Challenges and Successes of Engineering Instructors when Forced to Deliver Courses Remotely

Abdullah Hamad
Department of Computer Science and Engineering
University of Nebraska -Lincoln
Lincoln, Nebraska, USA
ahamad2@unl.edu

Abeera P. Rehmat
Department of Civil and Environmental Engineering
University of Nebraska -Lincoln
Lincoln, Nebraska, USA
ORCID: 0000-0002-4977-5830

Grace Panther
Department of Civil and Environmental Engineering
University of Nebraska -Lincoln
Lincoln, Nebraska, USA
grace.panther@unl.edu

Heidi A. Diefes-Dux
Department of Biological Systems Engineering
University of Nebraska -Lincoln
Lincoln, Nebraska, USA
hdiefes-dux2@unl.edu

Abstract— This research paper examines how engineering instructors initially experienced a forced change from in-person teaching to emergency remote teaching by collecting instructors' self-reported successes and challenges. Participants included engineering instructors from an R1 institution who completed weekly online surveys during the last seven weeks of the Spring 2020 semester. An inductive thematic analysis of the instructors' responses to two open-ended items was completed from which the three most frequently cited themes from each of the successes and the challenges are presented and discussed. Understanding the most common successes and challenges experienced by instructors during emergency remote instruction lays the foundation for designing supportive strategies for future instructional change initiatives in engineering education.

Keywords—theories of change, instructional change, instructors, qualitative, COVID-19, adaptability

I. INTRODUCTION

The spread of the COVID-19 virus led to rapidly evolving situations that impacted the education system worldwide. As a result, universities were compelled to close campuses, bringing an abrupt end to in-person teaching in Spring of 2020. During these uncertain times, delivery of remote instruction became a priority to keep the impact on student learning to a minimum [1]. Implementation of "remote" teaching began to occur within a few weeks of physical school closures, forcing instructors that lacked experience with remote learning to acquire an extensive set of skills in a short period of time. Engineering instructors, who are rarely forced to make changes to their instructional methods, were required to adapt and alter their instructional pedagogy to support remote teaching. This situation brought about a unique opportunity to study how engineering instructors handled a forced change in teaching practices as they transitioned to remote teaching. A better understanding of the impact of forced changes to instructional practices from the instructors' point of view could provide valuable insight into the support needed to help accelerate engineering education in the future.

II. BACKGROUND

A. Emergency Remote, Not Online, Teaching

Online learning is a form of distance education which for years has been acknowledged as an effective instructional model for learning [2-3]. The online learning mode has been associated with ideas of "flexibility of teaching anywhere, anytime" [2 p. 7], as teaching and learning in such environments can be synchronous or asynchronous. In synchronous online environments, the interaction between the instructor and students is "live" through audio conferencing, videoconferencing, and web chats. In contrast, asynchronous online learning involves significant delays in time either due to delays between the creation of instructional content and its delivery, as with video recording, delays from the start to end of a discussion, as through email exchanges and discussion forums [4]. Similar to face-to-face learning, online learning requires infrastructure, instructional planning, and pedagogies that take time to develop [2, 4]. However, the urgent and unplanned transition to remote teaching that occurred in education due to COVID-19 did not produce conventional online teaching and learning opportunities for students, but rather prompted a temporary solution to an immediate problem, termed *emergency remote teaching* [1-2].

Emergency remote teaching (ERT) is defined as "a temporary shift of instructional delivery to an alternate delivery mode due to crisis circumstances" [2, p. 7]. ERT involves an immediate and complete transition of instruction to remote teaching, that would normally be delivered face-to-face. In contrast to online teaching, ERT is unexpected and only enacted due to a crisis. ERT requires changes to both pedagogy, assessments, and modalities [5]. Essentially, for instructors this unplanned and abrupt transition is difficult since it necessitates a quick redesign of instructional materials and practices that may have otherwise been prepared in advance for the semester [5]. The unexpected shift to ERT can be particularly challenging for instructors that lack prior online teaching experience. Likewise, it can be equally arduous for academic programs (e.g., engineering) that are typically taught face-to-face [6].

III. THEORETICAL FRAMEWORK

Adaptability is defined as an individual's ability to "constructively regulate psycho behavioral functions in response to new, changing, and/or uncertain circumstances, conditions and situations" [7, p. 66]. The tripartite model of adaptability focuses on the extent to which individuals are able to make cognitive (thoughts), behavioral (actions), and emotional (affect) adjustments necessary to navigate during situations of uncertainty [8]. Adaptability specifically focuses

on change and thus it is distinct from factors such as resilience, buoyancy, and coping which are "defense mechanisms" relevant for dealing with adversity and hardship. Individual adaptability is a key quality as it enables an individual to be flexible, open-minded, and willing to change to meet dynamic circumstances [7-9]. In higher education, change is often a reactive response to novel situations, in this case the pandemic [10-11]. Therefore, using an adaptability framework to study changes in teaching due to the COVID-19 situation is appropriate and may lead to new insights about how to support faculty change in teaching. .

IV. RESEARCH PURPOSE AND QUESTION

The purpose of this study was to examine how instructors initially experienced a forced change from in-person teaching to emergency remote teaching. This work is a part of a larger project [12] about instructor adaptability. The research question addressed in this study is: *What is the nature and frequency of cited successes and challenges experienced by instructors following a forced change to emergency remote teaching?*

V. METHODS

A. Setting and Participants

The setting for this Spring 2020 study was an R1 University. As was typical prior to COVID-19, in this semester, instruction was planned for 16 weeks and included a one-week break; an additional week was allotted for final examinations. However, the university physically closed for instruction a week before the scheduled break. ERT was initiated in the week following the break (week 12 of the semester) and continued through week 16 and ended with final exams and projects being conducted remotely during finals week. Instructors completed their grading during Grades week.

Instructors in the College of Engineering were surveyed in Spring 2020. Out of 161 invited instructors, 57 volunteered to participate in this study but only data from tenured or tenure-track professors ($n = 39$) were included (Table I).

B. Data Collection

Data collection was conducted through weekly surveys. Seven surveys were administered overall, beginning at the end of week 12 and continuing through the week that instructors issued final grades.

Surveys consisted of multiple select, multiple choice, and open-ended items. The two open-ended prompts that were the focus of this study asked instructors to:

1) Describe a teaching success you had this past week.
2) Describe a teaching challenge you are having or anticipate having.

C. Data Analysis

A qualitative inductive thematic analysis of the instructors' responses to the two open-ended prompts about the instructors' success and challenges during the past week was completed. The process of developing themes started with two undergraduate engineering researchers individually coding either the successes or challenges data. Coding discussions were had between the two researchers to discuss code names and meanings. These

TABLE I. ENGINEERING INSTRUCTOR PARTICIPANTS DEMOGRAPHIC CHARACTERISTICS

Category	Subgroup	*n*	*%*
Gender	Male	28	72%
	Female	11	28%
Position	Assistant Tenure-Track Professor	12	31%
	Associate and Full Professor	15	38%
	Assistant Tenure-Track Professor of Practice	9	23%
	Associate and Full Professor of Practice	3	8%
Department	Architectural and Construction Engineering	5	13%
	Biological Systems Engineering	7	18%
	Civil and Environmental Engineering	9	23%
	Computer Science and Engineering	7	18%
	Mechanical and Materials Engineering	7	18%
	Other*	4	10%

Chemical & Biomolecular Engineering and Electrical & Computer Engineering departments were combined to ensure confidentiality due to low participation rates.

researchers then went through the process of establishing inter-rater reliability. Inter-rater reliability consisted of an iterative process where text segments from the item responses were selected randomly and independently analyzed by both researchers. Inter-rater reliability was accomplished by selecting random text segments and comparing the codes attributed to the text segments by the two researchers. The coding results were then compared, and the process was repeated until 90% (computed as a simple percentage) or higher reliability was achieved. Definitions in the code book were changed as needed and then the data was re-coded to ensure the updated definitions were accurately reflected in the data. As new codes were added, the inter-rater reliability was re-checked to ensure accuracy. Due to the complexity of the data, these two undergraduate researchers plus three experienced educational researchers finalized the codes. Each code definition was revisited as the entire data set was checked, discussed, and, as necessary, re-coded by all five researchers in group meetings. Consensus was sought among all five of the researchers before proceeding with any change. Trustworthiness was established through multiple coders and data sources.

The final code book included 24 themes. The five most common success and challenge themes, each having more than 64 coded responses associated with them over the seven surveys, were selected for presentation in these results. The number of success and challenge coded responses, as well as the number of unique participants that provided those responses, were determined each week for graphical presentation. Select quotes from these themes were also assembled to highlight the

differences between the focus of the successes and challenges within each theme.

VI. RESULTS

Five major themes that emerged from the data explain how instructors initially experienced a forced loss in ability to teach under normal in-person circumstances. These themes encompass: *Engagement*, *Course Design and Delivery*, *Assessments*, *Communication*, and *Grading* (Table II).

Overall, the most common success themes were Course Design and Delivery, Assessments, and Grading. While the most common challenge themes were Student Engagement, Assessments, and Grading (Table III). As will be seen in the more detailed results for each theme and Figs 1-5, Student Engagement was a considerable challenge during the first two weeks of remote instruction. Near the end of the semester, Assessments and Grading were more frequently reported as both successes and challenges compared to earlier in the data collection period.

A. Student Engagement

Student Engagement pertains to student participation/attendance in class, with lectures, video, office hours, or with instructor. The number of times instructors reported challenges related to this theme across the seven

TABLE II. CODING SCHEME AND DEFINITIONS

Themes	Definitions
Student Engagement	Pertains to students' participation/ interaction/ attendance in class, with lectures, video, office hours or with an instructor.
Course Design and Delivery	Relates to adjustments an instructor made to move from face-to-face to emergency remote teaching.
Assessments	Concerns with quizzes or exams including anticipation, planning, design, and administration.
Communications	Describes an instructor trying to make contact with students and the students' response (or lack thereof) to those attempts.
Grading	Describes the action of grading assignments.

TABLE III. TOTAL CODED RESPONSES BY THEME ($n = 39$)

Themes	No. Challenges	No. Successes	No. of Unique Participants
Student Engagement	55	47	33
Grading	54	33	29
Course Design and Delivery	42	28	27
Assessments	40	51	24
Communication	34	30	23

surveys was 55, while the number of times they reported successes was 33.

Overall, the number of challenges expressed by instructors were greatest in the first two weeks and decreased through to the end of the semester with a few more comments being expressed in week 15 (Fig. 1). In the first two weeks, more instructors cited challenges associated with student engagement as compared to successes. This changed in week 14 and then in finals week, during which the number of instructors reporting challenges decreased.
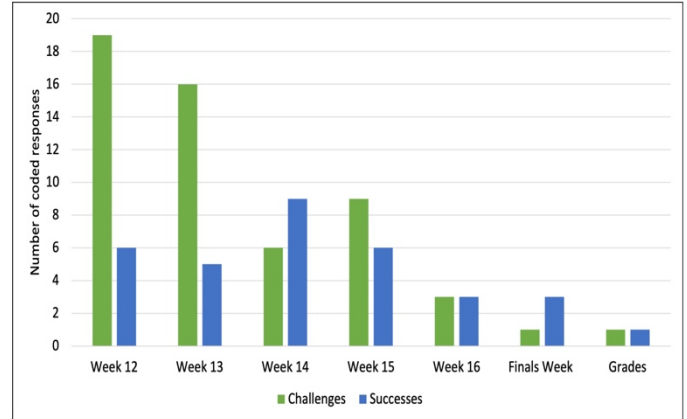

Fig. 1. Weekly number of coded responses for Engagement challenges and successes ($n = 33$).

Instructor challenges with engagement were concerned with lack of participation in lectures by students, percentage of students completing assignments, and attendance. In week 12 and 13, many instructors had trouble figuring out how to engage their students and to push students to complete their assignments. One instructor remarked, "I am uncertain about whether all my students are remaining engaged with the class." Instructor challenges with engagement continue throughout the semester, but fewer are reported after week 15. This can be attributed to instruction coming to an end, and instructors focusing on final examinations and grades.

Instructor successes highlight student participation during the lecture, completing assignments, and attending office hours. One instructor highlighted in one of their responses, "Carried on a very good class discussion via the discussion boards on Canvas [learning management software]. Much better participation than even in class discussions!" Another instructor pointed out how they saw an increase in the number of students attending office hours and participation as a success when writing "Increase in the number of students attending Zoom office hours and live Canvas Chat."

It appears that challenges in one week were translated into successes in the following week. For instance, one instructor mentioned in week 13 how there could be difficulties getting students to participate in the class, "I anticipate difficulties getting all students to participate in the worksheets. Some are unable to as they are now working during class time [sic]". In week 14, the instructor reported a success in students attending and participating in worksheet completion, "Students are still attending the Zoom meetings and are working together on homework and worksheets."

B. Grading

Grading describes the actions of grading assignments. The number of times instructors reported challenges related to this theme across the seven surveys was 33, while the number of times they reported success was 46. Frequency of coded responses related to grading was low immediately upon entering ERT in week 12. However, grading success and challenges were then reported with more frequency across the remaining weeks. The highest number of responses for challenges were cited during finals week as compared to successes, which were significantly higher after the issuing of final grades.
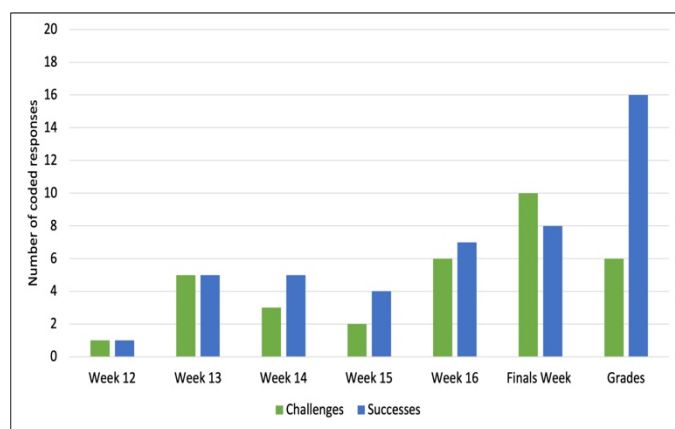

Fig. 2. Weekly number of coded responses for Grading challenges and successes ($n = 29$).

Grading challenges can be split into two periods. In the first period, from weeks 12-15, there was no primary theme; responses varied. During the second period, from week 16 to Grades week, instructors comments focused on the grading load. As one instructor mentioned, "Grading 120 randomized exams." While there were no other notable themes, there were a couple of interesting remarks made by some instructors. First, there was an indicator that instructors adjusted grades depending on the impact that COVID-19 had on their students. As one instructor remarked about students who did not have access to the correct equipment, "Challenges now are how to adjust grades for those that didn't have access to equipment needed to complete the project. They had a far less than ideal experience." Another interesting remark was concerned with the difference in the learning environment and its possible impact on grades. "The major concern was about students complaining about their grades. As different students and teams were impacted by COVID differently, I had to understand this aspect could have caused unfairness in the learning environment."

Unlike grading challenges, grading success responses were more uniform and the majority of responses were associated with instructors successfully grading assignments. Some assignments were graded traditionally while others were graded using online alternatives such as Canvas. This theme can be encapsulated in the following quote, "The biggest success was not having any huge errors in any of the low-stakes on-line, computer graded quizzes this week!" While responses were mostly homogeneous, there were a couple of responses that stood out. One of those responses mentioned how students may have done even better with the new online format. "Now that I'm grading their work, I can see that they are doing good thinking about the concepts. This may have been a better exam than a typical F2F [face-to-face], closed note, closed book, timed exam."

C. Course Design and Delivery

Course Design and Delivery relates to adjustments an instructor made to move from face-to-face to emergency remote teaching. The number of instructors that reported challenges related to this theme across the seven surveys was 42, while the number that reported success was 18. Instructors' citing successes related to course design and delivery varied throughout the semester, with the highest reported weeks 12 and 16 (Fig. 3). While the number of challenges reported for this theme were significantly higher during weeks 13, 14, and after issuing final grades. No successes were discussed in association with this theme during finals week as one might expect since content delivery was complete. Yet, a few successes were reported on the last survey, these were mostly related to the general success of completing the semester and converting material to an online format.
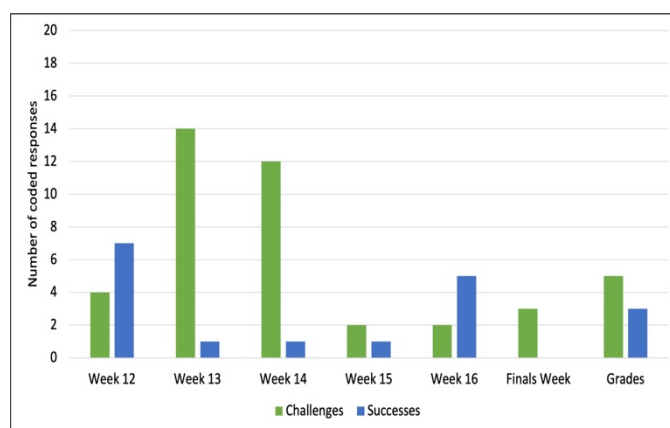

Fig. 3. Weekly number of coded responses for Course Design and Delivery challenges and successes ($n = 27$).

The challenges reported in weeks 13 and 14 tended to pertain to the difficulties in converting material to an online format and the amount of time it took. In terms of converting material to an online format, one instructor pointed out the difficulty in transitioning a project assignment, "Developing creative ways for students to complete projects while campus is locked down." In terms of time to convert online materials, another instructor wrote, "Scheduling is particularly tight for me now, and I am worried about finding time to convert the rest of my materials over for remote instruction."

The primary sub-theme amongst instructors' successes were attempts to find alternatives to in-class tools to replicate their teaching method in an online environment. As one instructor highlighted, "going online and teaching was successful [sic], writing on my surface is very similar to writing on a white board, and students like it because I speak more calm, more concentrated, and I am not blocking students' view when I write (normally standing at [sic] a board)." This is an interesting success, as the instructor not only moved from in-person instruction to ERT, but also found a method for giving lectures that appeared to work better for that instructor.

D. Assessments

Assessment concerns focused on quizzes or exams including anticipation, planning, design, and administration. The number of times instructors reported challenges related to this theme across the seven surveys was 40, while the number of times they reported success was 41. Instructor responses for successes and challenges had about the same frequency throughout the semester, though there were peaks in reported successes during week 13 and finals week (Fig. 4).
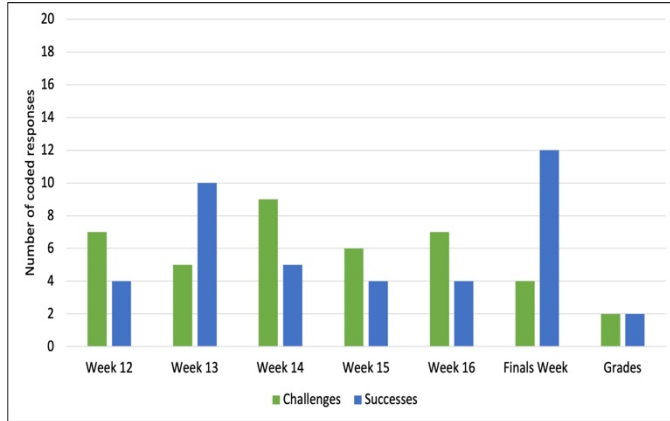

Fig. 4. Weekly number of coded responses for Assessments challenges and successes (*n* = 24).

Instructor challenges relating to assessments can be grouped into three main sub-themes: academic integrity, student performance, and planning for assessments. Academic integrity was a concern of many instructors, one citing the following, "The only challenge left is preventing cheating for the final exam." The second issue that instructors were concerned with was the low performance of students; as one instructor stated, "Currently have mixed feelings about low student grades (<70%) from the take home exam...I was expecting a distribution similar to homework grades." The last main issue was in regard to instructors' planning for assessments. One instructor remarked, "I'm still not sure about how to conduct the final exam, such as which format and how to monitor students, etc."

Instructor successes were primarily concerned with assessment planning and completion. The planning sub-theme concerns itself with instructors discussing the creation of assessments and is best expressed by the following quote, "Last week I had a quiz for one of my classes and it was great. I created a quiz in Canvas and used a pool of analytical questions so different students will have different questions. Also, I used the shuffling option for the substitutions. I think it was a success." Assessment completion deals with successes in the administration and having a positive retrospective look back on the experience. As one instructor wrote, "This past week I successfully administered two exams virtually using canvas." The highest number of responses coded as successes was in It was during finals week that the majority of respondents discussed successes in administering final exams.

E. Communication

Communication describes an instructor trying to make contact with students and the students' response (or lack thereof)

to those attempts. The number of times instructors reported challenges related to this theme across the seven surveys was 34, while the number of times they reported successes was 17. The number of responses coded communication successes was between one and three each week following a high of five in week 12 (Fig. 5). Whereas the number of challenges reported in surveys in weeks 12 through 14 were 11, 11, and 8, respectively. The decline in the number of responses for challenges after week 14 is most likely due to the semester coming to an end. The focus shifts from instruction and reaching students to final examinations and grades.
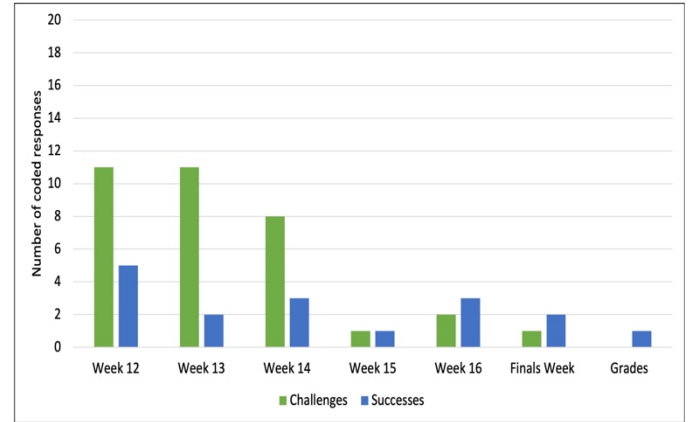

Fig. 5. Weekly number of coded responses for Communication challenges and successes (*n* = 23).

Instructor challenges concerning communication were mostly focused on reaching students that were not performing well and finding ways to more efficiently communicate. Concerns with reaching out to students that were not performing well is encapsulated in the following quote, "Students who are not completing assignments and are not responding to my attempts to reach out either at all, or in a timely manner." Finding ways to communicate efficiently when the instructor and student are not in-person was a big challenge as most communication had to be done through emails rather than voice which can make it more difficult to explain points. One instructor pointed this out by saying, "Everything takes longer. When students stick their nose in your office to ask questions, it takes just a few seconds. By email, it will take several back-and-forth emails to understand the question before I can answer."

Instructor successes concerning communication could be summarized as successful contact or interaction with students. The importance of identifying a strategy for getting students attention can be seen in the following remark from one instructor, "Students started following instructions I sent via emails. This took many email reminders, but now students are getting my messages. I learned that there should be a concise summary in each email."

VII. Discussion

The results of this study contribute new knowledge on engineering instructors' successes and challenges pertaining to teaching as result of a forced change to ERT. Furthermore, this study provides insights on instructors' adaptability to teaching remotely. First, ERT affected the way faculty engaged students

in learning. A lack of time for planning and experience with remote teaching as seen from the number and nature of coded challenge responses concerned with Course Design and Delivery indicate that adapting to ERT was difficult. Instructors also struggled with student engagement, and this was primarily a result of instructors' attempts to replicate the face-to-face experience by having the lecture moved from an in-person setting to an online conferencing platform such as Zoom. As researchers [1-2, 6] suggest, the rapid shift to ERT can be particularly challenging for instructors that lack prior remote teaching experience and/or programs that are traditionally taught face-to face (e.g., engineering). This finding suggests that in ERT situations, instructors need to be provided with planning time and resources to effectively convert and deliver their courses for online teaching.

Second, in week 14, the highest number of challenges reported pertained to Course Design and Delivery, Assessments, and Communication. This likely corresponded to a university change in policy. During week 14 instructors ceased to have access to physical campus facilities and resources which some were using to develop their video course content (e.g., classroom spaces). This meant that some instructors had to develop yet another plan to create their content. Losing access to facilities also meant that instructors had no access to in-person support as they were developing their next plan or to continue to work out their first plan. The forced change of plans and reduced access to support from colleagues consequently affected their potential for adaptability to ERT. Zhou et al. [13] asserted that in a crisis, adaptability and social support (e.g., colleagues, friends, and staff) are factors that promote psychological outcomes. In concurrent studies, Author et al. [14-15] found that during this week there was an increase in instructors' emotions in the category of 'Loneliness' and a decline in instructors' engagement in 'Casual Conversations.' A combination of lack of experience with online teaching and support from colleagues and staff not only correlate with instructors feeling of isolation but further explains instructors' potential for adaptability.

Third, in finals week, assessments had the highest number of responses, where the majority of instructors expressed successes in administering final exams. This finding could be attributed to the conclusion of the semester, suggesting that instructors felt they had adapted to remote teaching. Similarly, Author et al. [14] found that, during finals week, 73% of instructors cited feeling 'Accomplished' further indicating a sense of adaptability to ERT.

Overall, faculty adaptability to ERT varied from week to week and from theme to theme. In the sample, there was no mention of an instructor not completing the semester with their students. It is difficult to say whether or not the completion of all courses was a success of adaptability to ERT, as the outlook by instructors seems to be one of relief at the end of the semester rather than triumph.

VIII. Limitations

Instructors from across the college of engineering were invited to participate in the study (*n*=161), however participation was voluntary. The results presented here may not represent the experiences of all instructors. Secondly, instructors had to recall success and challenges they came across in the week of the survey. Details and events recalled by the instructors could be inaccurate.

IX. Future Work

This study focused solely on instructors' successes and challenges associated with emergency remote teaching. Further research on instructors' adaptability will delve into other data (e.g., interview, other survey items) to examine the extent to which instructors were able to make cognitive, behavioral, and emotional adjustments necessary to navigate during situations of uncertainty by mapping the different dimensions of adaptability to other instructor variables (e.g., years of experience teaching). An integrated understanding of these dimensions of adaptability can assist with designing faculty development opportunities for instructors that can also support their adaptability.

An interesting comparison would be between the start-up of online courses and ERT courses and whether the instructors suffer from the same issues found in this study. An important thing to keep in mind while examining this contrast would be the perception of the instructor. For example, an online instructor would likely have developed methods to communicate and engage students prior to the start of class.

X. Conclusion

This study shed light on the successes and challenges experienced by instructors during the initial period of a forced change to instructional practices. Next steps include analyzing additional survey data that was collected in Fall 2020 and Spring 2021 as the pandemic continued to interrupt in-person instruction. Understanding the most common successes and challenges experienced by instructors during a forced change lays the foundation for designing supportive strategies for future instructional change initiatives in engineering education.

Acknowledgment

References

[1] C. Golden, "Remote teaching: The glass half-full," *EDUCAUSE Review*. 2020, [Online]. Available: https://er.educause.edu/blogs/2020/3/remote-teaching-the-glass-half-full

[2] C. Hodges, S. Moore, B. Lockee, T. Trust, and A. Bond, "The difference between emergency remote teaching and online learning," *Educause Review*, vol. 27, 2020, [Online]. Available: https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning

[3] T. Nguyen, "The effectiveness of online learning: Beyond no significant difference and future horizons *MERLOT J. Online Learning and Teaching*, vol. 11, pp. 309-319, 2015.

[4] N. Dabbagh and B. Bannan-Ritland, *"Online learning: Concepts, strategies and application"*. New Jersey, NJ: Upper Saddle River, 2005.

[5] J. K. Green, M. S. Burrow, and L. Carvalho, L, "Designing for transition: Supporting teachers and students cope with emergency remote education,". *Postdigit Sci. Educ.*, vol. 2, pp. 906–922, 2020, doi: 10.1007/s42438-020-00185-6.

[6] J. J. Park, M. Park, K. Jackson, and G. Vanhoy, "Remote engineering education under COVID-19 pandemic environment," *Int. J.*

Multidisciplinary Perspectives Higher Ed., vol. 5, no. 1, pp. 160-166, 2020.

[7] A. J. Martin, H. G. Nejad, S. Colmar, and G. A. D. Liem, "Adaptability: Conceptual and empirical perspectives on responses to change, novelty and uncertainty," *Australian J. Guidance and Counselling,* vol. 22, no. 1, pp. 58-81, 2012, doi: 10.1017/jgc.2012.8.

[8] A. J. Martin, "Academic buoyancy and academic resilience: Exploring 'everyday' and 'classic' resilience in the face of academic adversity," *School Psych. International,* vol. 34, no. 5, pp. 488-500, 2013, doi: 10.1177/0143034312472759.

[9] A. S. Masten, "Ordinary magic: Resilience processes in development," *Am. Psych.*, vol. 56, pp. 227–238, 2001, doi: 10.1037/0003-066X.56.3.227.

[10] S. Dhawan, "Online learning: A panacea in the time of COVID-19 crisis," *J. Ed. Tech. Sys.*, vol. 49, no. 1, pp. 5-22, 2020, doi: 10.1177/0047239520934018.

[11] R. M. Cutri, J. Mena, and E. F. Whiting, "Faculty readiness for online crises teaching: Transitioning to online teaching during the COVID-19 pandemic," *European J. Teacher Ed.*, vol., 43, no. 4, pp. 523-541, 2020, doi: 10.1080/02619768.2020.1815702.

[12] G. Panther and H. A. Diefes-Dux, "Instruments used to capture instructors' experiences during a forced move to remote instruction," in *Proc. ASEE Virtual Conference & Exposition,* 2021.

[13] M. Zhou and W. Lin, "Adaptability and life satisfaction: The moderating role of social support," *Frontiers in Psychology,* vol. 7, no. 1134, pp. 1-7, 2016, doi:10.3389/fpsyg.2016.01.

[14] A. P. Rehmat, H. A. Diefes-Dux, and G. Panther, "Engineering instructors self-reported activities to support remote teaching during the COVID-19 pandemic," in *Proc. ASEE Virtual Conference & Exposition,* 2021.

[15] A. P. Rehmat, H. A. Diefes-Dux, and G. Panther, "Engineering instructors; self-reported emotions during emergency remote teaching," in *Proc. Frontier in Education*, Lincoln, NE, 2021.