# Spring 2020 Student Interviews

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For our student survey in this study, we looked at the questions that were developed by the researchers at Georgetown and HEDS to develop our own student survey. Because many of the engineering classes at SJSU include laboratories, projects or other group experiences, we wanted to create our own survey to ask students about these experiences. The survey was reviewed by the Associate Dean of Engineering at SJSU. The College of Engineering dean’s office agreed to give us a list of the emails of all Spring 2020 engineering majors who took at least one course in Spring 2020.

The SJSU team submitted an IRB application and it was approved on 5/28/20. There were 6,674 students who were enrolled as engineering majors in Spring 2020; each of these students was sent the survey through Qualtrics. The first email with the survey was sent on 6/1/20 with follow-up emails on 6/7/20, 6/15/20, 6/21/20, and 7/3/20. The survey was closed on 7/16/20.

One of the last questions in the survey asks for volunteers to participate in an interview. 129 students volunteered to be interviewed as of June 30, 2020. Because of the high number of volunteers, we went through the students that volunteered for the interview and picked four students per major (if there were at least 4 volunteers). The strategy we followed was as follows

- if volunteers < 4, we took them all

- if > 4, we divided them in three categories (1: Frosh+Soph+Junior, 2: Senior, 3: Grad) and picked one student for categories 1 and 2, and two students from the graduate students. To do so, we assigned them a random number between 0-1 and picked the student with highest number for each category

Overall, we chose 50 students to be interviewed based on the student survey data as of June 30, 2020. We contacted the students by email and set up Zoom meetings in July and August 2020 to interview the students who replied. 26 of the 50 students set up Zoom interviews with one of the co-authors. After we closed the student survey on 7/16/20, we downloaded additional students who had agreed to be interviewed—28 additional students overall. We decided to replace the students who did not reply to our emails with other students who had agreed to be interviewed. In our replacement, we looked at four variables: grade level, major, gender, and ethnicity. Our first choice was to replace a nonresponsive student who matched on all four variables and our second choice was to replace a nonresponsive student who matched on three of the four variables. We included the student volunteers from 7/1-7/16 in our replacements for the student interviews. Table 1 shows the distribution of our student pool from the initial selection to the final selection. Overall, we completed interviews with 40 engineering students.

Table 1. Distribution of Students Selected to be Interviewed

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|   | original | revised 7/17/20 |   | original | revised 7/17/20 |
| Female students | 16 | 15 | Frosh + Sophomore + Junior | 13 | 13 |
| Male students | 34 | 34 | Senior | 13 | 14 |
| other |   | 1 | Graduate | 23 | 22 |
|   |   |   | other |   | 1 |

## Student Interview Protocol

For this interview, we adapted the interview protocol that was used by Pawley [33] at Purdue University. The interview recordings were completed through Zoom. We recorded the interviews on the Zoom cloud. When this is done, Zoom automatically creates a transcript of the Zoom video. The transcripts were reviewed by graduate students for typos in the transcript and words that the electronic transcriber misheard or misunderstood. Dr. Backer then will pseudonymized the transcript, masking names, places, ages, organizations, ethnic groups (replacing them with broader racial categories), nationalities, languages, and religious affiliations or communities for those participants who desired it and the names of people participants mentioned. Dr. Backer sent the participants the pseudonymized transcripts to review for inaccuracies or things they regretted saying, and will make whatever changes they requested.

The interview protocol (adapted from Pawley [33]) is below. The interview consists of a single question: “How did you do in your classes in Spring 2020?”. According to Pawley, this allows “participants to tell their stories in whatever way they chose” (p.18).

We have included the prompts below for this interview protocol.

Interview guide

1. How did you do in your classes in Spring 2020?

Prompts as needed: Tell me a little about yourself. Tell me about your experiences at SJSU after the transition to 100% online instruction. How did your instructors teach your engineering classes after going online? Has COVID 19 made any impact on your life? Did you take any lab classes? How did they go?

2. Prompts on institutional structures—financial, community service, student support, rules and regulations at SJSU

Generic prompts: Let’s talk about that for a minute; Tell me more about that; So, just to clarify…How did you learn about this? What was important to you? Any regrets? Anything you wish you had done differently? Anything else you would like to tell me?

As discussed above, the interviews were conducted using Zoom cloud. After the transcripts were cleaned and approved by the interviewee, we analyzed the transcripts. We used NVivo 12, a qualitative data analysis tool, to code response and identify outstanding themes of perceived in the student and faculty interviews. Interview data was coded via grounded theory approach and analytical domains based on the designated goals and objectives. Dr. Backer first hand-coded the interview data transcripts and then employed a coding scheme in order to look for emergent themes or domains of meanings or meaningful patterns across the interviews [34] [35]. The student interviews were independently coded by a graduate student. The two coders compared the coding and themes and agreed to the final coding.

An iterative inductive stage involved several close readings of the transcribed interviews by these two members of the research team who coded the results. This reading provides a holistic perspective of the responses. In this stage, points of interest and interpreted significance are coded by the team. At this point, both Dr. Backer and the graduate student coded the same transcript and then their results were compared and arbitrated. This process was continued until the coders achieved a valence of consistency that approximated near complete calibration. Then each coding team member completed the rest of the transcripts individually, the project files from each coder are merged, and one final arbitration session was conducted prior to moving to the next stage.

The second stage consisted of a step-by-step analysis that went into the description of the analytic themes derived from stage 1. In the third stage, the development of a narrative that moves through several levels of analysis: 1st, a rich description of the phenomena, from the participants’ perspective; 2nd, through an abstract level of analysis; to 3rd, a more conceptual interpretation conducted by the investigator(s) was completed.

## Results

### Student Interviews

The student interviews were conducted in July and August 2020 by one of the authors in this study. Overall, we interviewed 40 students using Zoom. The interview protocol (adapted from Pawley) is in the appendix. The interview consists of a single question: “How did you do in your classes in Spring 2020?”. According to Pawley, this allows “participants to tell their stories in whatever way they chose” (p.18). We developed a series of prompts to assist in the interview process.

To pseudonymize the students and protect their identities, we used the list of 2018-2020 Atlantic Hurricanes to rename the participants (World Meteorological Organization, 2020). The names alternate from male to female and we following the same procedure. Because we interviewed 40 students overall, we used the cyclone names from 2018-2020. Table 2 below shows the majors, ethnicity, year, and gender of the students whose transcripts we analyzed for this study. One student’s transcript was not included because the student did not take any engineering classes in Spring 2020. Instead, this student took classes for the business minor.

We interviewed students from each major in the SJSU College of Engineering with the exception of students from General Engineering. General Engineering is the smallest program in the college; in Spring 2020, there were only 73 students in General Engineering of the 6,372 students in the college overall. Only six General Engineering students responded to the survey and one of these students volunteered to be interviewed. However, he did not respond to the email request to set up an interview.

We divided the students into three groups: lower division students (Freshmen and Sophomores), Upper Division students (Juniors and Seniors) and Graduate students. As described in our methodology section, we purposely used a stratified approach to our selection of the interviewees so that we would get representation from all of the departments.

Table 2. Students interviewed about their experiences in Spring 2020.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Pseudonym** | **Major** | **Ethnicity** | **Year** | **Gender** |
| Joyce | Aerospace Engineering | Two or more ethnicities | Lower Division | Binary |
| Fernand | Aerospace Engineering | Latinx | Upper Division | Male |
| Sebastien | Aerospace Engineering | Asian American | Graduate | Male |
| Tony | Aerospace Engineering | Latinx | Graduate | Male |
| Debby | Aviation | White | Upper Division | Female |
| Michael | Aviation | Two or more ethnicities | Upper Division | Male |
| Ernesto | Aviation | White | Upper Division | Male |
| Nadine | Biomedical Engineering | Latinx | Lower Division | Female |
| Sara | Biomedical Engineering | International | Graduate | Female |
| Kirk | Biomedical Engineering | Two or more ethnicities | Graduate | Male |
| Gordon | Chemical Engineering | White | Lower Division | Male |
| Florence | Chemical Engineering | White | Upper Division | Female |
| Arthur | Civil and Environmental Engineering | Asian American | Upper Division | Male |
| Patty | Civil and Environmental Engineering | Latinx | Upper Division | Female |
| Andrea | Civil and Environmental Engineering | International | Graduate | Female |
| Leslie | Civil and Environmental Engineering | Middle Eastern | Graduate | Female |
| Barry | Computer Engineering | Latinx | Upper Division | Male |
| Humberto | Computer Engineering | Latinx | Upper Division | Male |
| Van | Computer Engineering | Asian American | Graduate | Male |
| Valerie | Computer Engineering | International | Graduate | Female |
| Helene | Electrical Engineering | White | Upper Division | Female |
| Isaac | Electrical Engineering | White | Lower Division | Male |
| Lorenzo | Electrical Engineering | International | Graduate | Male |
| Nestor | Electrical Engineering | International | Graduate | Male |
| Chantal | Human Factors/Ergonomics (in ISE) | Decline to state | Graduate | Female |
| William | Industrial & Systems Engineering (ISE) | Latinx | Upper Division | Male |
| Pablo | Industrial Technology | International | Upper Division | Male |
| Dorian | Industrial Technology | Latinx | Upper Division | Male |
| Gonzalo | Industrial Technology | African American | Upper Division | Male |
| Jerry | Industrial Technology | Latinx | Upper Division | Male |
| Alberto | Materials Engineering | White | Graduate | Male |
| Oscar | Mechanical Engineering | Middle Eastern | Lower Division | Male |
| Cristobal | Mechanical Engineering | African American | Upper Division | Male |
| Edouard | Mechanical Engineering | African American | Upper Division | Male |
| Erin | Mechanical Engineering | Asian American | Graduate | Female |
| Gabrielle | Mechanical Engineering | Asian American | Graduate | Female |
| Rafael | Mechanical Engineering | Middle Eastern | Graduate | Male |
| Chris | Mechanical Engineering | White | Graduate | Male |
| Imelda | Software Engineering | African American | Upper Division | Female |
| Beryl | Software Engineering | White | Graduate | Female |

After the transcripts were coded using nVivo 12 software, we evaluated the frequency of the coding. Overall, we generated 35 different codes based on the student interviews. Table 3 shows the codes, the number of student interviews with the code, and the number of total references. The highest theme that was present was “negative experience.” 32 of the 39 students who were interviewed indicated that they had at least one negative experience in the Spring 2020 semester related to their engineering classes. The next highest codes were Project work in Spring with 28 student interviews including this code and online tests and exams with 27 student interviews including this code. Interestingly, the next highest code was “positive experience” with 25 student interviews including a positive experience in the Spring. The closeness of negative experiences and positive experiences show the dichotomy for many students about the Spring 2020 semester. For most students, they had classes and instructors that did a good job and others who did not.

In reviewing Table 3, we saw that most of the codes were related to negative comments by students related to their experiences in Spring 2020. The second most common category were comments related to student comments related to class content. The other categories were recommendations for improving instruction, student positive comments, student personal experiences in Spring, and other comments. We will discuss each of these categories separately in this analysis.

Table 3. Frequency of Coding in the Spring 2020 Student Interviews

|  |  |  |
| --- | --- | --- |
| Code | Number of Student Interviews | Number of Total References |
| **Student Sentiments** |
| Negative Experience | 32 | 89 |
| Positive Experiences | 25 | 47 |
| **Student Comments Related to Course Content** |
| Project Work in Spring | 28 | 41 |
| Online Tests and Exams | 27 | 75 |
| Lab Issues | 23 | 40 |
| Powerpoint usage and issues | 13 | 18 |
| **Student Recommendations for Improving Instruction** |
| Recommendations for faculty | 20 | 32 |
| Instructors should be better organized and be able to use technology | 13 | 14 |
| Classes could be more interactive | 9 | 9 |
| Videos should be available after class | 9 | 14 |
| Instructor refused to record or post lectures | 9 | 12 |
| **Student Negative Comments**  |
| Instructor lectured the entire period | 18 | 33 |
| Instructor did not respond to emails from students | 13 | 19 |
| Instructor did not conduct classes after COVID/instructor missed several classes | 7 | 11 |
| Instructor did not hold office hours | 7 | 10 |
| After COVID, classes were (should be) more flexible | 8 | 10 |
| Instructor could be more understanding | 5 | 6 |
| Instructors want students to work more | 4 | 4 |
| Instructor thought students were cheating | 4 | 4 |
| Students cheated | 3 | 4 |
| It was hard to talk to instructor during office hours | 3 | 4 |
| Class did not meet at scheduled time | 1 | 2 |
| **Student Positive Comments**  |
| Instructor used active learning | 16 | 24 |
| Instructor responded to students via email or in office hours | 9 | 11 |
| Instructor tried very hard in the online class or used Canvas effectively | 6 | 7 |
| Instructor used a whiteboard | 4 | 5 |
| **Students Personal Experiences in Spring** |
| Spring was a lot of stress | 20 | 34 |
| Students miss social interactions and work with other students | 12 | 20 |
| Student did not like online learning | 9 | 14 |
| Important thing is to reduce risk from COVID | 9 | 10 |
| Student needs to be more proactive in online classes | 8 | 9 |
| **Other Comments** |
| Graduation issues | 5 | 5 |
| Job search and internship issues | 3 | 6 |
| Internet, computer and connectivity issues | 3 | 3 |
| Student has learning disability | 1 | 2 |

### Student Sentiments

During the interviews, the students were direct in discussing their concerns about the instruction during Spring 2020. Almost all of the comments under Negative Experience dealt with the students’ experiences with their classes in Spring 2020. 32 of the 39 students interviewed had at least one negative experiences in Spring 2020 after instruction went online. Some of the comments related to the way the class were taught, other comments related to office hours, and others related to online testing. Some of the comments from students about their negative experiences are below

Gonzalo

“ I can't say that I did learn in the class, even though it was online. Half of the class was a lab and I didn't feel like I learned as much as the lab than the lecture. The lab was a very hands-on type of situation and instead we basically watched a pre-recorded video of the lab professor in the lab doing the system that we were going to intend to do during class and if I'm a technical learner, so I enjoy labs and in the lab section I feel I didn't learn as much.”

Isaac

“I think that the online lecture was handled very well. Personally it like the class wasn't too much different. There's a lecture and we had, the lecture format when we were in the class was just being in the class, and he would go through a slideshow and show us, you know, step by step how to analyze various circuits and so moving the lecture itself to the online section wasn't too hard because rather than watching him projected you just all you know share the screen. So, it was really very similar. The issue became that moving it online just made it very difficult in terms of how we interacted with students. He was not very good with receiving emails and it was difficult for him to answer questions during the class.”

Fernand

“We had not much communication with the professor for almost a month. I'm not sure what happened to the professor. I think that his wife may have fallen ill. So he was kind of absent for almost a month and there wasn't very much instruction on how we're going to go and proceed with the class. But when it came to, I think we had about six weeks left of school, he had assigned us a full report for the class.”

Beryl

“And then what happened actually at the final exam. So you couldn't go back. So, and he didn't tell this and it was not written on the final exams…And usually like a normal exam, you can go back, you can skip a question of go back.”

Chris

“And this professor, he isn't, he doesn’t have the best technological understanding to begin with you were in person. Doing PowerPoints, and stuff was kind of hard. But I feel like the main problem he ran into was he didn't really take advantage of the tools that were available to them. He did not use Canvas. He did not, you know, use any kind of organizational tools. So, we would submit homework and he would lose it. Like we would send him an email, like, Hey, here's my homework. Okay, and then two days later he sends us or like weekly great feedback and it's not even, showing us submitted. He's like you never sent me this, like, yes, I did, it’s in your email.”

Jerry

“We had a midterm, midterm, number two. That had some graphics on it, and for some reason the Canvas LockDown Browser wouldn't show any of the graphics. So, when it came time to the answer that question, we would just see a blank page with like the letter A and B, and it was completely confused. We didn't know what to do and yeah, she tried to explain it to us afterwards. But it still didn't click for anybody in the class. I think the majority of the class got it wrong.”

Crisobal

“I was facing like internet connection problems during the tests which made it really difficult for me to continue to test sometimes. And the first time they said, Okay, we'll let you retake the test. But the second time they said this is a recurring issue. You should have figured it out. But it's not like it was an excuse, it was an actual problem that I have in my house.”

At the same time, many students reported positive experiences in their classes after the move online in March 2020. Overall, 25 of the 39 students reported a positive experience. The positive experiences were reported by the same students who had negative experiences. These positive experiences were related to the ways that the faculty conducted classes as well as supports that the faculty members gave the students. Some student comments are included below.

Gordon

“He was outstanding. All of his PowerPoints were fluid. It looked very easy, very appealing. So I had no issues whatsoever with math. It felt as if I was in his classroom as normal.”

Erin

“He recorded his screen. He went through a PowerPoint on the screen and wrote on something similar to a whiteboard on his screen, where applicable to solve problems. So that was how he was giving us instructions. He would record it, uploaded on canvas, and then we could access it at any time and just view it as a video within canvas.”

Chantal

“Something I found really helpful that one professor did was he would have happy hours. And it was just a time to have asked all the students to log in and talk about non school sort of related things like We do little slides about and talk about our lives and so on purpose role is really on board with just trying to keep us all connected.”

Jerry

“We had dates for everything in class when we had our zoom meetings, she explained that all the dates all the cutoff dates, whether or not there's any leeway. clearing to find any expectations and then had us what’s our concerns during the zoom meetings. Via email if we missed anything and then the good thing about her class every single day. We had class. She has an assignment where we basically voice. What we learned what we still didn't understand and any outstanding questions.”

### Student Comments Related to Course Content

The largest number of student comments related to course content including project work in the Spring 2020 semester (28 students), online tests and exams (27 students), lab issues (23 students) and PowerPoint use and issues (13 students). As can be expected, both projects, most of them group projects, and lab work was challenging for the students and instructors after the quick move online in March 2020. Despite the challenges, most of the students were able to complete their projects after the move online. As Leslie noted, “We had yeah we had projects in both classes, we presented them over Zoom. We would put up the PowerPoint and then present like normal.”

The main issue with project work was related to the senior projects for most of the engineering majors. At SJSU, most seniors complete a two course sequence for their senior projects. The Fall semester is focused on designing the senior project with the Spring semester dedicated to the building of the project. Many groups did not finish their senior project work before the move online in March 2020. Fernand’s experience in his senior project was echoed by many other students we interviewed.

Fernand

“I think spring semester was something that a lot of us in the aerospace engineering lab had a tough time dealing with since a lot of us have projects going on, and a lot of a lot of it was coming to fruition, but then spring came with the coronavirus and it just derailed everything. So I think a lot of us who had like personal projects for either a master's program or for bachelor's are missing that aspect of doing it together as a group and working on things.”

 Approximately two-thirds of the students reported issues with labs after the move online in Spring 2020. Many instructors either omitted the labs from their classes or did the experiments themselves and shared the results with the students in the class.

Humberto

“Typically, yeah, they just give you the data and then they tell you, like, how do you interpret this. How did they come up with this result based off this like data.”

Sebastien

“We were supposed to do labs, but that got cancelled because we couldn't meet and do the physical labs.”

 There were many issues related to online tests and exams. Overall, very few students enjoyed the online tests. The tests ranged from take-home exams to proctored exams using lockdown browsers.

Erin

“The professor uploaded an exam sheet with questions. The exam was conducted over a webcam (zoom). Everyone had their webcam turned on. Professor wanted to see our hands, papers, and our faces. At the end, we scanned our answer sheets and uploaded them on canvas.”

Oscar

“So he always had, like, he was always saying from the beginning that the midterm would be on the lockdown browser. So we did end up having our midterm on the lockdown browser. For the midterm, he actually had us be disabled the camera because I guess some people's webcams aren't working, but for the final and another quiz had the camera. But I feel like, and also the way he made the test, so let's say you have extra time at the end, you can't go back. So most of them were pretty long. So, a lot of us students didn't even finish like the last few questions. And the way he had it is like the beginning is like the multiple choice, and then the end are like the long, you have to type out the code. So it was a little like rushed at the end always.”

Valerie

“Many students faced challenge with the proctorU exam, due to technical difficulties they were not able to begin exam for about an hour. One time, the proctor didn’t allow student to use restroom during exam. So the students has to quit exam soon due to his health issues. During proctorU exam, we were not able to communicate to our professor to ask any doubts in the question, I lost 12 points in one of the midterm exam, because I accidently closed the proctorU chat window and got panicked whether university not able to monitor me and what if my exam got invalid. So clicked submit exam before completion.”

Students had mixed feelings about the use of PowerPoint in their classes after the move online. From the interviews, it appears that many instructors used PowerPoint for their entire class time after the COVID 19 shutdown. Patty’s comment is typical of the comments of the other students with respect to Powerpoint use by the instructors.

“Yeah, he would kind of just like read through the PowerPoint, but it was kind of confusing. Because the exercises that we would follow with, they just, I don't know if they just didn't if they were missing some portions in his PowerPoints, but it was, it was kind of hard to, It was hard to get the proper instruction to do the exercises to understand the material.”

### Student Recommendations for Improving Instruction

Most students appreciated the efforts that faculty made in the quick transition online. The students expressed concerns about the organization of the classes (13 students), the lack of interactivity (9 students) and the availability of lecture videos (9 students). More than half of the students gave recommendations as to how faculty could improve their online classes in Fall 2020. Many faculty, according to the student interviews, were unprepared to teach online. They had difficulties in using the learning management system (LMS), Canvas, as well as Zoom. As well, some faculty would not record their lectures or not post them online. As some students had Internet connectivity problems, this was a problem for students. Approximately 1/3 of the instructors did not or would not post videos.

Gonzalo

“So strangely enough for a teacher, for professors, or instructors, I suggest they try watching preschool shows like Blue's Clues and Dora the Explorer and notice that the character and his show price to engage with the audience saying like, so what else should we do here? So things like that, um, be more engaging than having the regular lecture of because even though regular lectures, you're in class, you can see that they're there, when it's on video, it's a bit. There are few more distractions than on screen. So I'd suggest having like an after class quiz asking the students on how they're understanding it. So like what gets students to think ahead of what they're about to show in the class, things like that that'll keep people engaged.”

Patty

“I really was not a fan of the YouTube lectures, I felt like I couldn't ask questions and he wasn't the best at communicating through email, anyway. So, I really, really like zoom lectures like I feel like they just help keep a schedule so you don't fall behind.”

Nestor

“Yeah, so in online classes that thing is like you cannot interact with the class. So generally, we don't interact with the other students, we just interact with a professor so like there is no group discussions or anything. So due to which, the thing is like you have to do the whole course or just take stress on yourself. But if we have some friends, other friends, then like we can discuss with the class and we can understand that, oh, this is the problem that I'm facing so to face the same problems.”

Isaac

“The issue became that moving it online just made it very difficult in terms of how we interacted with students. He was not very good with receiving emails and it was difficult for him to answer questions during the class.”

Imelda

“So it's kind of required to attend lecture, but he also said he didn't know how to like work like dealing with the zoom transcripts and stuff but I did attend every lecture link all my classes, which was fine for me. But it was hard because that class was already tough as it is and like having to refer back to the book, instead of like the like videos or PowerPoints was like I don't know too tedious.”

Joyce

“In my preference, I preferred when lectures were recorded and then posted. So I could go back and listen to them and go through the notes. I'd say three out of the four lectures, I had didn't do that.”

### Student Negative Comments

Not surprisingly, considering that most students expressed at least one negative sentiment, the largest number of different comments were negative. A large number (18 out of 39 students) reported that, in at least one of their classes, that instructors lectured the entire period. Most classes at SJSU are scheduled for either twice a week for 75 minutes or once a week for 2.5 hours.

Chris

“We didn't really have a whole lot interaction class, we would have like a lecture and we would take notes and submit something. There wasn't anything where we would be asked to think of something ourselves and submit it like a normal class setting which you have some kind of like, there's a give and take, but it's really just give you weren't, you weren’t really submitting anything of our own.”

Valerie

“They just lectured like they were in class and they just pretended everything was normal and they lectured for the whole two and a half hours.”

Rafael

“The online lectures for the master's program, they are pretty long. You know, like, because they do this two days per week and then two hours or sometimes three hours in one day, that, I think, I don't know like the professors need to be more creative or more Like find different ways for these lectures. Because two hours just watching the PowerPoint slides, we lose focus.”

Approximately, one-third of the students responded that their instructors did not respond to emails from students. SJSU has many part-time lecturers in the College of Engineering so this issue was compounded by the fact that many part-time instructors, particularly in the Masters programs, are working professionals. The loss in communication between the instructors and students was shown also in the number of instructors who did not hold office hours after the switch to online instruction in Spring 2020. According to SJSU policies, full-time instructors must hold 3 hours of office hours each week; the amount of office hours is reduced for part-time instructors. The students felt this lack of communication deeply.

Chris

“So, we would submit homework and he would lose it. Like we would send him an email, like, Hey, here's my homework. Okay, and then two days later he sends us or like weekly great feedback and it's not even, showing us as submitted. He's like you never sent me this, like, yes, I did, it’s in your email.”

Florence

“On top of that, answering emails is a big thing for me like I had a professor in the spring quarter. He was really good about answering emails for a little bit and then towards the end. I would send him follow up emails like hey did you get this, and I never got a reply. So, emails can go a long way as well with the communication factor, especially because we can't just like go out and have what do they call the office hours.”

Kirk

“And so both of them were working you know, and industry so you know, I felt both my classes were in the evenings there from Six to nine, you know, from six o'clock to 845 at nighttime. Right and so both professors were working during daytime. And so they didn't have, you know, office hours, or they would be on campus normally”

Van

“So lectures in his case were done online through zoom, but students would have like issues connecting and the lecture material was hard to follow. And it was difficult for students to raise questions to Um, yeah. And it was hard to communicate with the teacher because with the professor because he didn't hold office hours.”

### Student Positive Comments

Despite the general negative impressions that students had during Spring 2020, there were accolades for instructors who did well online. Over 1/3 of the students had at least one class that used active learning online (16 students). Some faculty used features in Zoom or Canvas to do active learning online while others had students complete group assignments during class.

Gonzalo

“There was a difference, the professor in the other technical elective class really provoked us to ask more questions. So he will know that we were we were paying attention and we were learning. It was also, we also had it more than once a day. I feel like that really helps with online classes. And it's not just all in one chunk but spread out, that's very helpful, and for the professor to check to see how engaged the students are.”

Fernand

“I do think she handled it well because the way she transitioned from in class to online, was she tried to keep the same format where she would present a new material, have us do some kind of example for five to ten minutes of the class and then explain it. And then we move on and do something on MATLAB or, look at case studies examining earlier aircraft incidents nothing in depth but insightful.”

Imelda

“Especially for my XXX class. I think my professor did a really good job because that cause really requires a lot of discussion and she really like open up discussion with the class. So even though it was on Zoom.”

Nadine

“Okay, so, the lab was actually pretty fun I had Professor XXX. He spread us out through breakout rooms. And, he would explain everything in the beginning, and then he'll tell us okay you're making the code for the robot. Everyone has to pitch in. You are random assigned groups, So, I am going to assign groups. Just make sure you write down everyone's name, and it was kind of just go, which was really helpful is, yeah, it was just to the point simple.”

Helene

“And then he would take a canvas quiz. So, we would break from our lecture, take the canvas quiz and then come back on zoom like 10 minutes later.”

### Students Personal Experiences in Spring

More than half (20 students) reported that the Spring 2020 semester after the move online was stressful for them. There were many causes for the stress that students felt. Some undergraduate and graduate students have children and, in California, all K-12 schools in our area went online in March also. This caused additional stress to students who now had to be the teachers for their children as well as being students themselves. Everyday life caused additional stress.

Sara

“I mean, this is totally a new situation. We never ever imagine something like that could happen. It creates a lot of stress. Everytime we have to go out for some urgent work we feel so anxious about getting in contact with people. The grocery shopping or any shopping for that matter is now a headache. We have to sanitize everything, from door knob to our cell phone.”

Chantal

“But it killed my mental health. Like, I literally was a man crying every day. Like, and my friend had to drag because I had to stay with a friend because I lost him a big deal. But my friend literally had to drag me and find the computer and tell me sit down. I was about ready to quit. It was A mess.”

Kirk

“The only thing I would add is that safety over learning is more important to me at this point.  I would rather have more challenges in school, if it meant a reduction in risk or harm from the Coronavirus for my family, friends, and my own health.  I will always have a chance to learn and expand my knowledge, but a serious injury or death is not something that can be taken back.  Personally I would rather extend my time in school or make modifications to the learning process if that translated to a reduction in risk.”

Cristobal

“But for the other classes where you have the we have to have the camera on and then your laptop on and everything, it's the simple notification that gets in while you're focusing on problem that distracts you from everything or especially like with high level anxiety.”

Students missed social interactions with other students. This was related both to classwork or group work with other students as well as activities on campus. SJSU moved online quickly in March 2020 and all campus events were cancelled and the facilities such as the Counseling Center and Student Center were closed. This left many students feeling isolated.

Sara

“So this year, like March 14, we had this women in engineering conference, which we were really looking forward to it. I was one of the staff for the conference. I actually work in women in engineering, I developed their website. We put so much effort into the conference but at the last moment it went virtual. Though on the day of the conference we were at campus, but it is not as similar as the actual conference.”

Michael

“First got it started in class because we were able to get to know one another and, interact in person that way. But when we got online. There was no interaction because we didn't do zoom right away, so it was a little disjointed. The communication was not as effective because we didn't have the visual and we didn't have as much unity that we did in person. It seemed like more of the students felt that they didn't need to be at class.”

Florence

“Um, shoot, I guess just It's It's kind of rough like I know with everything being online like it's kind of discouraging to see like when it comes to paying tuition we're paying a lot of money with like services. We can't even really use and it's, it's, you know, I understand, but at the same time. I'm like, I wish I could be utilizing those resources, since I'm still paying for them.”

Nine of the thirty-nine students interviewed did not like learning online. There were many reasons for this. Some students did not believe that they learned the same amount of content as they would have if the classes were in-person. Other students were concerned about the labs.

Imelda

“So like I'm a software engineering major, so having not having that like a class interaction definitely impacted me a lot. And just like, I guess, having to spend more time like studying the course material like definitely was a big change for me.”

William

“Um, for me, it was a challenge. I'd say because I'm just not a student, where I need to be in the classroom to I mean I can learn. I mean, doesn't that doesn't matter. But if I'm in the classroom is like the whole mentality changes of I'm a student now and I need to pay attention while at my home is a different story. I mean, you know I'm taking you know my computer with me. I'm, I'm, you know, hear, my professor. But then, you know, there's a lot like a lot of other things going on. And so, It so, so it distracts me a lot, and I pay less attention to the material. So, that's what really happened with me this semester, actually.”

Alberto

“Yeah, so, we transition to lectures once a week and for me, it's hard. I mean, it's like, I prefer the traditional classroom without distractions. You know in the in the zoom classroom. You know, you could be playing chess and not really paying attention and and I'm guilty of doing that a little bit.”

## Overall Impressions from Student Interviews

 The student interviews echoed the surveys we conducted and provided more context. The students struggled in many ways after the move online in Spring 2020. They had issues with the instructors’ teaching, the online learning environment, and personal issues. The students felt that the instructors did not realize the impact of teaching the same way as they did in an online class. Also, the students believed that the instructors did not realize the stress they were under. Students hoped that the Fall 2020 semester would be better organized and conducted. Valerie summed up her feelings about the classes: “One professor only one professor was like giving us the thought of, I mean having the opening talk of Okay, how are you people doing, how was the things with assignment. Do you need any extensions are you people doing okay?. Professor followed that practice of consent. He goes to ask us things are normal. Hope everybody have a Wi Fi connection. Hope you're doing well. Do you need any help for the extension of assignment and things like that only one professor did that.”

## Discussion

Much of the results from our survey and student interviews agree with other research studies on the impact of COVID 19 on university students in Spring 2020. Our student interviews indicated that students had more negative impressions than positive ones about their experiences in Spring 2020 after the switch to online teaching. 32 of the 39 students interviewed had at least one negative experiences in Spring 2020 after instruction went online. Some of the comments related to the way the class were taught, other comments related to office hours, and others related to online testing. Overall, many students did not like online instruction. This agrees with the study by Means and Neisler (2020) who found that student satisfaction after moving online was lower than for in-person classes. When we compared our results with another study on engineering students in the CSU by Asgari et al (2020), we found similar challenges for students. However, since we conducted in-depth interviews with 39 engineering students, we were able to expand on this research to provide a more nuanced analysis of the engineering student experience.

## Implications for Practice

This study has several implications for practice, particularly as related to instructional pedagogy. It is clear that faculty must create online instruction in a purposeful manner instead of porting the in-class experience directly to online classes. In Summer 2020, SJSU offered online pedagogy classes for faculty in the university. However, from the student comments in the interviews specifically, this training was probably not enough.

 With COVID 19 continuing to affect future semesters, faculty need to rethink their courses so that they maximize interactivity and content. Students were willing to sit through entire periods of lecture in the in-person class mode but online these methods are less effective. Faculty tend to associate their joy in teaching with face-to-face interactions, failing to recognize ways in which those joyous moments can be transferred to an online environment. Faculty struggle to transition their joy and self-worth as an educator between pedagogies, including pedagogies necessary for online instruction.

Online teaching faces difficulty in gaining respect from a professoriate who has little experience with it. Faculty spend years developing their expertise and credibility in their fields, with little preparation for instruction. Faculty tend to fall back on teaching the way they were taught, with relatively few of them having had an online experience. Very quickly, those who begin to teach online realize that online instruction is not as simple as moving the same in-person curriculum and content online (Schmidt et al., 2013). Quality online instruction takes time and effort, both of which may be limited for probationary and part-time faculty.

Online instruction requires a set of skills as a teacher that many faculty have not learned. Again, faculty tend to teach with the same methods that they were taught without sufficient professional development that encourages and promotes new pedagogical skills. Professional development in academia often lags the state-of-the-art in pedagogical practice, often related to resistance to pedagogical advances and lack of time available to learn and practice new pedagogies, as discussed above. Universities interested in investing in online education must invest in preparing their faculty to transition to an online environment.

## Conclusions

Teaching online has been viewed with suspicion by many faculty, even in the STEM disciplines. At SJSU, prior to Spring 2020, there were few engineering classes taught in a fully online mode. The educational crisis brought on by COVID 19 has led to a dramatic revision in the way that courses are taught, both at our institution and nationwide. However, best practices in teaching online has generally been passed over in the need to put a class online.

It is time for our engineering faculty to accept that online education is a viable alternative for in-class instruction. Witham, Malcom-Piqueux, Dowd, and Bensimon (2015) outlined equity minded principles for improving outcomes for students from all backgrounds. Using equity minded strategies in the classroom can change an instructor’s view from blaming the students for non-achievement to approaching pedagogical reform to provide “more just, equitable and effective learning environments for African Americans, Latinos/as, American Indians, and subordinated Asian and Pacific Islander populations” (Bensimon, Dowd, and Witham, 2016). SJSU is a Hispanic serving institution. As an HSI located in one of the most ethnically diverse locations in the United States, it is important for us to redesign our teaching to improve the outcomes for students from all backgrounds.

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