



Learning from the Student Experience: Impact of Shelter-in-Place on the Learning Experiences of Engineering Students at SJSU

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Dr. Backer has been a faculty at SJSU since 1990 and held positions as an assistant professor, associate professor, professor, department chair, and director. Since coming to San Jose State University in 1990, she has been involved in the General Education program and conducts research into pedagogy and STEM education. Currently, Dr. Backer serves as the PI for SJSU's Title III Strengthening grant both from the U.S. Department of Education.

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Maria Chierichetti joined the department of Aerospace Engineering as a full-time assistant professor in Fall 2019. Her interests lie in the field of aerospace structural design and vibrations, with particular emphasis on developing methodologies for combining finite element analysis and machine/deep learning for structural health monitoring and unmanned structural inspections in the context of urban air mobility. Maria is also interested in investigating how students' learning is affected by external factors, such as the COVID-19 pandemic and community service. Before joining SJSU, she worked as a faculty member at Worcester Polytechnic Institute and at the University of Cincinnati. She earned her PhD at Georgia Tech in 2012 working on the monitoring and tracking of helicopter blade deformation. She earned a BS and MS from Politecnico di Milano (Italy) in 2004 and 2007 respectively, with majors in Aeronautical Engineering. She is an Amelia Earhart Fellow – Zonta International Foundation.

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Abstract

This is a research paper based on an in-

College of Engineering co-
Summer 2020. In this paper, we report on the interviews we did with 40 students in the College of Engineering. In March 2020, SJSU moved all of its classes to remote learning for the Spring term. The students included freshmen (3 students), sophomores (7 students), seniors (11 students) and graduate students (17 students). Data from 39 students reported more negative experiences with their classes after the move to remote learning as compared to positive experiences with 32 of the 39 students reporting positive experiences. The students had many comments related to course content in the Spring 2020 semester (28 students), online tests and exams (27 students), Powerpoint use and issues (13 students). Also, approximately 30 students responded that their instructors did not respond to emails from students. Students showed appreciation for the efforts that faculty made in the quick transition to remote learning. However, the students expressed concerns about the organization of the classes, the lack of interactivity (9 students) and the availability of lecture videos (9 students). 9 students of the students gave recommendations as to how faculty could improve their classes for Fall 2020. Many faculty, according to the student interviews, were unprepared for the move. They had difficulties in using the learning management system (LMS), Canvas. As well, some faculty would not record their lectures or not post them online. Student comments can give faculty insight into improving their classes in the future.

Introduction

The outbreak of COVID-19 in the world has caused many universities to move to emergency remote learning. Instead of being a planned movement, this shift to remote instruction was quick. At San José State University (SJSU), students and faculty had less than one week to prepare to teach and take classes remotely. Most faculty at SJSU taught online before this dramatic shift in March 2020 and both faculty and students were challenged to finish the semester. Most SJSU engineering classes are offered in a face-to-face mode with in-person laboratories and project classes. Because of the COVID-19 pandemic, SJSU classes, including those in the College of Engineering, went to a remote learning mode.

The object of this study was to determine the impact of the sudden move to remote learning on engineering students at SJSU through a survey and interviews. By supplementing the survey with interviews of students, this study hopes to provide insights to engineering faculty on how to teach classes taught in a remote teaching mode as well as strategies to make remote learning more effective. In this paper, we focused on the following research questions.

1. What is the impact of COVID-19 on student learning for engineering students?
2. What are student perceptions towards emergency remote learning?

3. What aspects of remote learning worked best and least for students in engineering?
4. What can faculty do to improve both remote and face-to-face learning environments?

Review of the Literature

Since the move online because of COVID-19 in the United States, there have been many surveys of students to determine their attitudes towards this change. MindWires [1] is keeping a list of student surveys on its website. As of April 2021, they have links to 29 surveys that have been completed with 500 to 76,000 respondents. In this paper, the authors are going to summarize the surveys that are most relevant to the current research.

Digital Promise and Langer Research Associates surveyed a randomized nationwide sample of 1,008 undergraduates, 717 attending four-year colleges and 271 attending two-year colleges, whose classes were converted from in-person to remote learning after the COVID-19 pandemic hit [2]. They found that student satisfaction in the emergency remote learning mode was lower than for in-person classes and students “struggled to stay motivated and missed receiving feedback from instructors...” (p. 3) This finding agrees with other surveys. One survey by Simpson Scarborough [3] of 513 students in March 2020 found that, among college students who took the survey, “63% say online instruction is worse than the in-person instruction they received at their school.” A second survey at the Harvard School of Dental Medicine [4] found that students reported that “their learning has worsened since the move to e-learning, with 44% of students responding ‘somewhat worsened’ and 26% answering ‘significantly worsened.’”

found that students had several challenges during Spring 2020. “About 70% of students indicated

(p. 294). 82 students in the Qatar study participated in written reflections about their experiences

The transcripts were reviewed by graduate students for typos in the transcript and words that were transcribed incorrectly. The researchers thenypda-1 (e t)-6 (rn)20 -1 (e t)-6 (r). (t)-6.ec (h)-0 (pos)Erneat-2 (

qualitative analysis. All interviews were conducted by one of the authors, which is a white female engineering educator, an engineering education researcher and an advocate for active learning and active communication. This epistemological commitments and positionality of the interviewer might have affected the follow up questions asked to the participants, although the interviewer kept the follow up questions as consistent as possible.

Results

The student interviews were conducted in July and August 2020. Overall, we interviewed 40 students using Zoom. To pseudonymize the students and protect their identities, we used the list of 2018-2020 Atlantic Hurricanes to rename the participants [21]. The names alternate from male to female and we followed the same procedure. Because we interviewed 40 students overall, we used the cyclone names from 2018-2020. Table 2 shows the major, 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 a business minor.

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	Th.6 (a 0.004 Tw 9.96 -0		

Cristobal	Mechanical Engineering	African American	Upper Division	Male
Edouard	Mechanical Engineering	African American	Upper Division	Male

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 to remote learning. But, 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 remote 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. Students overwhelmingly wanted access to class videos for review purposes. According to 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.”

Student Negative Comments

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working during daytime. And so they didn't have, you know, office hours, or they would be on campus normally”

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 during remote instruction (16 students). Some faculty used features in Zoom or Canvas to do active learning online while others had students complete group assignments

transition. As Kapilan, Vidhya and Gao [24

- [6] Higher Education Data Sharing Consortium (2020). *HEDS COVID-19 spring student survey*. Retrieved from <https://www.hedsconsortium.org/heds-covid-19-response-information/>
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