Results of a Summer 2020 Survey of Computer Science Faculty: The Transition to Online Teaching last Spring and Planning for the Fall

Betsy Bizot, CRA
Ran Libeskind-Hadas, Harvey Mudd College and CRA Board
Susanne Hambrusch, Purdue University and CRA-E co-chair
Jim Kurose, University of Massachusetts
Lori Pollock, University of Delaware and CRA-E co-chair
Nancy Amato, University of Illinois at Urbana-Champaign and CRA Board
With Contributions from the CRA CERP Team

Introduction

In June 2020 we conducted a survey of computer science faculty members who made the transition from teaching in person to teaching online as the result of the COVID-19 pandemic. The survey asked faculty members about their perceptions of the challenges in moving to emergency online instruction and also about planning for the fall 2020 term.

The anonymous survey was disseminated to the CRA and the SIGCSE mailing lists. A total of 450 surveys were submitted, 54% from faculty members at public institutions and 46% from private institutions. Not every respondent answered every question and thus some response tallies are less than 450. Table 1 shows the type of institution of each respondent and Table 2 shows information about the respondent's position and teaching experience, including whether or not they had previously taught a course online. The complete text of the survey is available here: https://cra.org/wp-content/uploads/2020/07/Faculty-Survey-Questions.pdf.

Table 1. Responses by Institution Type, percent within count by column.					
Highest Computing Degree (N=450)		Institution Control (N=448)		Faculty Size (tenure-track or full time teaching track) (N=450)	
Bachelors	15.6	Public	54.2	< 35	58.7
Masters	10.0	Private	45.8	>= 35	41.3
PhD	74.3				

Table 2. Responses by Faculty Position and Experience, percent within count by column.					
Position (N=452)		Teaching Experience, Years (N=452)		Online Teaching Experience (N=450) +	
Tenured/ Tenure-track	69.7	1-2	8.0	Yes, this course or one very similar	17.0
Full-time Teaching track	21.7	3-5	13.5	Yes, a different course	15.9
Part-time Teaching track	5.3	6+	78.5	No	67.0
Other *	3.3				

* Other faculty include visiting, emeritus, etc.

+ Prior online teaching experience collapsed to "Yes" or "No" for comparisons

About the Course

Each respondent was asked to consider one course that they taught last spring that moved from in-person to online teaching as a result of the pandemic. Table 3 indicates the type and level of the course for each respondent, Table 4 indicates how the course material was presented after the move to online teaching, Table 5 examines changes to course components as a result of moving the course online, Table 6 summarizes how exams were handled after moving to online instruction, Table 7 examines changes in assessment methods, and Table 8 examines changes in academic integrity violations.

Table 3. Type/Level of Course and Percent of Faculty Teaching Each Student Size Group, of Total Teaching That Type of Course.

Course Area/Level	How many students were enrolled in all sections you taught?			
	< 25	25-49	50-99	>= 100
Service (specifically not for majors) (N=24)	8.3	37.5	12.5	41.7
Lower-division course for majors (N=136)	19.1	28.7	16.2	36.0
Upper-division course for majors (N=168)	24.4	41.1	24.4	10.1
Graduate-level course (N=69)	58.0	20.3	13.0	8.7%
Other (N=12)	16.7	25.0	41.7	16.7%
Total (N=409)	27.1	32.8	19.6	20.5%

Table 4. How was course content presented after moving the course online? (N=406)

	Percent
In real time, but recordings were available later	37.2
In real time/synchronous	23.2
Recorded in advance/asynchronous	20.0
Mixed (some real-time, some pre-recorded content)	17.0
Other	2.7

Table 5. Course components and how they were handled after the move online.

Which of the following apply to your course before moving online? (select all that apply)			Percent handled this way after move online, of those who had this component		
	Count	% of courses (N=409)	Discontinue	Minor adaptation	Significant adaptation
Active learning in class	250	61.1	34.9	43.4	21.3
Collaborative project(s)	180	44.0	13.9	71.7	14.4
Scheduled helper or consulting hours	172	42.1	3.8	76.1	20.1
Lab component	166	40.6	9.1	64.6	26.2
Team student presentations	106	25.9	17.3	67.3	15.4
Pair programming	85	20.8	38.6	53	8.4
Individual student presentations	75	18.3	23	64.9	12.2
Guest lectures	44	10.8	36.4	54.5	9.1
Peer mentoring	42	10.3	28.6	64.3	7.1
Capstone or senior design class	23	5.6	4.5	72.7	22.7
Field trips or field work	7	1.7	71.4	14.3	14.3

Table 6. How were exams handled AFTER the class moved online? (Percent by exam type)

	No exams of this type given	Normal method, continued online	New method: many problems/ challenges	New method: Worked okay	New method: I would recommend or use again
Timed exam online with deadline, once started, students have a fixed amount of time (e.g, 1, 2, 3 hours) to complete it	38.2	16.2	10.7	25.4	9.4
"Take home" exam (students may take the exam over a multi-day period)	71.2	8.3	5.3	10.4	4.7
Open book, open notes	43.3	13.7	9.1	24.6	9.4
Other	73.6	8.2	3.6	5.5	9.1

Table 7. How did you handle assessments for components other than exams after you moved online? (Select all that apply.) (N=409)

	Percent
Assessment was unchanged	63.6
Formerly face-to-face conducted with video	12.7
Some components no longer graded	13.0
Adjusted rubric for some components	15.4
Changed weighting of components	29.6

Table 8. To what extent did you observe academic integrity issues in this class AFTER the class went online? (N=400)

	Percent
None observed	45.0
Observed, but similar to normal circumstances	32.0
Observed somewhat more than under normal circumstances	15.8
Observed many more than under normal circumstances	7.3

Faculty and Student Challenges

Figure 1 summarizes the challenges, also shown in Table 9, reported by respondents. Note that more than half of respondents agreed with the statements "It took a lot more time than my regular teaching would have" and "It was hard to implement my preferred teaching style."

Table 10 examines faculty perceptions of the challenges faced by their students. Family obligations and lack of sufficient internet access were the two most salient concerns followed closely by mental health issues and challenges due to time zone differences. Although the numbers are lower, we also note that financial insecurity and food insecurity were concerns and their impact cannot be underestimated.

Table 11 examines areas that may have been better for students online than in-person. The ability to watch lectures at convenient times and to re-watch lectures as necessary were the two most common perceived benefits for students.

Table 12 examines the stress incurred by faculty in making the move to online teaching last spring and Table 13 examines the perceived impact of moving online to student learning.
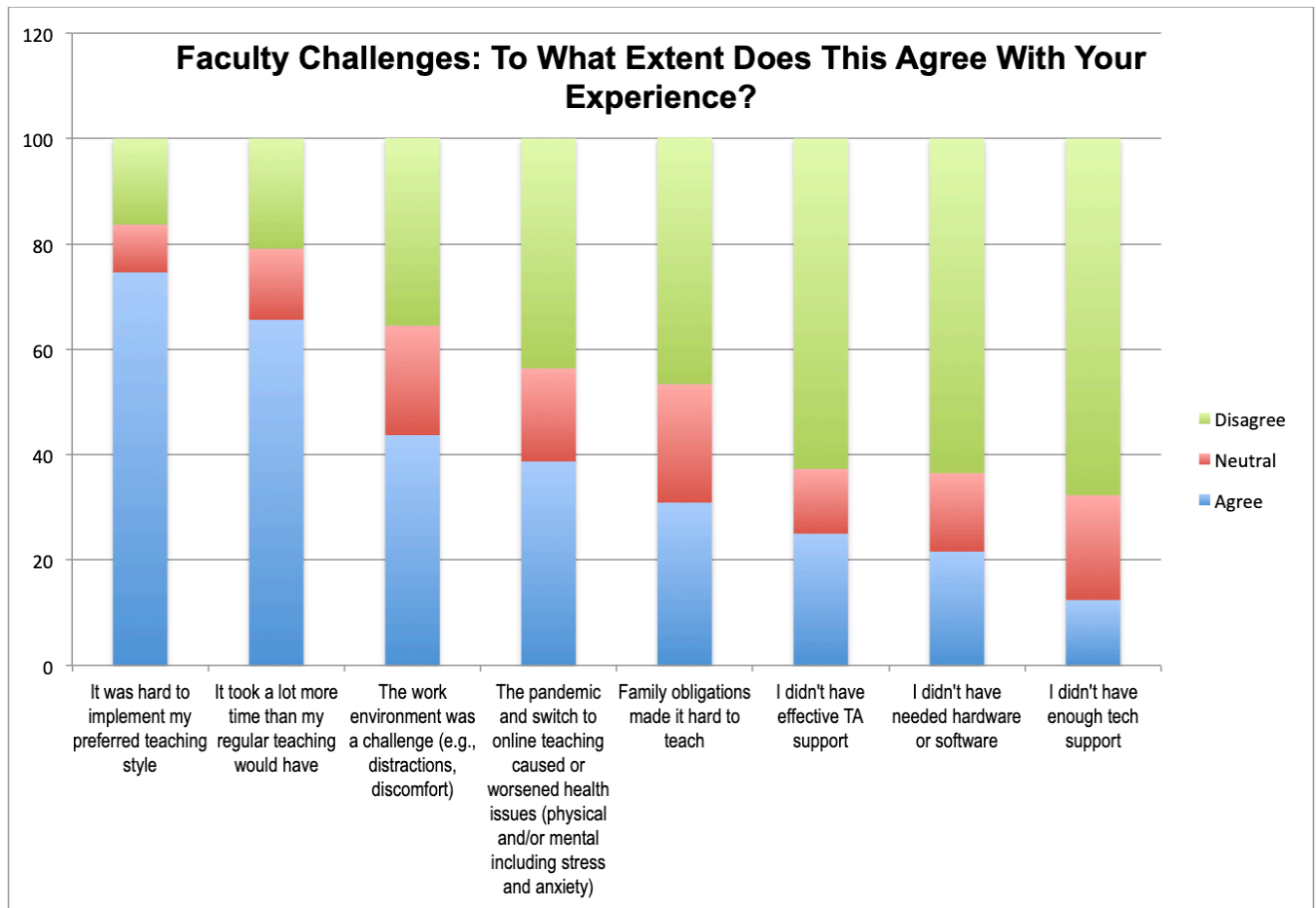

Figure 1: Faculty Challenges

Table 9. Some people experienced the following as challenges while teaching online. To what extent does that agree with your experience?

	Agree	Neutral	Disagree
It was hard to implement my preferred teaching style	74.6	9.1	16.3
It took a lot more time than my regular teaching would have	65.6	13.5	20.9
The work environment was a challenge (e.g., distractions, discomfort)	43.7	20.8	35.6
The pandemic and switch to online teaching caused or worsened health issues (physical and/or mental including stress and anxiety)	38.7	17.7	43.6
Family obligations made it hard to teach	30.9	22.5	46.8
I didn't have effective TA support	25.0	12.3	62.7
I didn't have needed hardware or software	21.6	14.9	63.5
I didn't have enough tech support	12.4	19.9	67.7

Table 10. What challenges do you believe may have impacted your students' performance in the online part of this course? Select all that apply. (N=409)

	Percent
Family obligations	59.2
Lack of internet access (including insufficiently fast access)	58.9
Mental health issues	56.5
Time zone differences	49.6
Lack of needed hardware (laptop, camera, headset, etc.)	42.5
Financial insecurity	36.2
Stress due to timing of online material, e.g., a week of lecture videos posted at once for a course that formerly met 3x/week	29.6
Insufficient access to help with course material (content, not technical)	22.0
Technical difficulties in accessing online material or exams/assessments	21.3
Food insecurity	13.0
Lack of access to disabilities support for remote learning, please specify	7.1

Table 11. Which if any of these features do you believe were better for at least some of your students online than in-person? Select all that apply. (N=409)

	Percent
Ability to watch recorded lectures at a different time than class time	63.6
Ability to watch parts of recorded lectures more than once to better understand concepts	63.1
Ability to work at their own pace	35.0
Not aware that anything was better	18.3
Access to help from TAs or others	10.3

Table 12. Shifting to online teaching of this course was difficult and stressful? (N=399)

	Percent
Strongly Agree	24.8
Agree	41.6
Neutral	18.5
Disagree	10.0
Strongly Disagree	5.0

Table 13. Students learned about the same amount as they would have if we had continued to meet in person for the duration of the term? (N=399)

	Percent
Strongly Agree	6.3
Agree	30.3
Neutral	19.5
Disagree	34.8
Strongly Disagree	9.0

Student Research

About half of the faculty responding to the survey (254) supervised student research in the spring: 160 supervised PhD students, 108 master's students, and 160 undergraduate researchers. The vast majority of research supervisors were tenured or tenure-track faculty

(88%) while a smaller number were teaching track faculty (8%) and a few were part-time or other faculty (4%).

Table 14 summarizes the challenges and successes of student research in spring 2020. While research continued - 60% of faculty say that research projects progressed as much as they would have without the disruption - there were difficulties. The largest difficulties were in relationship building; It was hard for students to maintain connections with a research group and it was harder to continue to develop mentoring relationships.

Table 14. What challenges and successes did you and your students encounter after moving their research online? (N=254)	Not at all	Somewhat or Very Much
It was hard for students to maintain connections with a research group	25.0	75.0
It was harder to continue to develop mentoring relationship(s)	30.6	69.4
Students had other demands on their time that inhibited their research progress	32.8	67.2
Research project(s) progressed as much as they would have without the disruption	39.6	60.4
Students had hardware constraints or internet issues	56.1	43.9
It was harder to schedule time to discuss research progress with student(s)	59.0	41.0
Students had more time available for research	67.8	32.3
Research was dependent on a lab or other resources that were not accessible	68.0	31.9
It was easier to have conversations with students you mentored	73.4	26.7

Looking to Fall 2020

The survey asked a number of questions regarding plans and concerns for teaching online in Fall 2020.

Table 15 summarizes results for the question "If teaching the same course online again in the fall, what would you change?" The most common responses were generating more online discussion and interaction, preparing more pre-recorded material, and refining/updating materials to increase independent student learning. This highlights a theme that was also seen in some of the free-form text responses: Many faculty would like to move away from synchronous online lecturing to spending more in discussion and other interactions with students, with needed lectures being pre-recorded for students to watch in advance.

Table 16 examines the additional resources that faculty indicate that they need to support their fall teaching. The greatest stated need is for scalable methods for managing exams and training in online instruction and pedagogy.

Table 17 reports on concerns if teaching online again in the fall. The greatest concerns are student-related: Keeping students engaged, being aware of student difficulties with the material or non-academic issues, and student willingness to study online in the first place.

While 77% of respondents indicated that academic integrity issues were not observed or no worse while teaching online last spring, in free-form text responses about concerns for the upcoming fall semester, a number of respondents indicated that they are concerned about cheating and finding viable ways to conduct exams.

Table 18 summarizes concerns about the possibility of teaching in-person in the fall. Nearly two-thirds of respondents were concerned about the ability to maintain safe social distancing.

There were a number of statistically significant group differences. Faculty at non-doctoral institutions were more concerned about many issues related to students learning online including covering the necessary amount of material, creating a comfortable inclusive environment, continuing best practices in teaching, being aware of student difficulties, maintaining their own teaching/research balance, and student willingness to continue with online studying. Faculty at non-doctoral institutions also indicated higher rates of interest in training in online education, planning for more pre-recorded material, and spending time with students individually or in small groups.

Table 15. If you were to teach the same course again this fall, what would you change compared to your Spring 2020 online teaching? Items checked by 25% or more. (N=392)	
	Percent
Generate more online discussion, interaction	58.7
Prepare more pre-recorded material	48.7
Refine/update course materials to increase student independence in learning	47.7
Redesign assignments	38.0
Spend more time in individual or small-group online meetings with students	33.9
Keep it pretty much the same	26.3

Table 16. If you teach a course online in Fall 2020 which of these resources will be important for you to have more of than you had this spring? Items checked by more than 25%. (N=369)

	Percent
Scalable methods for managing exams	50.9
Training on online instruction (pedagogy rather than technologies)	48.8
Online teaching tools/software	40.9
Hardware (e.g., tablets, cameras, etc.)	36.3
Assistance with making content accessible to students with disabilities	33.3

Table 17. If you have to teach online in Fall 2020, what concerns do you have?

	Not at all a concern	Somewhat a concern	Very much a concern	Mean
Keeping students engaged in the material	9.9	34.6	55.4	2.5
Being aware of student difficulties with course material or non-academic struggles	7.1	46.2	46.7	2.4
Willingness of students to continue with all-online or primarily-online instruction	12.4	47.8	39.8	2.3
Continuing teaching best practices that you have used before	20.7	39.8	39.5	2.2
Designing effective assessments	23.3	35	41.7	2.2
Creating a comfortable inclusive environment for students	21.5	43.9	34.6	2.1
Creating an accessible environment for students with disabilities	23.2	55.2	21.7	2.0
Maintaining your own balance between teaching and research	35.7	30.2	34.2	2.0
Maintaining your own balance with personal/family obligations	33.8	30.6	35.5	2.0
Covering the necessary amount of material	47.4	38.6	13.9	1.7
Successfully mentoring student researchers	47.3	34.4	18.3	1.7

Table 18. If you return to on-campus in-person teaching in Fall 2020, what concerns do you have?

	Not at all a concern	Somewhat a concern	Very much a concern	Mean
Ability to maintain social distancing in classrooms	6.6	27.7	65.8	2.6
How to adjust normal practices (e.g. office hours) to social distancing	8.8	35.4	55.9	2.5
High-risk health concerns for yourself or a household member	16.7	32.5	50.7	2.3
Willingness of students to return to in-person environment	16.3	47.3	36.3	2.2

Conclusion

The results of this survey of computer science faculty members clearly indicate a number of common experiences from last spring and salient concerns about this fall. Among these are:

- The switch to online teaching was generally stressful for faculty (Table 12) and many are concerned about teaching online this fall, with respect to the impact on their workload, home lives, and the impact on their students (Table 17). Interestingly, faculty with 3-5 years of teaching experience reported somewhat less stress than those who were new to teaching (1-2 years) and those with 6+ years of teaching experience. Faculty members who had taught online before the pandemic also found the move relatively less stressful.
- Approximately three quarters of the respondents felt that the switch to online teaching significantly impacted their preferred teaching style and two thirds felt that it took much more time than regular teaching (Figure 1).
- Family obligations, mental health, lack of access to internet resources, and time zone differences were perceived as significant challenges for students (Table 10).
- More than half of respondents felt that the ability to watch course presentations asynchronously and, potentially, multiple times, was advantageous to their students (Table 11).
- Many faculty members would like to move away from synchronous online lectures in favor of pre-recorded content and more time in discussions and other interactions with their students (Table 15).
- Concerns among faculty for online teaching this fall include keeping students engaged and being aware of their academic and other challenges (Table 17).

We hope that the challenges that were confronted this past spring will provide our community with a level of experience that will make teaching this fall at least a bit less jarring. Nonetheless, it is clear that many challenges remain. Department and institutional leaders will need to remain mindful of the significant needs of their faculty and students.