical College In Mumbai - A Cross-Sectional Study. *National Journal of Integrated Research in Medicine*, *7*(2), 9–13.

Rao, C. R. (2002). Karl Pearson Chi-Square Test the Dawn of Statistical Inference. *Goodness-of-Fit Tests and Model Validity*, 9–24, https://doi.org/10.1007/978-1-4612-0103-8_2.