Research Article

JMBE Journal of Microbiology & Biology Education

Reconnecting Students and Faculty to Maximize Academic Integrity and Minimize Student Stress in the Virtual Classroom

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The article documents faculty experiences with the shift online due to the pandemic and provides recommendations to science, technology, engineering, and mathematics (STEM) instructors. Over 100 faculty members were surveyed on these topics and contrasted with previously reported student experiences. The online shift changed how faculty administered exams, ran courses, and acted to ensure academic integrity. For example, when exams went online, 73% of faculty reported spending more time preventing cheating. Concerning academic integrity and stress, faculty and students agreed with the exception of a few notable disconnects. Students reported greater workloads in online classes, while faculty maintained that the shift online did not change student workloads. Students perceived more online cheating than faculty. Overall, there seems to be a significant disconnect regarding faculty not realizing how much their actions may encourage or discourage cheating. Few faculty (<15%) indicated that being a tough grader or having test times too short is a motivating factor, but over 55% of students reported that these motivate students to cheat. Conversely, over 60% of students reported respect for their professors discourages them from cheating, while only 37% of faculty indicated the same. Over 70% of faculty and students indicated that fear of getting caught is a deterrent to cheating. Recommendations to reconnect include (i) faculty should use the finding that the number one deterrent of cheating is fear of getting caught; and (ii) faculty should maintain students' respect by being clear or overestimating workload requirements, carefully adjusting time for online exams, and setting clear expectations with uncomplicated exam questions consistent with the material taught.

KEYWORDS academic integrity, exams, stress, virtual classroom, cheating

INTRODUCTION

At the time the coronavirus disease 2019 (COVID-19) pandemic moved classes online in Spring 2020, most professors only taught in-person and had limited training in teaching courses online (1, 2). The sudden shift from in-person to online teaching impacted the professors in multiple ways. For example, the transition meant that the practice of adjusting one's teaching midclass based on visual cues from students was limited as students now hid behind Zoom screens. Science, technology, engineering, and mathematics (STEM) faculty worried about the loss of connection with their students (3), the loss of student lab skills (4), how much stress this would cause their students, and the level of cheating during online exams (5). To examine faculty concerns, a survey regarding faculty experiences conducting online courses was administered at the same time as a previously published student survey (6). The authors have included faculty comments from open-ended questions in the survey to understand their perspective both in aggregate and individually. For example,

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The authors declare no conflict of interest.
Received: 5 June 2022, Accepted: 22 August 2022,
Published: 12 September 2022

one response exemplifies the frustration felt by many faculty, "virtual education, in my opinion, is worthless." Since online courses are here to stay, this study aims to examine the disconnect between faculty and students in online courses and make recommendations to ease some of the frustrations that faculty experience in their teaching.

Presently, at most colleges and universities, classes have returned to meeting in-person, but many students continue to fill up online courses first when they are offered or request that they be allowed to attend face-to-face courses online (7, 8) (https://www.anthology.com/paper/nationwide-student-survey-opportunities-to-grow-student-success-and-career-preparation). Throughout the pandemic, professors have continued to learn new skills and techniques to meet the changing needs of their students (9, 10), and these skills will continue to be needed as students request more online classes.

Previous research has documented a rise in cheating when the 2020 pivot to online learning occurred (11–13), including a Wiley survey of 789 faculty, 93% of whom indicated that students are more likely to cheat in a virtual environment (14). Cheating has proven to be easier during online exams than during in-person exams since it is more difficult to monitor students who may use their phones to contact other students, consult their text or notes, have someone else take the exam for them, or use online resources for help during the exam (15, 16). Respondents to our survey noted, "Course Hero, Chegg, and other sites that are similar - provide answers for [money] . . . As long as Chegg.com exists, it will be impossible to teach online." Faculty concerns regarding the methods students use have required them to continue to adjust their practices (17).

The aim of this study is to illuminate faculty awareness of cheating, the restrictions institutions put on faculty to prevent cheating, and the time faculty spend to prevent and detect cheating at five colleges and universities in New York. Our study further aims to identify the approaches faculty have taken to ensure a fair online classroom environment and maintain academic integrity from their students. Faculty responses are then compared with student responses to similar questions that were previously published (6). When this analysis reveals disconnects between the two groups, recommendations are made to reconnect professors with their students.

METHODS

Statement of ethics and disclosure

This project was declared exempt or expedited by the institutional review boards of all institutions involved in this study. The research complied with all relevant federal guidelines and institutional policies.

Survey design

Members of the $(STEM)^2$ Network from three senior colleges (Adelphi, Hofstra, and St. John's Universities) and two community colleges (Nassau Community College [NCC] of the State University of New York [SUNY] and Queensborough Community College [QCC] of the City University of New York [CUNY]) participated in this study (18). The two public community colleges in the study, QCC and NCC, could not require students to turn on cameras during class or examinations without an explicit pedagogical reason. This is in contrast with the three private 4-year colleges that encouraged faculty to require the use of cameras during class and exams.

We designed a survey to parallel the previously published student-centered survey on perceptions of stress and academic honesty during online examinations in STEM courses (6). The survey was developed from the authors' experiences with remote learning as well as from literature (https://www.gettysburg.edu/offices/academic-advising/honor-code/honor-code-data-archives/IntegritySurveyClassof2021.pdf, https://oir.umbc.edu/files/2013/04/UMBC-AI-Survey-Report-S2003.pdf, and https://provost.gsu.edu/document/florida-state-university-academic-integrity-survey-spring-2015/). The 16-question survey was offered through www.surveymonkey.com, which ensures anonymity. These questions were designed to (i) identify limited faculty demographics, (ii) acquire information on faculty awareness/perception of cheating and reasons why students may or may not be academically dishonest, and (iii) understand faculty perceptions regarding roadblocks to cheating during exams (whether they are effective to maintain academic honesty and whether they are stressful for students) and compare these with student responses.

The finalized www.surveymonkey.com link was sent to the chairs of the STEM departments at the participating institutions for distribution to the faculty. Links to the survey were emailed, and responses were accepted from May to August 2021 (Appendix 1). Only responses from faculty who affirmed that they were in a STEM department at one of the five participating institutions and reached the end of the survey were included in this study.

All statistical analyses were run in SPSS (19). Nonparametric analyses were used to analyze the categorical and ordinal data generated by the survey. Chi-square goodness of fit tests were used to test the hypothesis that differences existed between virtual and in-person modalities with respect to the workload assigned to students and time spent preventing or detecting cheating. Chi-square tests were used to test the hypothesis that 2-year and 4-year faculty differed with respect to modality preference (virtual versus in-person), awareness or detection of specific cheating methods, and perceived effectiveness of roadblocks to deter cheating. Fisher's exact tests were used to determine if 2-year and 4-year faculty differed with respect to the factors they perceived encouraged or discouraged student cheating. All tests were two tailed. A sequential Bonferroni-adjusted alpha was used in all instances with multiple comparisons.

TABLE 1
Faculty respondent demographics by discipline and institution (n = 107)

	Faculty respondents	
Discipline	**2-yr**	**4-yr**
Biology	32	21
Chemistry	13	12
Engineering	13	0
Mathematics	5	4
Physics	3	2
Computer science	2	0
Total	68	39

The percentages of students the faculty perceived to be cheating online versus in-person were not normally distributed and had unequal variances. Therefore, a related samples Wilcoxon signed-rank test was used to evaluate faculty perception of cheating prevalence on virtual relative to in-person exams. To explore differences in 2-year and 4-year faculty perceptions of cheating prevalence, a Mann-Whitney U test was used. The relationship between faculty perception of the percentage of students cheating and the number of cheating methods faculty caught students using was tested using Spearman's rank correlation.

RESULTS

Demographics

Over 100 STEM faculty (107) responded to the survey; 63.6% were faculty at 2-year colleges, and 36.4% were faculty at 4-year universities. The plurality of faculty were from Biology departments, but members of a variety of STEM disciplines took the survey (Table 1).

Virtual versus in-person

The majority of faculty reported assigning the same workload to students regardless of modality (72.9%; chi-square goodness of fit test: $N = 107$, $\chi^2 = 77.738$, degrees of freedom [df] = 2, $P < 0.001$) (Fig. 1). Faculty reported that students put forth more effort for in-person courses (59.8%) than for online courses (7.5%). A plurality of faculty perceived that students experience the same level of stress with either modality (45.8%). Of those who perceived a difference in student stress level, 36.4% indicated that online courses cause students more stress versus 17.8% for in-person courses. With regard to teaching preference, 67.0% of faculty preferred to teach in-person, 17.9% had no preference, and 15.1% preferred to teach online courses. There was no difference in modality preference between 2-year and 4-year faculty (chi-square: $N = 106$, $\chi^2 = 3.146$, df = 2, $P = 0.207$) (Fig. 1).

Perceived cheating and awareness/detection of cheating

Overall faculty reported that they spend significantly more time preventing or detecting cheating online than in-person (chi-square goodness of fit test: $N = 106$, $\chi^2 = 21.736$, df = 1, $P < 0.001$) (Fig. 2). Faculty from 2-year and 4-year schools showed no difference in time spent detecting cheating (chi-square: $N = 106$, $\chi^2 = 5.458$, df = 5, $P = 0.363$).

Overall, faculty perceived cheating to be more prevalent on virtual exams (33.5%) than on in-person exams (10.2%; related-samples Wilcoxon signed-rank test: $N = 102$, $T = 3837$, $P < 0.001$) (Fig. 3). Faculty at 2-year institutions perceived more cheating on virtual exams than faculty at 4-year institutions (Mann-Whitney U test: $U = 812.5$, $P = 0.005$) (Fig. 3). However, there was no significant difference between faculty at 2-year and 4-year institutions with respect to the perception of cheating during in-person exams (Mann-Whitney U test: $N = 102$, $U = 1{,}290.5$, $P = 0.598$) (Fig. 3).

Faculty were also surveyed to assess the level of personal awareness each faculty member had regarding five different methods of cheating (received unapproved help, looked up answers on the internet, used notes, had someone else take the exam, and lied about internet/technical issues). For four of the five methods of cheating that faculty were asked about, responses ranged from "not applicable in my course" to "have identified more than three students" that used this method. The only exception is that no faculty identified more than three students that had someone else take their exam for them, although several faculty identified at least one student doing this. Faculty at 2-year and 4-year institutions were aware of and detected similar levels of each of the five methods (chi-square tests: $N = 104$ to 107 [some respondents did not select a response for one or more methods], $P >$ sequential Bonferroni-adjusted alpha) (Fig. 4).

There was a positive correlation between the number of methods faculty caught students using and faculty perception of percentage of students cheating (Spearman's rank correlation: Spearman's rho = 0.250, $P = 0.01$) (Fig. 5).

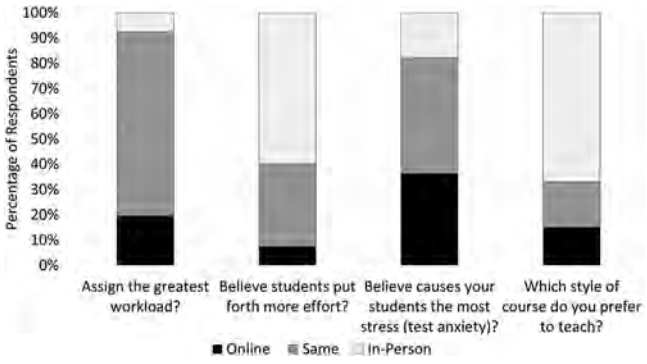

FIG 1. Percentage of all faculty respondents indicating which modality faculty assign students greatest workload, believe students put forth more effort, believe causes the most student stress, and personal preference teaching between online and in-person courses.

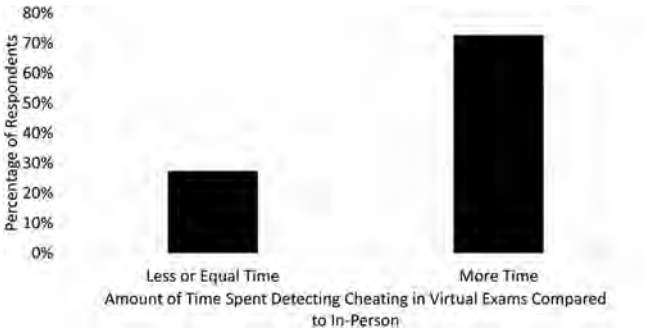

FIG 2. Percentage of faculty respondents that indicated spending less/equal time and more time detecting cheating in virtual exams than in online exams. Faculty could choose from the following responses: less time, equal time, 10% more time, 25% more time, 50% more time, and >50% more time.

Factors that encourage or discourage cheating

In order to address what motivates or inhibits academic dishonesty, faculty were queried as to which factors they perceived incentivize or disincentivize cheating. The two stand-out factors that faculty reported encourage students to cheat are to get a better grade (91.6%, $N = 107$) and because it is easy to do (72.9%, $N = 107$). Approximately 50% of faculty indicated that academic dishonesty is incentivized by students' perception that lots of other students are also engaged in cheating, and that students perceive that academic dishonesty saves time studying. Very few faculty identified exam time being too short (11.2%), the professor being perceived as a tough grader (13.1%), and students considering course material as not valuable (14%) as incentives to cheat. There were no differences in the frequencies with which 2-year versus 4-year faculty indicated that each factor encouraged student cheating (Fisher's exact tests: $N = 107$, all $P > 0.05$) (Fig. 6B).

Personal integrity (75.7%) and fear of getting caught (72%) were the most commonly cited factors that faculty deemed to discourage cheating, while the desire to learn the content (47.7%) and respect for the professor (37.4%) were the least commonly cited. There were no differences in the frequencies with which 2-year versus 4-year faculty indicated that each factor discouraged student cheating (Fisher's exact tests: $N = 107$, all $P > 0.05$) (Fig. 6A).

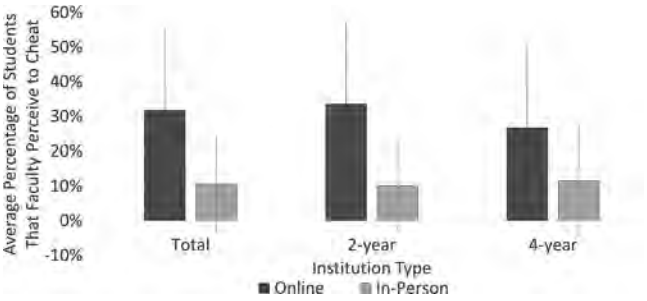

FIG 3. Average perceived cheating during online and in-person exams reported by all faculty, faculty at 2-year institutions, and faculty at 4-year institutions. Bars represent standard deviations, showing a large variance in respondents' answers.

Successful roadblocks to cheating

Faculty were asked whether they perceived each of 12 methods, or roadblocks, as deterring cheating on virtual exams across three broad categories: exam logistics (time limits, inability to backtrack, randomized question and answer delivery, and synchronous exams), exam question types (essay, oral, multiple choice, and short answer), and technology requirements (cameras on, lockdown browser, camera plus lockdown browser, and audio and video recording). Between 101 and 107 respondents selected a response (agree/disagree/neither agree nor disagree/never used) for 11 of the 12 potential roadblocks. An issue with survey delivery resulted in only 81 respondents selecting any response for the time limit roadblock. Of those respondents selecting a response, a subset indicated that they had never used that roadblock and were removed from the calculated percentages. When those indicating "never used" were removed, the total number of respondents ranged from 58 to 100 on each roadblock. There were no differences between 2-year and 4-year faculty for any roadblock regarding perceived effectiveness at deterring cheating (chi-square tests: all $P > 0.05$) (Fig. 7A to 9A). These questions were slightly different from related student questions because students were not asked whether they had encountered such roadblocks. Therefore, no student responses were removed as we have done here, and that may have affected the percentage of students who agreed to each (6).

Exam logistics. All four methods in this category were cited by greater than or equal to 70% of faculty as reducing the likelihood of students cheating on virtual exams. Randomized questions and answers was the most frequently cited exam logistic deterrent (85.6% agree, $N = 97$) (Fig. 7A). Faculty were nearly twice as likely to consider each of these effective roadblocks compared to students (6).

Question type. Respondents were most likely to indicate that oral exams (78%, $N = 59$) and essay questions (75%, $N = 88$) reduce the likelihood of cheating, while multiple-choice questions were perceived as least likely to reduce cheating (21.4%, $N = 98$) (Fig. 8A). Faculty were about twice as likely to indicate that oral, essay, and short-answer questions reduced cheating in comparison to students, although few students or faculty agreed that multiple-choice questions were effective roadblocks (6).

Technology requirements. Cameras in combination with lockdown browsers were most frequently indicated as technological requirements that would reduce the likelihood of cheating (67.2%, $N = 61$) (Fig. 9A). As expected at 4-year institutions, 21 faculty stated that they use cameras and a lockdown browser (in a separate question), and 21 4-year faculty stated that cameras with a lockdown browser are effective to deter cheating. Of particular interest, only 4

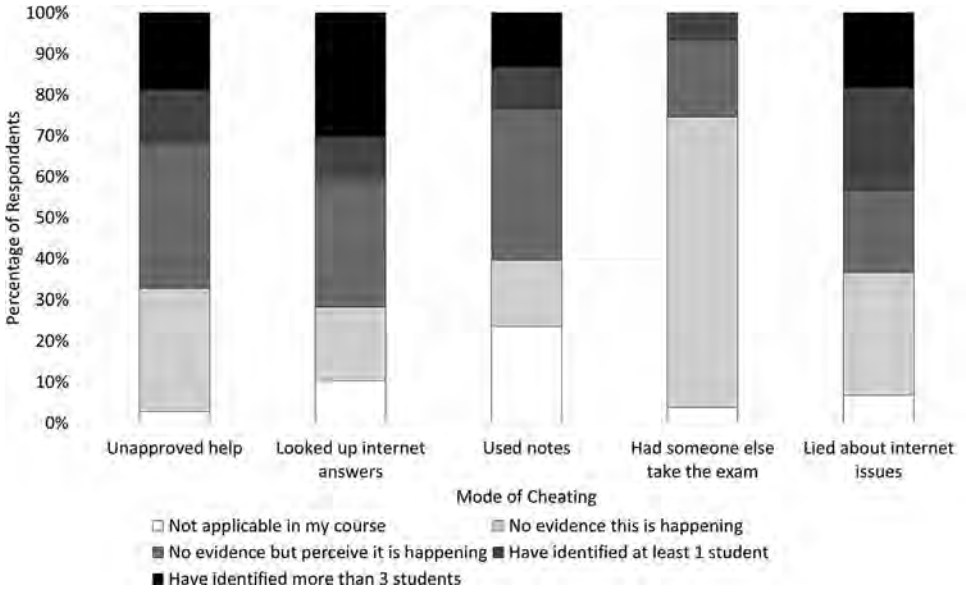

FIG 4. The percentage of faculty that have perceived or identified students cheating on their virtual exams via five different cheating methods. Respondents could only choose one response for each method.

faculty from 2-year colleges indicated that they use a lockdown browser even though 14 faculty from 2-year colleges indicated that using only a lockdown browser works to deter cheating (see Discussion).

Stressful roadblocks to cheating

Faculty were asked whether they perceived each of the 12 potential roadblocks as likely to cause stress for students. In addition, they were asked if they felt that having a visible timer caused students stress. Between 95 and 107 respondents selected a response to each of the 13 items, which ranged from 57 to 102 when "never used" responses were removed. There were no differences between faculty at 2-year and 4-year institutions (chi-square tests, all $P > 0.05$) (Fig. 7B to 9B).

Exam logistics. No backtracking was stated as causing the greatest amount of stress for students (78.7% agree, $N = 89$) along with time limits (71.4% agree, $N = 91$). Few faculty indicated that randomized questions (28.6% agree, $N = 98$) or synchronous exams (26.4% agree, $N = 102$) cause students stress (Fig. 7B).

Question type. Oral exams were most likely (71.4% agree, $N = 63$) and multiple-choice exams were least likely (13% agree, $N = 100$) to be identified as causing students stress (Fig. 8B).

Technology requirements. Similar proportions of faculty agreed that cameras (45.6% agree, $N = 68$) and lockdown browsers (46.6% agree, $N = 58$) cause students stress. A larger proportion of faculty perceived simultaneous use of cameras and lockdown browsers as stressful for students (64.9% agree, $N = 57$), on par with being audio and video recorded (63.3% agree, $N = 60$). Notably, more than 45% of faculty that use each method sensed that each technological method likely causes students stress (Fig. 9B).

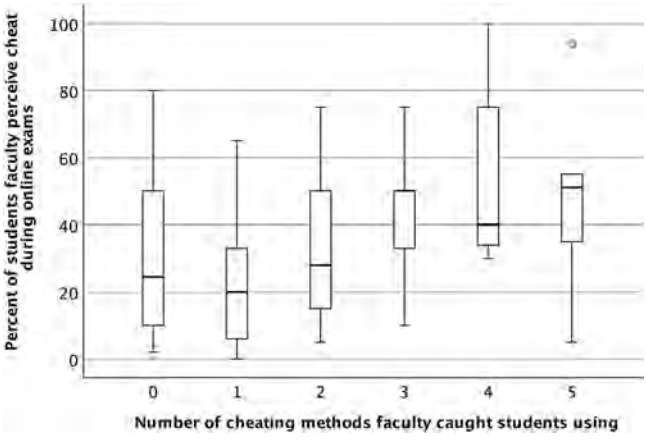

FIG 5. Box plot of the number of methods faculty caught students cheating with (as indicated by respondents stating either "identified at least one student doing this" or "have identified more than three students") versus the percentage of students the faculty perceived to cheat during online exams.

DISCUSSION

The responses from the faculty survey highlight several points of commonality but also several points of disconnect with students. Below, faculty responses and previously published student perspectives are compared and contrasted with a goal to reconnect faculty and students. While one of the salient factors that helped explain responses from the student survey was whether students attended 2-year or 4-year schools, in the present study, the more relevant factor is how restricted faculty were in the technology they can

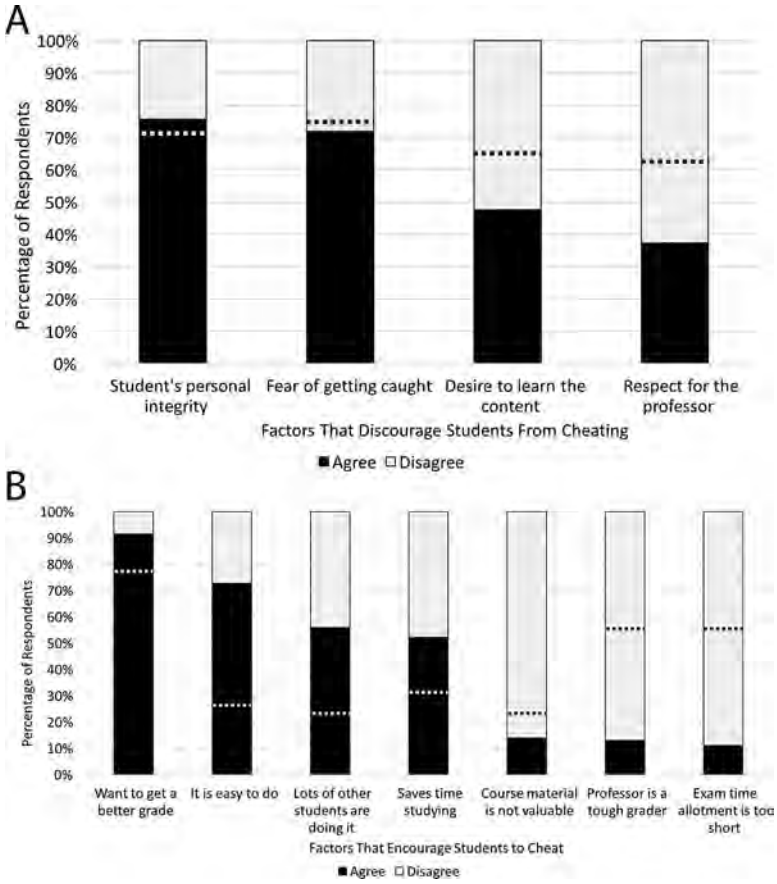

FIG 6. (A and B) Percentage of faculty that agree that each factor will discourage (A) or encourage (B) cheating in descending order. Respondents were only able to select "agree" or "disagree" for each factor provided. The dotted line represents the percentage of students who agreed to each factor (6).

use. These distinctions cut along exactly the same lines, but significantly, public SUNY and CUNY schools do not allow faculty to require cameras during exams, a previously described effective roadblock to cheating (6). One professor from a 2-year school summed up this disparity stating, "A few of the students who have been caught cheating confessed to being on a WhatsApp class group during exam time. I don't know how to stop that."

Virtual versus in-person

Largely, faculty and students agree that students put forth more effort when courses are in-person. However, there is a disconnect seen with the overwhelming majority of faculty (72.9%) (Fig. 1) that believe they assign the same workload regardless of modality, because, as previously reported, significantly more students reported that online classes have greater workloads than in-person classes (50.2%) (6). This could be because faculty do not recognize the difficulty some students have when trying to work and study for their online courses. Or it could be that faculty give classwork in-person that students do during class, but when students are online, they make it an assignment that needs to be turned in. Faculty may also try to weight their courses differently with online modalities so that tests do not count for as much of their grades, like the professor that stated, "I have added other assessments to replace the role of exams."

While faculty were not asked about their previous online teaching experiences, previous studies indicated that less than half of faculty had taught online or hybrid courses before the pandemic (20). Interestingly, 15.1% of faculty in our survey indicated that they prefer to teach online courses (Fig. 1). After returning to in-person classes at their respective campuses, the authors noted that some colleagues had come to like what has been termed "Set it and forget it" with regard to running their online courses. With videos recorded and assignments and exams programmed into their online platforms, some professors did not need to put in nearly as much time and effort into their courses. While this is likely a minority of faculty, we encourage faculty and department heads to caution against this. "Set it and forget it" makes the course only about content and removes the inspirational nature of the course. Furthermore, students can tell when faculty put a lot or a little effort into a course, and they mirror that effort (21).

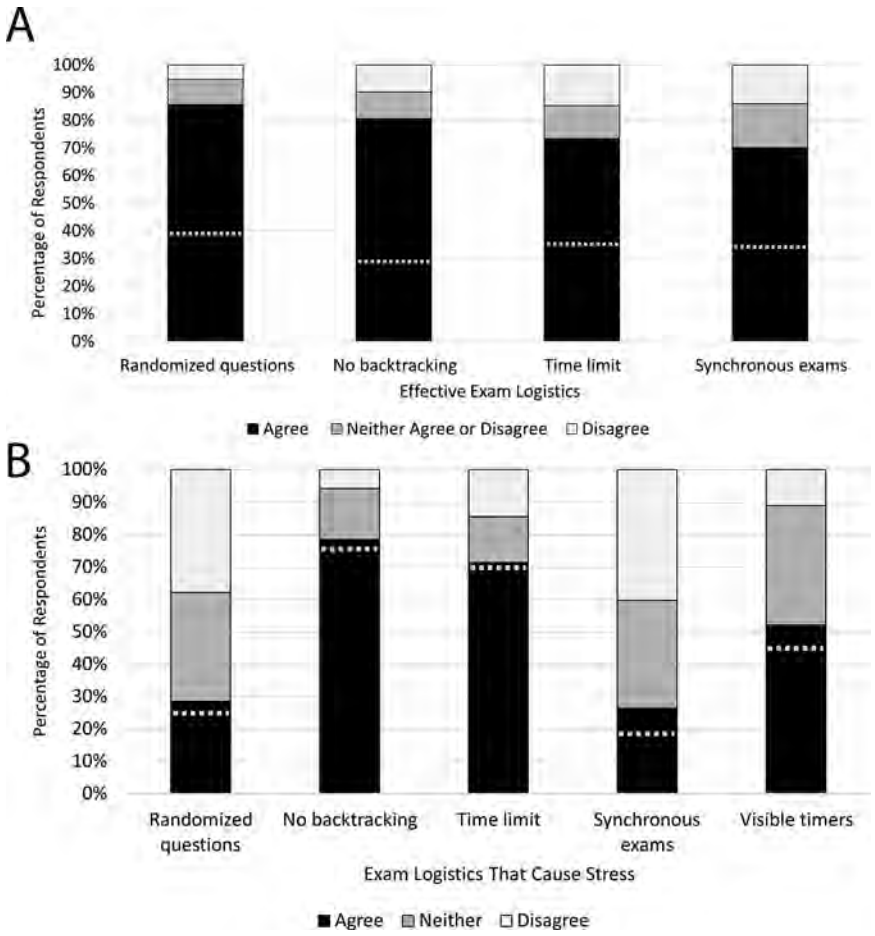

FIG 7. (A and B) Percentage of faculty that reported each exam logistic as a deterrent (A) or that the faculty perceived it to cause stress (B). The dotted line indicates the percentage of students who agreed for each roadblock (6).

Perceived cheating and awareness/detection of cheating

Methods to prevent cheating for in-person classes are likely so ingrained from decades of use that faculty rarely put effort into developing new methods to prevent in-person cheating. However, the online environment presents new challenges that need to be addressed in novel ways. To that end, 73% of surveyed faculty reported that they needed to put in more time and effort, up to 50% or more, to prevent cheating in online exams (Fig. 2).

While faculty appear in-line with students' views that more cheating occurs online than in in-person courses, the scope of cheating is perceived to be much greater according to students than according to faculty (50.2% versus 31.7%) (Fig. 3) (6). It seems logical that a perception of more of their peers cheating would motivate more students to cheat, as 56.1% of faculty said it is a significant motivator to cheat (Fig. 6B). However, students by and large reject this notion, with only 27.0% stating that other people cheating motivates students to cheat, the least likely factor to encourage students to cheat (6).

The student survey also revealed that the more methods of cheating students were aware of their peers doing, the more students perceived that their peers cheat online. In a similar manner, the more methods faculty caught individual students cheating with, the more they reported a perception that more students overall are cheating (Fig. 5). Interestingly, that does not explain the significant difference between levels of cheating perceived by faculty at 2-year (33.6%) and 4-year (26.7%) schools, as there is no statistical difference in the number of students caught cheating by 2-year versus 4-year faculty (chi-square: $N = 107$ $\chi^2 = 15.386$, df = 13, $P = 0.284$) (Fig. 3). It could be that faculty are likely to either find it harder to detect cheating when more roadblocks are in place or have less cheating when more roadblocks are in place. It is likely that 4-year schools use more roadblocks or more effective roadblocks with the technology they have access to, but this was not measured in this survey. Certainly, the hope of many faculty is "If it is more difficult to cheat, many students won't try."

One important confounding factor in determining the real levels of cheating is the number of faculty who, for a variety of reasons, do not attempt to catch students cheating (22). One very forthright professor wrote, "Catching a student cheat is very upsetting for me and I, unfortunately, take it very personally.

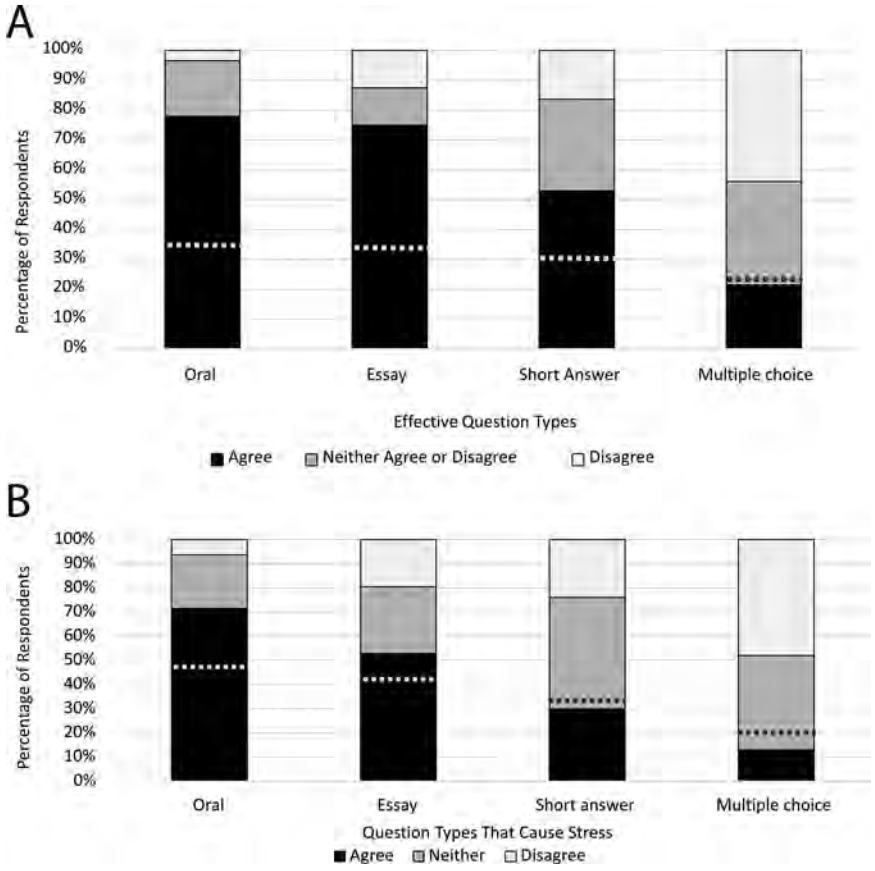

FIG 8. (A and B) Percentage of faculty that reported each question type as a deterrent (A) or that the faculty perceived it to cause stress (B). The dotted line indicates the percentage of students who agreed for each roadblock (6).

That is why I put in a lot of effort to make it difficult for my students to cheat but don't try to catch them."

Factors that encourage or discourage cheating

The factors that encourage cheating can broadly be grouped into two categories: student inspired and faculty inspired. Factors that encourage cheating that are student inspired are the student wants a better grade, the student wants to save time studying, lots of other students are doing it, and it is easy to do. Each of these factors received affirmative responses from over half of faculty who took the survey (Fig. 6B). However, other factors may be considered faculty inspired if they are part of the course structure or exam setup. They likely do not believe they are a tough grader, that their exam times are too short, or that their course material is not valuable, or even if they do, they may not realize that these factors encourage cheating. For example, exams that require a lot of calculations may be very time consuming for students due to the difficulty of online exam interfaces. These were all reported as factors that encourage cheating by less than 15% of faculty (Fig. 6B). The disconnect is that over 55% of students reported that "professor is a tough grader" and "test time is too short" encourage students to cheat (6).

Regarding the factors that discourage cheating, faculty only disconnected with students with a surprisingly low percentage of faculty realizing that respect for the professor is a significant factor for over 60% of students (6), but only 37.4% of faculty likewise responded (Fig. 6A). In short, the biggest disconnect regarding motivations is that faculty do not realize their level of influence and that their actions can encourage or discourage cheating. One faculty member that recognizes the role that professors can play in affecting student perception regarding cheating stated, "These are students who typically want to do good, and in the right way, but feel that they have little choice due to the perceived workload." Still, another professor explains, "by asking a large number of questions within a shorter block of time. There is no time to look up anything!" While this may discourage students from cheating, it may have the exact opposite effect.

It might be worth noting that over 70% of faculty and students indicated that fear of getting caught is a deterrent to cheating (Fig. 6A) (6). If faculty capitalize on this motivation by bringing it to the forefront of students' minds, it may make more students shy away from attempting to cheat.

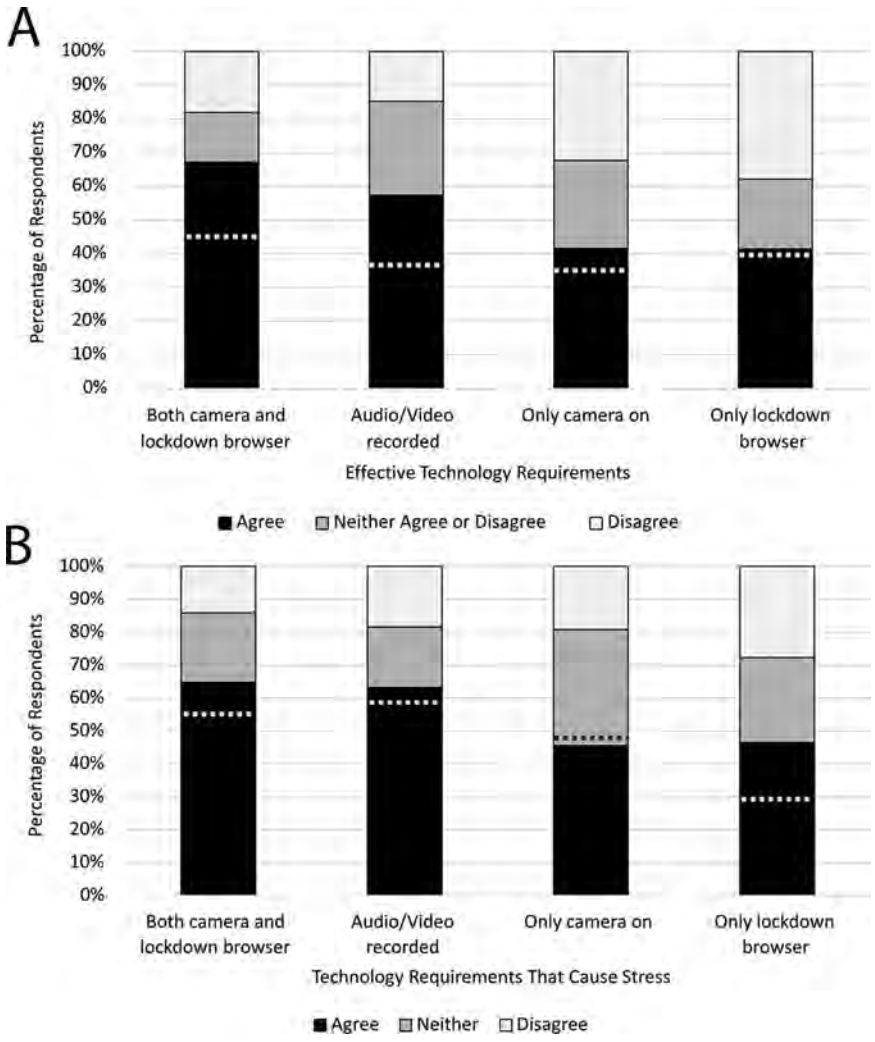

FIG 9. (A and B) Percentage of faculty that reported each technology requirement as a deterrent (A) or that the faculty perceived it to cause stress (B). The dotted line indicates the percentage of students who agreed for each roadblock (6).

Successful and stressful roadblocks to cheating

All faculty who took the survey tried multiple types of roadblocks to decrease the likelihood that students will cheat to various degrees of success. Regardless of methods used, the virtual environment cannot recreate the classroom experience faculty have honed for years prior to being forced online. However, methods that most closely reproduce invigilated in-person exams, from our previous student survey, are most likely to discourage students from cheating (6). In other words, timed, synchronous exams with students being watched (live or recorded) and not being able to access the internet are most effective at stopping cheating. Two roadblocks that appear to be effective that are less likely in classroom settings are randomized questions and no backtracking. Randomized questions can either be a random order for questions delivered to students or questions randomly selected from a question pool (set of questions of equivalent difficulty on the same topic). Nearly double the percentage of faculty reported that no backtracking, randomized questions, time limits, and synchronized exams are effective roadblocks (Fig. 7A) in comparison to students (6).

Faculty by and large agree with the sentiments expressed by students regarding what roadblocks cause students stress (Fig. 7 and 9). Namely, a large percentage of faculty recognized that no backtracking was most stressful for students and that timed tests are also very stressful (Fig. 7B). In spite of acknowledging that some of these methods cause students stress, some faculty continue to use such methods to do the best they can to limit cheating.

Nearly twice the percentage of faculty compared with students also reported that essay, oral, and short-answer exam questions are effective roadblocks (Fig. 8A) (6). One professor enthusiastically reported, "I am strongly of the opinion that oral examinations are a huge solution to this problem [of online cheating]." Another professor stated, "My preferred method to prevent cheating is to ask essay

questions that require thought for the answer (not just spitting back an answer)."

Through personal communications, the authors gained insight into why there are many more 2-year faculty that indicated that a lockdown browser works than those that reported personally using lockdown browsers in their courses. This discrepancy likely arises due to the hoops faculty have to jump through to be approved to use lockdown browsers, including being required to have a notification to students in their syllabus and the technical difficulties students have when their computers are not compatible with the software. For example, Respondus Lockdown Browser does not work on Chromebooks. One professor wrote, "my experience has been that lockdown browsers are effective, but also cause a lot of anxiety due to their spotty nature and wildly diverse effects on students' computers. Given the technical difficulties my students have experienced, I abandoned the lockdown browser." Some schools get around such technical limitations by offering to loan students computers for a day or semester depending on need. One professor at such a school wrote, "without Respondus or lockdown browser I do not have a way to monitor students when they are taking an exam." However, one faculty member cautioned, "You *MUST* require students' hands and faces to be *in camera* at all times, otherwise lockdown apps are meaningless." And still another 2-year faculty member lamented, "[our school] does not have the software [another school] has, to monitor them more closely while they are taking exams."

Clearly, these new technologies engender a lot of opinions, as they have not been completely optimized. In the free response section of the survey, one faculty member cited a *New Yorker Magazine* article (23) stating, "Lockdown browsers will either be ineffective or will cause undue stress and perpetuate systemic inequities in education." In spite of these difficulties, a slightly higher percentage of faculty than students reported that each technology is effective at preventing cheating (Fig. 9A) (6). Of particular note, regardless of the differences in technology available to 2-year and 4-year faculty, over 70% of each reported that one factor that they agree encourages students to cheat is that it is easy to do (Fig. 6B). In other words, having more technology available to a faculty member does not seem to diminish the belief that cheating is easy for students on virtual exams.

New technologies can also be used to, as Kahn et al. suggests, gamify (e.g., using Kahoot!) or personalize assessments (possibly using digital storybooks). They further suggest changing from knowledge reproduction questions to questions that require students to apply knowledge in a new context (24). At the very least, since most faculty now know that students can search for exam questions (because publisher-provided question databases are frequently posted online), minor edits to make questions unsearchable may stymie attempts to search for online answers.

Conclusions

Disconnects. Many faculty members have forgotten what it is like to be a college student, and many feel that "students don't see us as humans, but rather they see us as robots that should be perfect." College students look up to their professors as experts in their fields and, as previously reported, do not cheat because they respect their professors (6). The following are disconnects between faculty and students that we observed. Disconnect 1: whether real or in the minds of students, students perceive more cheating than faculty. Disconnect 2: faculty do not realize how much they are respected based on their positions as faculty, which is a factor in discouraging students from cheating. Disconnect 2a: faculty do not recognize the difficulty some students have when trying to work and study for their online courses and that students perceive that they have an increased workload in online classes. Faculty do not recognize that students feel encouraged to cheat by short exam times (disconnect 2b) and by their professor being a tough grader (disconnect 2c).

Our recommendations for reconnection. Reconnect 1: faculty should foster a healthy fear of getting caught by being upfront and letting students know that they use methods to actively deter cheating and what the penalties will be if students are caught cheating. Reconnect 2: faculty should be careful not to lose their students' respect by being mindful of the level of work they assign in online classes and how students perceive their levels of work (reconnect 2a). Make students aware early on what the level of work is likely to be in a course and even overestimate this, so if less work is given, the faculty member appears as generous rather than overburdening if the opposite occurs. Reconnect 2b: give more time for online exams or remove a few questions so students do not feel that exam lengths are unfair and affect their grades. Shorter and more frequent exams that are each lower stake may be a better alternative. Reconnect 2c: set clear expectations for what students should know on exams and clear question instructions so that they know how to properly answer. Double check that assessments are in-line with learning objectives and materials presented to students. Survey students to see if what is on each exam was what they expected to be on the exam.

Final thoughts

There is no universal answer to stopping cheating in online courses. Some techniques work for some students and not for other students. One professor pointed out that, "for example, some students have told me that seeing a timer is stressful, but others have said that not seeing the timer is stressful." In a similar manner, one author noted that some students told them that they perform better on exams that require no backtracking because they make mistakes when they go back and change their answers.

The world of online teaching is new for many faculty and students alike. Continuing to ask your students for feedback and optimizing your own courses is the surest way to a better learning experience.

Limitations

With a sample size of only 107, some statistical analyses did not find significance. Also, there were no public 4-year or private 2-year institutions included in our study. We recognize that faculty respondents come from a variety of backgrounds with various levels of e-learning, which was not evaluated in our survey. Furthermore, some faculty have never used some roadblocks and therefore could not provide opinions on those methods. Survey responses are perceptions of respondents and may not reflect actual circumstances.

SUPPLEMENTAL MATERIAL

Supplemental material is available online only.

SUPPLEMENTAL FILE 1, PDF file, 0.2 MB.

ACKNOWLEDGMENTS

This work was conducted as part of a $(STEM)^2$ Network Working Group. We thank Michael Dores, Kevin Kolack, Alison Hyslop, Emily Kang, Jiyun Kim, and Amanda Turner for comments and suggestions. We thank our colleagues who helped distribute the survey link to their departments. Most importantly, we thank the faculty for providing their candid responses.

This report is based on work supported by the National Science Foundation under grant number 1919614. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

We have no conflicts of interest to declare.

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