STUDENT PERSPECTIVES OF REMOTE TEACHING DURING THE COVID-19 PANDEMIC

Milo D. Koretsky
Tufts University • Medford, MA 02155

INTRODUCTION

The COVID-19 pandemic brought a widespread shift in instructional practice as faculty scrambled to transition to remote instruction. One positive consequence is that this shift has inspired many instructors to think carefully about their teaching practice and the ways that technology tools and instructional strategies support their learning goals. Correspondingly, STEM educators have been investigating these needed changes and reporting them. There have also been coordinated efforts within our community to support chemical engineering educators such as five AIChE EdDiv virtual communities of practice: (1) Mass & Energy Balances/ Thermodynamics; (2) Transport/Separations; (3) Reactors/ Controls/Computing; (4) Design; and (5) Lab.[1]

The overall response of chemical engineering educators is laudable, compassionate, and mirrored by university instructors in other disciplines.[2] However, some administrators have also been quick to leverage this aspect to frame the pandemic as an opportunity to promote a widespread shift in teaching at the university. For example, two upper administrators at a prominent engineering school have described the rapid instructional activity as "*the shove we need to accelerate change*."[3] They portray a vision where a "*student, staff, or faculty member should be able to be anywhere in the world participating in a learning or discovery community and still be fully engaged with the university.*" They go so far as to quote the Six Million Dollar Man from the fantasy 1970s TV series, saying, "*We have the technology.*"

On the one hand, many faculty have immersed themselves in dedicated instructional re-design to meet their students' needs in challenging times. On the other, some administrators seek to leverage COVID-19 to broadly congeal online delivery of core programs – like chemical engineering. Undoubtedly, there are lessons to be learned. Part of that stems from understanding features of the pandemic-induced transition to remote teaching. In this qualitative study, I ask students how they have experienced the shift to remote learning in chemical engineering and related disciplines. The fundamental research question is, "*Do the student experiences in the shift to remote learning support advocacy for a scale-up in online education?*" This article extends preliminary results presented at the ASEE annual meeting[4] by extending the analysis of the student survey data to parse it by cohort, conducting focus groups with graduate and undergraduate student instructors, and extending the literature review and discussion.

LITERATURE REVIEW

I reviewed published articles in three COVID-related special issues for archival journals relevant to chemical engineering education: *Advances in Engineering Education*,[5] *Biomedical Engineering Education*,[6] and the *Journal of Chemical Education*.[7] At the time this paper was written, special issues for *Chemical Engineering Education* and the *Journal of Engineering Education* had not yet been published. These 255 special issue papers address a broad span of topics including course design, content delivery, assessment practices, classroom environment, and project and laboratory work. Of the papers reviewed, eleven report directly on

Milo Koretsky *is the McDonnell Family Bridge Professor holding a joint appointment in Chemical and Biological Engineering and Education at Tufts University. He received his BS and MS degrees from UC San Diego and his PhD from UC Berkeley, all in chemical engineering. He is interested in integrating technology into effective educational practices and in promoting the use of higher-level cognitive and social skills in engineering problem solving.*

aspects of the student experience at the university level and are summarized in Table 1.

The papers identified in Table 1 largely report about chemistry courses. Most studies use Likert and/or free response surveys and convenience sampling. Only Vielma and Brey[10] and Blizak et al.[11] systematically examine experiences across an entire program, as is done in this study. Three papers take a different approach than Likert and/or free response surveys with Kalman et al.[14] focusing on a narrative analysis from two students and a faculty member, and the two papers in *Advances in Engineering Education*[7,8] presenting innovative approaches towards understanding the student experience.

METHODS

This study was conducted at Oregon State University, a large research-intensive public university on a quarter (trimester) system. The university went to completely remote teaching during Spring term 2020, and most courses continued in remote mode during the 2020-21 academic year. Data collection occurred during Fall 2020 in two sequential stages as illustrated in Figure 1.

First, a three-question free response survey was distributed to students in the chemical engineering department about their experiences with remote instruction. The survey was

TABLE 1
Papers from 2020 COVID-19 Special Issues that Reference the Broader Student Experience During the Switch to Remote Teaching

Paper	Journal	Setting	Sample Population	Sample Size	Data Collected
Atman, 2020[8]	AEE	US, large, research-intensive	Human-centered design and engineering 2 courses	16	2 reflective activities
Morelock et al., 2020[9]	AEE	US, large, research-intensive land-grant	Engineering students, faculty, and staff	70	*SenseMaker* narrative and reflection tool
Vielma and Brey, 2020[10]	BEE	US, Hispanic-serving institution	Chemical and biomedical engineering Across educational level 31 courses	177	Survey, free response
Blizak et al., 2020[11]	JCE	Algerian university	Chemistry Across educational levels	380	Survey, Likert
Burnett et al., 2020[12]	JCE	US, large, research-intensive land-grant	Chemistry 3 courses	Not reported	"Informal" survey
Jeffery and Bauer, 2020[13]	JCE	US, research-intensive land-grant	Chemistry 12 courses	208	Surveys, Likert and free response
Kalman et al., 2020[14]	JCE	US, liberal arts teaching college	Chemistry	3	Narrative report from 2 students and 1 faculty
Petillion and McNeil, 2020[15]	JCE	Canada, large research-intensive, satellite	Chemistry 3 courses (2nd year)	64 + 7	Survey, Likert, and free response. Interviews
Ramachandran and Rodriguez, 2020[16]	JCE	US, large, research-intensive	Chemistry 1 course (upper div)	259	Survey, Likert and free response
Rodríguez Núñez and Leeuwner, 2020[17]	JCE	Canada, large research-intensive	Chemistry 2 courses	619	Survey, Likert and free response
Simon et al., 2020[18]	JCE	US, Hispanic-serving institution	Chemistry 1 course (1st year)	41	Survey, Likert[1] and free response
This Study	JCE	US, large, research-intensive land-grant	Chemical, bio, and environmental engineering Across educational levels 4 courses	380 +19 + 16	Survey, free response Focus groups

AEE = *Advances in Engineering Education*
BEE = *Biomedical Engineering Education*
JCE = *Journal of Chemical Education*

developed by the curriculum committee and administered through invitation in targeted core courses for students in each year of the program. One or more core courses from each year in the curriculum were chosen so that all students who are taking a required course would be invited, regardless of what year they were in. Thus, most, but not all, students in chemical engineering were invited to participate. The three questions were designed to provide multiple perspectives of the student experience by addressing challenges, useful resources and strategies, and perspectives of assessment (Figure 1). The survey design was informed by several factors. We wanted the survey to be brief and not overburden students, so we limited it to three questions. We also sought a thick description of student experience with ample opportunity for the student voice and did not assume to know the important aspects of their reaction to this unprecedented situation, so we choose to have free response questions.

This study was approved by the Institutional Review Board, and all participants provided consent. A total of 380 students responded. The overall response rate was 53% but varied by class with the second and fourth-year students overrepresented. The number of responses were as follows: 1st Year – 58 responses; 2nd Year – 149 responses; 3rd Year – 67 responses; 4th Year – 106 responses. Since the survey was anonymous, the demographics of the respondents are unknown. Institutional records indicate 39% of the students in chemical engineering identified as women, 0.2% identified as Native American, 9.3% Asian, 0.1% Pacific Islander, 1.1% Black, 8.9% Hispanic, and 9.7% identified as multiracial.

To achieve balanced representation, a random set of 50 anonymous responses from each cohort (200 total) was selected and analyzed by the author using open coding. The code categories were developed through an iterative emergent coding process with no a priori assumptions or predetermined codes.[19] A second researcher coded 20 responses, selected at random, from each of the three questions. Comparison between coders showed inter-rater agreements using Cohen's kappa (κ) of: 0.96 (Q1), 0.83 (Q2), and 0.73 (Q3). These values indicate between substantial and almost perfect inter-rater reliability. In addition, one of the questions was re-coded by the author after about three-months and yielded almost a complete match with the original coding process, further suggesting a reliable coding process.

Second, in the last week of the term, two focus groups were conducted with student instructors, including: (i) 19 graduate student teaching assistants (GTAs) and (ii)16 undergraduate learning assistants (LAs). In those meetings the participants read a summary of the codes from the survey responses, their frequency, and examples of specific responses from each of the four class levels. Then the participants spent roughly half the time in small 4-5 person groups in breakout rooms discussing each question's response and half the time in a facilitated whole group discussion. Focus groups can capture socially constructed thoughts, attitudes, and beliefs through participants' interactions with others and served two purposes. First, they provided triangulation of the individual survey responses. Second, they allowed exploration of challenges and responses associated with instructional practice.

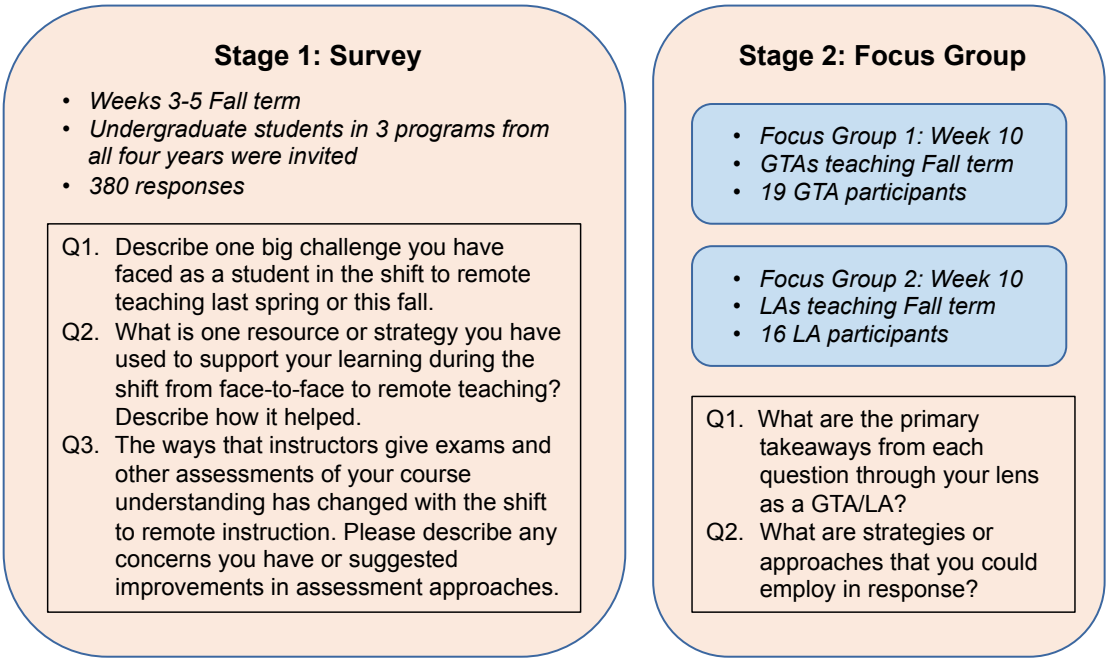

Figure 1. *Sequential study design*

Notes were taken collaboratively by the facilitators and the participants in both the breakout and the whole group discussion using a shared authoring tool. The author was one of the facilitators in the GTA focus group and the sole facilitator in the LA focus group.

FINDINGS

In this section the results from the surveys and the focus groups are presented.

Survey

For each of the three question prompts, the common category themes are presented in the following tables, including code categories, a sample student response, and percent response, for each code. Each table is followed by a Sankey diagram illustrating code frequency by year in the program. Examples of coded responses for each category of students from each cohort are reported elsewhere.[4] A broader version of this information, including sample quotations for each category from each cohort, was distributed to the focus groups.

The first question asked:

> **Q1: Challenges:** Describe one big challenge you have faced as a student in the shift to remote teaching last spring or this fall.

Results are shown in Table 2 and Figure 2. The most prevalent challenge identified was engagement, with 41% of responses coded indicating issues with motivation, paying attention, and focus. These statements often referred specifically to lecture (e.g. "*I have the hardest time paying attention during lecture*" – 3rd year student) while others were broader (e.g. "*It's very difficult for me to maintain interest*" – 4th year

TABLE 2
Coded Response for Challenges by Frequency

Category	Sample Response	Percent Response
Engagement (Attention / Focus / Motivation)	*It has been really difficult to maintain discipline and stay 100% on task during remote class sessions. It is much easier to multitask and not give my full attention to whatever remote class is going on, and I believe that I am not doing as well in my classes due to this temptation.* (1st Year)	41%
Social Interactions (Difficult To Collaborate)	*Coping with exams that are often more difficult with the same amount of time as the previous years exams. Also not having face to face studios is difficult since many people don't actively participate in the online ones. Studios used to be where I learned the most and now its where I learn the least.* (3rd Year)	27%
Instructional Practice	*Classes have become less organized and communication with students has worsened. It is not clear what material needs to be learned for tests, assignments are often not announced in a clear way, and changes to course structure are often not communicated to students clearly.* (3rd Year)	24%
Technology Problems	*Sometimes internet connection at home doesn't work well or working in groups online becomes tricky.* (4th Year)	24%
Limited Support (Difficult To Get Help / Ask Questions)	*The hardest thing for me is not being able to go to office hours or tutoring/ learning centers in person. It is really difficult to get help on homework over Zoom® because it takes so much longer and I can only show things through screen share.* (2nd Year)	22%
Time (More Time Needed / Work Assigned In Remote)	*I never realized how much mental energy it took to simply look at a screen all day and do all your assignments online. I know it is a stupid reason, but I felt super drained at the end of each day because I was just looking at a screen the whole time. I feel like it has been a bit harder to retain information as well, and I have had to really commit time to retaining it.* (1st Year)	21%
Workspace	*Because I have a very hard time focusing in the place I live, no matter where that may be. I have always been the type of student who would pay attention in lecture, take really good notes and not need to do much reading (though I knew this wasn't going to be possible for much longer).* (3rd Year)	14%

student). Twenty-seven percent of students expressed missing regular social interactions, describing "*not being able to talk with other students about their work or form relationships*" (2nd year student). Other cited challenges were with instructional practices that did not suit the remote environment (24%), technology problems (24%), limited ability to get support (22%), issues with the extra time needed to be successful in remote learning (21%), and issues with workspace (14%).

In the Sankey diagram (Figure 2), the lines illustrate the proportion of each cohort's responses that associate with each category, with the width of the line proportional to the number of responses. As illustrated, the challenges were distributed fairly evenly across responses from each cohort in the program.

The second question asked:

> **Q2: Strategies and resources:** What is one resource or strategy you have used to support your learning during the shift from face-to-face to remote teaching? Describe how it helped.

Results are shown in Table 3 and Figure 3. Common themes for success included organizing work schedule (daily routine) and workspace, being deliberate with study habits, finding other students to regularly (and safely) work with, using office hours, using class resources and, importantly, taking time (even a small amount) for mental health.

With remote learning, 29% of students identified a need to be intentional about their study habits and more methodical about staying organized, describing how using electronic calendars, being more methodical about note taking, and splitting work into smaller sections could improve their success. While students identified discussions and problem solving with peers as the most challenging in-person practice to replicate, they still found value in those interactions (24%). Two resources were identified as being better than in-person, with students suggesting they be retained with the return to in-person instruction – Zoom office hours (22%) and recorded lecture videos (14%). Some students noted that Zoom office hours provide greater access, and they were more likely to use them rather than physically going to an instructor's office. However, other students mentioned challenges communicating complex content across Zoom. Students liked to be able to re-watch lecture at their own pace and to have it available to refer to when solving problems. Surprisingly few results identified self-care and mental health (8%) as important. This area could be targeted by instructors and administrators for student messaging.

Some differences appear between cohorts when reporting resources and strategies. Study habits and planning were identified more frequently by students earlier in the program (1st and 2nd year). It is unclear the degree that this strategy is particular to remote learning specifically or to the transition to being successful in college more generally. In contrast, 2nd year students identified discussions with peers most commonly, and 3rd year students referred to lecture videos and textbook / lecture notes. These differences make sense when considering the differing demands of the year in program.

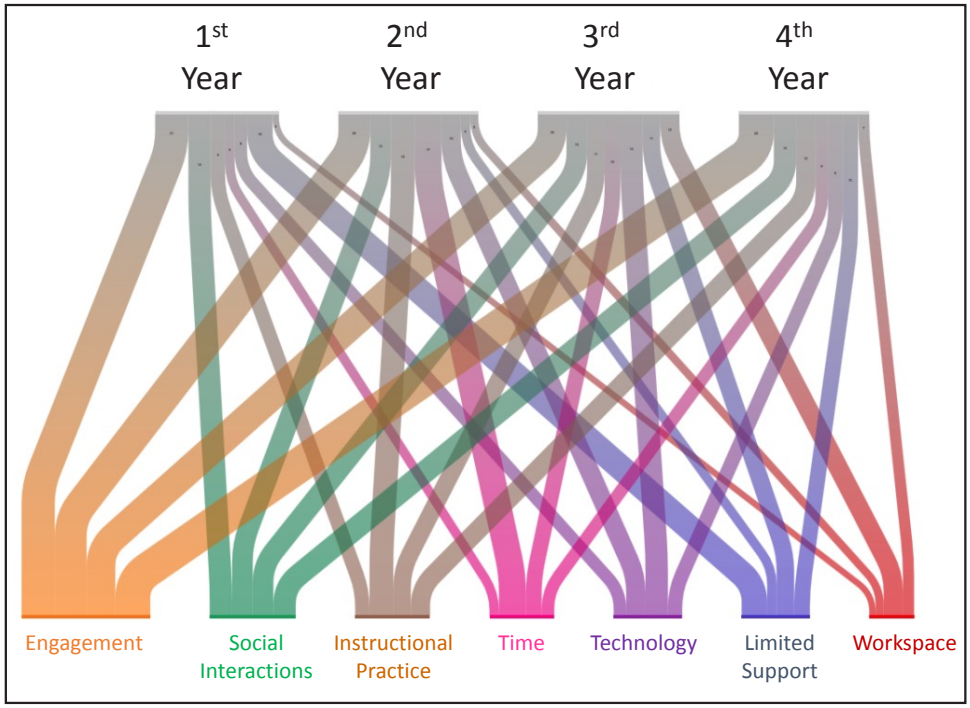

Figure 2. *Sankey diagram of challenge codes by year in program.*

TABLE 3 Coded Response for Strategies and Resources by Frequency		
Category	**Sample Response**	**Percent Response**
Study Approach / Work Habits / Planning	*I have been splitting up my work into smaller sections rather than just doing it all at once. I feel like this makes it easier to stay on top of my work and had really helped with the transition*. (4th Year)	29%
Discuss With Peers	*I try to keep in touch with my friends who are in the same classes as I am and check in with them so we can study together.* (2nd Year)	24%
Office Hours (Also Tutoring Centers, Advisor …)	*One resource is office hours from the TA seem slightly more accessible for students because you can attend them from anywhere yet they still do not seem as valuable as in person office hours*. (3rd Year)	22%
Lecture Videos	*I really just love having lectures recorded. I come to Zoom class every day, but being able to rewatch lectures is a huge plus for me. If I didn't understand something during class, I can rewatch that part of the lecture to see if I get it the second time around*. (2nd Year)	14%
Textbook / Lecture Notes	*Reading the textbook for class as often as possible. It helps quite a bit, since I can get any necessary derivations and equations, then I only have to focus on listening during lecture*. (3rd Year)	10%
Mental Health (e.g. Breaks In The Day)	*One strategy I have done has been being aware of when I need to take a break. Depending how I feel I will either lay down for a bit, jump up and down, or go on a walk. I found that if I do not give myself a break, then I will sit at my desk for a long period of time, and feel overwhelmed*. (1st Year)	8%
Online Videos (YouTube™, Kahn)	*YouTube™ videos have helped me in different classes when I needed help with different assignments, learning how to do certain problems. I have also rewatched class recordings to see if I missed anything during class*. (1st Year)	8%
Slack™ / Social Media	*Discord™ has been a way I've been able to connect with students in the same class as me. I don't have any close friends in CHE 311 or CHE 331 so I use Discord as well as Slack*. (3rd Year)	7%

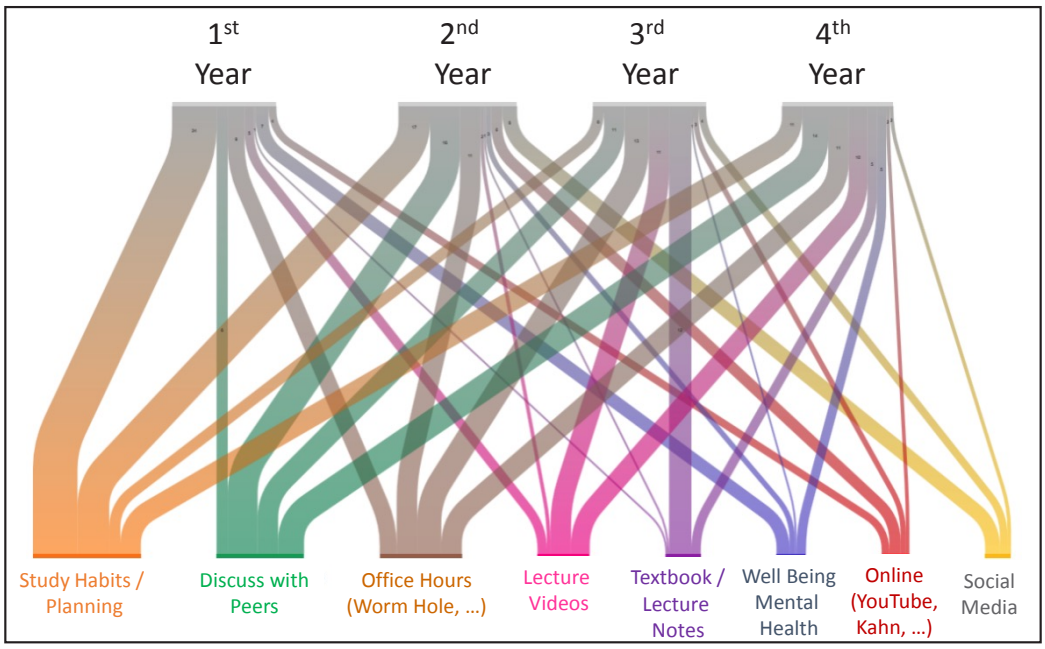

Figure 3. *Sankey diagram of strategies and resources codes by year in program.*

The third question asked:

> **Q3: Assessment:** The ways that instructors give exams and other assessments of your course understanding has changed with the shift to remote instruction. Please describe any concerns you have or suggested improvements in assessment approaches.

Results are shown in Table 4 and Figure 4. Online assessments are inherently different than in-person assessment. Even when the same assessment instruments are used, changes in administration and proctoring can cause major changes to the student experience.[20] While many student responses reflected aspects of these differences, 20% stated they had no concerns. Thirty-one percent of the responses commented on aspects of exam scheduling and delivery. As one 4th year student wrote, "*I have concerns that exams will try to be as 'normal' as they can be when it can't be normal with remote learning*." In fact, many of the responses in this category can be connected implicitly with issues of cheating. For example, 1st year students expressed frustration with a learning management system (LMS) format (designed presumably to prevent cheating) in which students were unable to return to questions once they were answered. Surveillance software was also viewed unfavorably and cited as adding stress. Students reflected more favorably on exams that had wider time windows to complete, even if there was a fixed amount of time to take the exam. However, it is unclear if different versioning of questions using this approach would adequately address concerns of academic dishonesty. Three issues were often stated in the same response: the esubmission process (19%), exams that were too long (11%), and stress (13%). Surprisingly, only 9% of responses identified cheating as an issue. Seven percent advocated for more frequent low-stakes assessments.

As shown in Figure 4, the biggest differences between cohorts appear in their responses about assessments. Notably, more 1st year students reported no concerns while 2nd and 3rd year students commented on the esubmission process,

TABLE 4
Coded Response for Assessments by Frequency

Category	Sample Response	Percent Response
Exam Scheduling / Delivery	*Most of my classes offer tests in a format where you can't go back and see questions you've already answered which has made it really hard to manage time and impossible to go back and check over your work if you do have extra time. This was really frustrating because it goes against all the test taking strategies I've been taught throughout school and I often times realize a mistake I made after I have answered but I can't go back and fix it so I end of submitting a test or quiz that doesn't accurately represent my understanding of the class content.* (1st Year)	31%
No Concerns	*I don't have any concerns or suggestions. In terms of exams, the format and difficulty has stayed the same for all my classes.* (2nd Year)	20%
eSubmission Process	*The extra time that has been given to take tests is a big plus. Though some classes don't give enough time, especially when you have to print out and scan work. You have to take that into account while doing the test so, in the end, the work you produce isn't the best it could be since some students are rushing to get enough time to scan everything.* (1st Year)	19%
Stress	*One concern I have is getting an increased workload because of the remote classes. Remote learning sometimes requires more time to understand the material, and having additional assignments and exams only makes my stress even worse.* (2nd Year)	13%
Exams Too Long	*I have noticed that professors have made the exams lengthier (including exam 1 in this class). I wish that the exam lengths could be more reasonable.* (4th Year)	11%
Technology Issues	*My main concern is the possibility of any technical problems that might occur within the timed exam.* (4th Year)	10%
Cheating	*It's hard to assess the individual's learning if there's no way to stop them from working with others, using Google or reviewing notes or texts.* (2nd Year)	9%
More Low Stakes = Better	*In my biochem class the professor eliminated all exams and instead has weekly quizzes. I really like this low stakes format, however, in that class the questions are all multiple choice so I don't think that would work as well or at all for this class.* (3rd Year)	7%

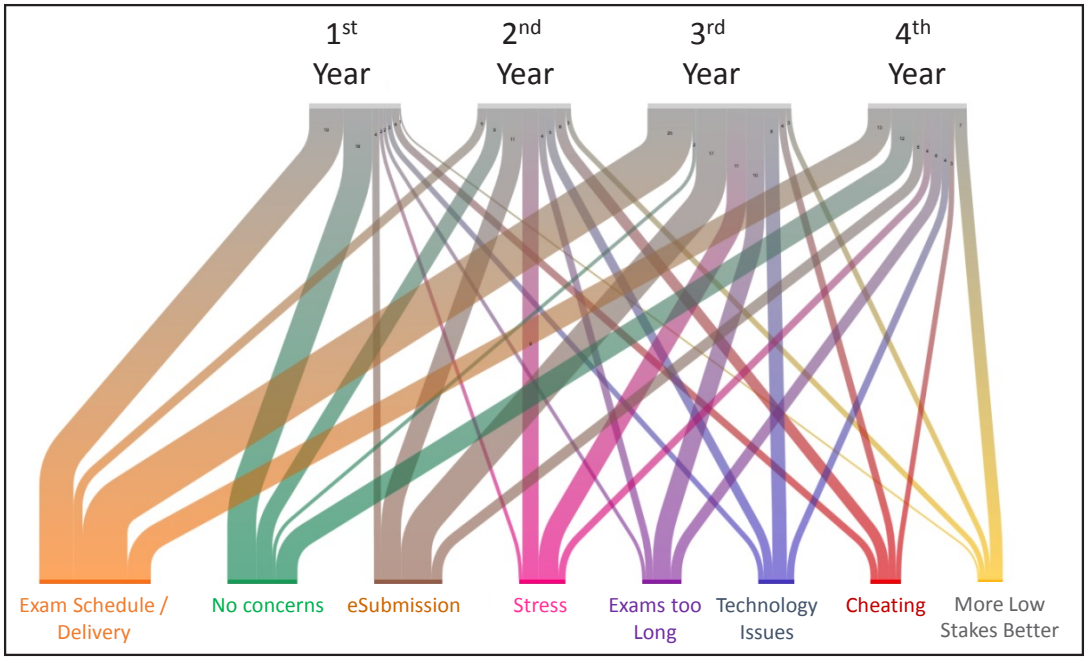

Figure 4. Sankey diagram of assessment codes by year in program.

stress, and exams that were too long. These differences also correspond to programmatic differences as students are involved in progressively more challenging engineering science courses in years 2 and 3 while more of the work shifts to project work in year 4. Concerns about cheating, while small in number, were evenly distributed.

Focus Groups with Students

A brief summary of the discussion of these survey results with focus groups of GTAs and LAs is presented next. These focus groups were intended to build understanding and empathy within the instructional community, and the findings should be considered with this goal in mind.

Graduate Teaching Assistants (GTAs). The challenges the students reported resonated with GTAs, who agreed that it is also hard for them to focus on classes or TA work when working remotely from home. The feeling of disconnection expressed by students was echoed by the GTAs. They agreed that remote learning takes more time than in-person learning. They were concerned that students who relied on campus technology during in-person learning faced greater disadvantages while at home. There were also some striking stories of more general issues with workspace and environment at home.

On the other hand, some GTAs described "tenacious" students who used available tools such as e-mail and Slack to ask questions and used recorded lecture videos to gain understanding. Part of the discussion was devoted to differences in studio sessions when located in the physical classroom versus online breakout rooms. The number of non-participating students during studio increased during remote instruction, placing burden on both other students and the GTAs/LAs facilitating. The discussion also addressed challenges and merits of camera on versus camera off and the challenges of teaching and collaborative group work without the cues of body language.

As the discussion turned to strategies, technology suggestions were most common, including using social media (Slack, Discord) more actively to create community, interaction, and engagement, and using tablets and whiteboards to facilitate collaborative problem solving and productive instructor interactions at a distance. There was strong caution expressed of potentially "invading" a student's work environment that is now their home. The GTAs supported the idea of more frequent lower-stakes tests and suggested changing assessments from exams to more authentic projects whenever possible. They also advocated for a mastery approach where students could have multiple opportunities to take an exam. The GTAs suggested that instructors clearly provide students a reason to engage more, such as looking at studios as a great time to learn real-world skills for when they go to industry – where much of the engineering work might be done remotely. The GTAs explicitly acknowledged how the change in environment has impacted productivity and suggested that expectations should also be modified accordingly.

Undergraduate Learning Assistants (LAs). The focus group with LAs reiterated many of the points raised in the GTA focus group. They stated that office hours were in some ways better for their access during remote teaching

and that posting lecture videos was beneficial to learning. They reiterated the value of social media tools like Slack and Discord to connect and build community. They expressed that the most effective remote classes used a healthy dose of active learning through polling systems like the AIChE Concept Warehouse or a Zoom poll. They also suggested that as students matured through their time in college, their needs shifted, so strategies for 1st year students and 4th year students need not be the same.

The LAs agreed that trying to implement traditional timed exams was difficult, and issues with scanning, proctors, and technical problems lead to stress. Like the GTAs, the LAs recommended weekly quiz formats or transitioning towards more projects. The LAs acknowledged that instructors were also likely overwhelmed, but also observed that many faculty were "*not accepting of technology*" nor were they using it well.

DISCUSSION AND CONCLUSIONS

The survey findings from this study are consistent with findings reported in the early special issues on COVID-19. Like Morelock et al.,[9] both students and instructors faced a variety of challenges in the rapid transition to remote instruction. Students most commonly reported challenges of staying engaged as they struggled with motivation, attention, and focus, responses that are similar to those reported by students in other settings.[10, 12-14, 16] In particular, students reported being distracted during lecture. Instructors can counter such distractions, to some degree, by regular use of interactive delivery strategies such as polling and breakout rooms, but many students clearly indicated that sitting in their bedroom staring at a computer screen is fundamentally different than being in a vibrant classroom co-located with their peers and the instructor. More generally, students noted missing important social interactions due to the isolation mandated by the pandemic.[21] They identified these interactions as both supporting connection to the department community and supporting the learning of challenging content. Several students remarked that is was difficult to gauge how they were performing in class. As an instructor, one of the most challenging aspects in the shift to remote teaching was making in-the-moment instructional decisions with limited cues from students' body language. Apparently, such cues are also important for students' self-regulation processes. For example, a student gets very different non-verbal information when their classmates appear lost during a complex derivation than when they are animatedly following a classroom discussion. While post-pandemic opportunities for social interaction will be greater, the "learn anywhere" visions posed by administrators[3] should be tempered by developing understanding of how in-person interactions support community and learning.

Guidelines for *Chemical Engineering Education* have been recently modified to require that papers incorporate a diversity, equity, and inclusion (DEI) lens into their paper. This focus on the student experience that is the basis for the study reported here is within the context of a broader initiative within Oregon State University to attend to DEI issues where we seek to create a culture where everyone in the School community feels valued and belongs.[22] As with many university structures and practices, we were concerned that the pandemic would impede this initiative by disproportionately impacting disadvantaged students. As a step towards understanding the variety of students' experiences, we used the survey and focus groups described in this paper. The following comments reflect on the findings from this study from that perspective. Findings suggest that remote instruction may disproportionately impede students with less resources. For example, issues of unreliable technology and limitations in students' workspace to attend class and take exams are clearly related to access to economic resources. Thus, it is reasonable to conjecture that students from socioeconomically disadvantaged populations were disproportionally impacted by the shift to remote teaching during the pandemic.

In contrast, a recent study reports disadvantaged students were not disproportionately harmed with the shift to remote learning during the pandemic.[23] However, that study was in a different context; the sample contained only students from an introductory biology course. Experiences of first-year students in a general science class serving several majors are likely different than responses from a sample across all four years of students within their engineering major. These differences suggest the role of community for in-person engineering programs may be important and warrants further study. In addition, the different findings may be explained by deductive versus inductive methodological approaches. The primary data sources in the biology study were Likert-scale surveys while the study reported in this paper used free response questions triangulated by focus groups of undergraduate and graduate student instructors. While the Likert-scale surveys can provide a measure of theory-based motivational constructs, they are less likely to probe more deeply into unforeseen aspects of this unprecedented situation.

The findings reveal some important lessons from this unintentional experiment, including aspects of remote teaching that can be productively integrated when in-person instruction resumes. Many student success strategies can transfer, such as more deliberate planning and organization and attending to their own mental health.[14,15] Both student and student instructors recommend continuing the use of Zoom office hours and recorded videos of lectures, although in-person office hours are recommended for more complex technical work. Students often innovatively used technology tools such as social media to support their communication and

learning. They noted that often instructors were less facile at adopting the use of technology tools. While time constraints certainly contribute, I conjecture that exploring technology with students creates vulnerability. Shifting from a paradigm of being the expert "teaching to" students to "learning with" students could support the use of technology tools.

When instructors rigidly adhered to a pre-pandemic view of an in-class exam, students tended to have poor experiences and elevated stress. On the other hand, instructors who were able to adapt, innovate, and be flexible seemed to lead to better assessment experiences for students. More generally, as the focus groups suggested, rather than trying to reproduce the in-person learning environment, identifying realistic goals and then designing instruction, assessment, and interactions around the affordances and constraints of the remote environment was a more fruitful approach. It seems this lesson can be extended to approaches in other instructional contexts as well.

Both the student survey and the two focus groups suggest real challenges as the community rapidly shifted to remote teaching, but they also identified dedication, resilience, and compassion of students and faculty alike. What is clear, however, is that the shift in processes and practices necessitated by COVID-19 *does not* serve as a beacon for future practice as suggested by some upper administrators. But there is plenty to learn from this experience.

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