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EDUCATION RESEARCH

Flipped teaching transition to online teaching by STEM educators during the COVID-19 pandemic

Chaya Gopalan,[1,2] Charles Serrano,[2] Paige Dickey,[2] Sheyenne Daughrity,[3] Elizabeth Hackmann,[5] Georgia Bracey,[4] Lynn Bartels,[5] Julie Fickas,[6] Sharon Locke,[4] and Carolyn Butts-Wilmsmeyer[7]

[1]*Department of Applied Health, Southern Illinois University Edwardsville, Edwardsville, Illinois;* [2]*Department of Nurse Anesthesiology, Southern Illinois University Edwardsville, Edwardsville, Illinois;* [3]*Department of Biology, Southern Illinois University Edwardsville, Edwardsville, Illinois;* [4]*Center for STEM Research, Education, & Outreach, Southern Illinois University Edwardsville, Edwardsville, Illinois;* [5]*Department of Psychology, Southern Illinois University Edwardsville, Edwardsville, Illinois;* [6]*St. Louis Community College, Forest Park Campus, St. Louis, Missouri; and* [7]*Center for Predictive Analytics, Southern Illinois University Edwardsville, Edwardsville, Illinois*

Abstract

COVID-19 necessitated online teaching (OT) during the second half of the spring 2020 semester. The perceptions of science, technology, engineering, and math (STEM) faculty of OT at a two-year (2-YI) and a four-year (4-YI) institution were examined during this sudden switchover. One group of educators had received flipped teaching (FT) training (FTEs, n = 23), whereas the other group was practicing traditional teaching (TTEs, n = 18). There were two cohorts of FTEs: *cohort 1* were implementing FT for the third time in their classrooms, and *cohort 2* had started for the first time. The survey results suggested that FTEs were more confident with OT than TTEs ($P < 0.05$). It was interesting to note that 62.5% of the FTEs, whether they were from *cohort 1* or *cohort 2*, chose an asynchronous approach, whereas 37.5% delivered synchronous OT during the sudden transition. It was found that FT experience helped *cohort 1* adjust to OT compared with *cohort 2*. Overall, these results suggest that FTEs were confident and their resources for FT eased the transition to OT.

NEW & NOTEWORTHY COVID-19 necessitated online teaching (OT). The perceptions of STEM faculty of OT at two-year and four-year institutions were examined. One group had received flipped teaching (FT) training (FTEs), whereas the others practiced traditional teaching (TTEs). Among two cohorts of FTEs, *cohort 1* had been practicing FT but not *cohort 2*. FTEs were more confident with OT than TTEs. FT experience helped *cohort 1* adjust to OT more than *cohort 2*. Overall, FT eased the transition to OT.

COVID-19 pandemic; flipped teaching; online teaching; traditional teaching

INTRODUCTION

More than 1.5 billion students in over 180 countries worldwide have been subjected to school closure since COVID-19 (1). Rather than completely withdrawing students' access to education, universities transitioned to online teaching (OT; Refs. 2–5).

Although a remarkable technological improvement has increased students' access to remote learning, the transition to an exclusively virtual format because of COVID-19 has been challenging (2, 5). In the frenzy to quickly adapt to OT, most educators opted for the asynchronous approach, where the course content is made available for the students to learn at their own pace, versus synchronous OT, in which faculty interact with students remotely at regularly scheduled times.

Traditional teaching (TT) involves a heavy reliance on lecturing, in which the students passively consume the information provided by the instructor, with minimal to no active participation, leaving students on their own to acquire a deeper understanding of the content (6–8). By contrast, flipped teaching (FT) is an instructional strategy that shifts lectures out of the classroom, allowing class time to be a student-centered active learning opportunity (9). FT reverses the conventional order of homework and classwork, allowing students to practice lower-order thinking skills, such as memorization and comprehension, before their scheduled session (10, 11). During the synchronous virtual FT course, students are more engaged in applying their foundational knowledge to learn the content at a deeper level while interacting with peers and their instructor (11–15). Newer literature is emerging on the effectiveness of FT in engaging students during times of calamity (16, 17).

Although online courses were taken by those working full time in the past, more students have been opting for this

Correspondence: C. Gopalan (cgopala@siue.edu).
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modality, and therefore the number has been steadily increasing (18). There are many reasons to choose remote learning, including balancing work, family, and higher education (19) The nature of OT was predominantly of an asynchronous form before COVID-19, and many faculty had minimal or no experience with OT (19). Whether the educators were prepared or not, higher education institutions were forced to switch to a virtual mode because of COVID-19.

This study examined the perceptions of transitioning of science, technology, engineering, and math (STEM) faculty to online instruction from the flipped classroom by two cohorts, faculty expanding FT skills and novice FT faculty, from two institutions: a public four-year institution (4-YI) and a two-year community college (2-YI).The objective of the study was to learn whether the experience with FT was significant in the transition to a completely OT environment and to evaluate the OT method the participants chose, such as asynchronous or synchronous. In addition, we compared the adaptation to OT by the 2-YI versus the 4-YI and the two cohorts. It was anticipated that flipped teaching educators (FTEs), who received training in FT, would experience an easier transition to OT than the traditional teaching educators (TTEs), especially since the preclass FT preparation is similar to the asynchronous OT format (20). It was also hypothesized that most faculty would choose asynchronous versus synchronous teaching approaches to avoid coordinating schedule constraints given the sudden disruption of their standard instructional practices.

METHODS

Study Participants

This study focused on two STEM faculty groups from two institutions who were challenged by the unanticipated COVID-19 quandary. The first group consisted of the TTEs (n = 18), who practiced the traditional lecture style of teaching, whereas the second group, the FTEs (n = 23), had previously received training in FT. The training provided participants with the tools, expert guidance, and opportunities to prepare for their FT implementation. The participants were expected to develop their FT courses by the end of the training period and implement them in their targeted courses. This study was approved by the Institutional Research Board of Southern Illinois University Edwardsville (Protocol No. 35).

Among the FTEs there were two subgroups, *cohort 1*, who had been practicing FT for over a year (n = 12), and *cohort 2*, who had started implementing FT in their classrooms for the first time in the 2020 spring semester (n = 11). Each cohort had six faculty members from a 4-YI and six from a 2-YI. Among participants in *cohort 2*, one was on family medical leave and could not engage in the study (n = 23).

Participant Recruitment

Flipped teaching educators were recruited through an application-based selection process as part of a project that was funded by the National Science Foundation (NSF) (ID No. 1821664). Traditional teaching educators were recruited on a voluntary basis to match the FT courses as closely as possible. The STEM participants represented mechanical engineering, calculus and precalculus, biology, chemistry, biotechnology, and physics courses.

Study Design and Data Collection

An anonymous online survey was designed with Qualtrics, a commercial survey platform, to evaluate the experiences of FTEs and TTEs while transitioning to OT during the first few weeks of COVID-19. A triangulation mixed-method design was applied in collecting quantitative and qualitative data (21). The research team created the survey questions to generate meaningful responses from the participants. The content validity and relevance to our participants were strengthened through discussions with faculty experts in psychology and STEM, who guided the team in making several revisions to the instrument.

The closed-ended questions targeted the type of institution the participants taught at (2-YI or 4-YI), their STEM course(s), their experience with fully online instruction before COVID-19 (1 = no experience; 2 = some experience; 3 = extensive experience), the online format they used during COVID-19 (synchronous or asynchronous), and their confidence level with OT (1 = not confident at all; 2 = not confident; 3 = neutral; 4 = confident; 5= very confident).

The open-ended questions were designed to collect *1*) participants' experience in switching suddenly to the OT format, *2*) whether they had prior OT experience or not, *3*) the practical aspects during COVID-19, and *4*) any challenges they faced when moving lecture class to the online format. An additional four questions were used for the FTEs to obtain specific FT details: *1*) development of instructional video, *2*) development of preclass activities and assessments, *3*) development of in-class activity and student engagement, and *4*) strategies utilized in flipped teaching (5 = very useful; 4 = useful; 3 = neutral; 2 = not useful; 1 = not useful at all).

Data Analysis

The quantitative data analysis consisted of descriptive and inferential statistics, and qualitative data were analyzed with basic thematic coding techniques (22). For the quantitative data analysis, the interest was whether the participants' perceptions varied between teaching methods such as asynchronous or synchronous, 2-YI and 4-YI, *cohorts 1* and *2*, and TTEs and FTEs.

Open-ended survey responses from the TTEs and the FTEs were analyzed by four members with NVivo, a qualitative data analysis software package. First, each researcher independently examined the responses, looking for words and phrases related to the research aims—adaptations made, FT structure utilized, and FT components chosen—and creating an initial list of codes. The researchers then met to share their lists and examined and discussed emerging meanings and patterns. Over several meetings, the initial codes were categorized and merged to create one set of themes, with the researchers reaching a consensus on names, definitions, and examples. These themes were then used as a guide to recode the survey responses independently. Researchers again met to discuss and agree on the analysis, ensuring that the emerging themes were meaningful and captured as much data as possible.

Statistical Analysis

The survey responses were compiled for each question and were compared by using a one-way ANOVA to determine the positive FT component. The impact of all possible explanatory variables was examined by a two-tailed Wilcoxon rank-sum test, also known as a Mann–Whitney test, with SAS Analytics Software version 9.4. To better understand the strategies of the FT method that were beneficial during the transition to OT, FTEs were surveyed on the significance of FT resources. The survey responses were compiled for each question and compared by using a one-way ANOVA to determine the FT component that was beneficial. The results are reported as the mean and standard deviation.

RESULTS

Quantitative Data Analysis of TTE and FTE

Coincidentally, the FTEs reportedly had more experience with OT than their TTE counterparts (Fig. 1). The TTEs' survey responses indicated that 22% (n = 4) had extensive, 33% (n = 6) had some, and 45% (n = 8) had no experience teaching a course entirely online. Conversely, 36% (n = 8) of FTEs had extensive, 41% (n = 9) had some, and 23% (n = 5) had no OT experience. On the other hand, the TTEs and FTEs showed similar proportions in choosing the synchronous course delivery format versus the asynchronous method. As illustrated in Fig. 2, 39% (n = 7) of the TTEs opted for the synchronous teaching method and 61% (n = 11) modified their course to an asynchronous delivery. Among the FTEs, 36% (n = 8) opted for the synchronous format and 64% (n = 14) gravitated toward the asynchronous instruction mode.

As shown in Fig. 3, among the TTEs 12% (n = 2) were very confident, 47% (n = 8) felt confident, 23% (n = 4) were neutral, and 18% (n = 3) were not confident. Conversely, FTEs (4.09 ± 0.61) reported being confident in their ability to transition their courses from the face-to-face to online format compared with TTEs (3.5 ± 0.92; $P < 0.05$); 24% (n = 5) of the FTEs felt very confident, 67% (n = 14) were confident, 9% (n = 2) were neutral, and none (n = 0) felt not confident.

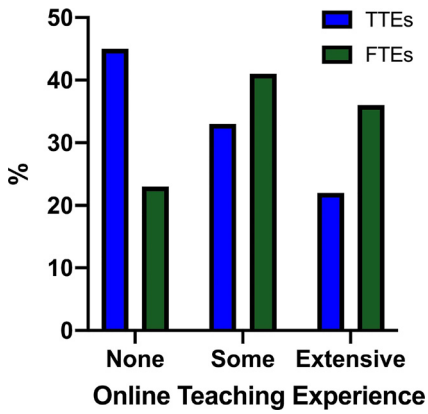

Figure 1. The online teaching experience level of traditional teaching educators (TTEs) vs. flipped teaching educators (FTEs).

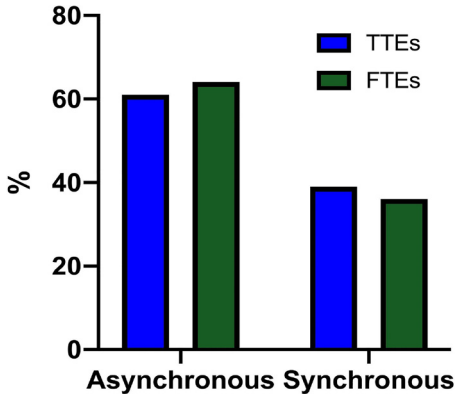

Figure 2. Course format chosen by the traditional teaching educators (TTEs) and flipped teaching educators (FTEs).

Quantitative Data Analysis of *Cohort 1* and *Cohort 2*

Table 1 summarizes the analysis of the survey data related to the FT resources during OT between the two cohorts, the two institutions, and the synchronous and asynchronous formats. Although both 2-YI and 4-YI faculty benefited from the preclass content during their transition to OT, 2-YI faculty (4.75 ± 0.45) rated the benefits more significant than their counterparts at the 4-YI (4.36 ± 0.5).

The instructional materials (4.48 ± 0.66), preclass assignments and assessments (4.56 ± 0.51), and overall FT knowledge (4.48 ± 0.51) were significantly different compared with the in-class activities [3.95 ± 0.84; $F(3,87) = 4.188$ ($P < 0.01$)], as shown in Fig. 4.

Two-Year vs. Four-Year Institutions

Overall, the confidence level with online teaching was similar in both cohorts (P = 0.65 for *cohort 1* and P = 0.40 for *cohort 2*). Faculty from both institutions found the resources such as lecture videos and in-class exercises useful (P = 0.60 and P = 0.26, respectively). Likewise, strategies for FT were viewed equally favorably at both types of institutions (P = 0.86). This was also true for the preclass FT resources among faculty at 2-YI and 4-YI (P = 0.09). Faculty at the 2-YI in the study were more likely to rate the preclass resources higher (4.75 ± 0.45) than faculty at the 4-YI (4.36 ± 0.5).

Qualitative Data

TTEs vs. FTEs.

There were six themes that were in the positive category and nine that were considered challenges. The positive responses

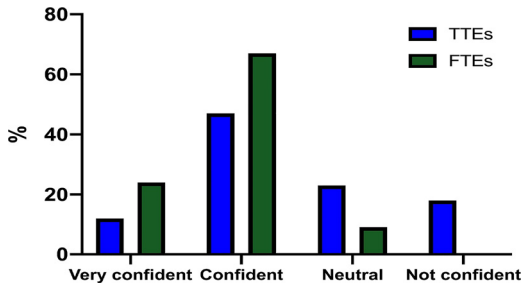

Figure 3. Self-confidence in online teaching of traditional teaching educators (TTEs) vs. flipped teaching educators (FTEs).

Table 1. *The survey data on FT resources used during the sudden switchover to online teaching*

	Instructional Materials*	Development of Preclass Activities and Assessments*	Development of In-Class Activity and Student Engagement	Overall FT Knowledge
		Educational institution		
4-YI	4.55 + 0.69	4.36 + 0.50	4.18 + 0.75	4.45 + 0.52
2-YI	4.42 + 0.67	4.75 + 0.45	3.73 + 0.90	4.50 + 0.52
		Format		
Asynchronous	4.47 + 0.64	4.53 + 0.52	4.00 + 0.68	4.47 + 0.52
Synchronous	4.50 + 0.76	4.63 + 0.52	3.88 + 1.31	4.50 + 0.53
		Cohort		
1	4.57 + 0.51	4.64 + 0.50	4.00 + 0.82	4.64 + 0.50
2	4.33 + 0.87	4.44 + 0.53	3.89 + 0.93	4.22 + 0.44

FT, flipped teaching; 2-YI, 2-year institution; 4-YI, 4-year institution. *$P < 0.05$, Wilcoxon rank-sum (also known as Mann–Whitney) test.

noted were student peer support, synchronous class meetings, group work, adjusting to the online format, online teaching transition, and educational technology. On the other hand, the challenges noted were virtual laboratories, communication, student engagement, adjusting to the online format, faculty-student interaction, synchronous group work, online assessment, time commitment, and educational technology (Table 2).

Asynchronous vs. synchronous OT.

On the other hand, when the synchronous and asynchronous OT by the TTEs were compared, the positive responses to the asynchronous modality consisted of having weekly contact with students, creating lecture videos, and having flexibility and being familiar with learning management software. The negative responses focused on the lack of student adjustments, the challenging transition to OT by faculty, technological accessibility to technology, working with newer technology, time-consuming preparation, faculty-student communication, and unreadiness of faculty. The synchronous positive response themes were the smooth transition, lecture videos, familiarity with instructional technology, and student engagement. Contrarily, the negative responses to the synchronous portions were centered around conducting examinations, student engagements, and hands-on laboratories (Table 3).

Comparing the asynchronous versus synchronous OT by the FTEs, the asynchronous positive responses included

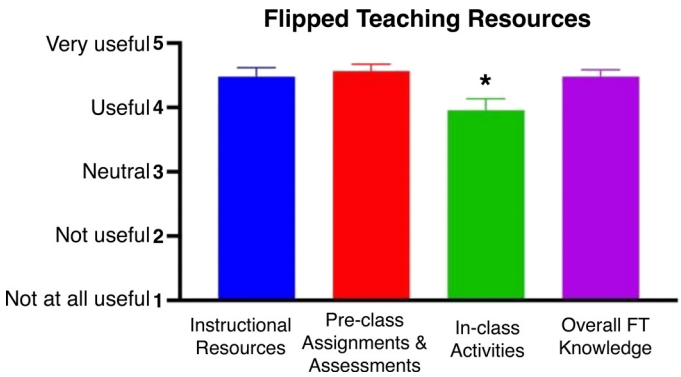

Figure 4. The effectiveness of flipped teaching (FT) strategies during online teaching (OT) by the flipped teaching educators (FTEs). Values are means ± SD. *$P < 0.05$, 1-way ANOVA.

themes of experiencing a smooth transition, students, educational technology, and the overall methods that have been working well in the OT courses. Additionally, the combination of FT components and preclass materials was helpful in the transition to OT. In contrast, the negative asynchronous responses consisted of difficulty working with newer technology, experiencing a difficult transition, student engagement, laboratories, activities, and time. Furthermore, the positive synchronous responses were centered around the synchronous meetings, preclass materials, FT helping the transition, student effort, and previous preparation. The negative responses included group work, access to technology, using newer technology, experiencing a challenging transition, and student engagement (Table 4).

DISCUSSION

This study evaluated the experiences of the transition of TTEs and FTEs to a fully remote teaching method during the closure of educational institutions due to COVID-19. On the basis of the survey results, it was evident that the FTEs were more confident in their transition to OT than the TTEs (Fig. 3), perhaps because FTEs had more experience with OT (Fig. 1). FT design is built on using some remote strategy to engage students, such as assigning the course content in multiple formats and formative assessments. Furthermore, teachers who had previously switched to FT could be more open and confident and therefore were likely to adapt to OT by not being afraid of changing the teaching method.

In this study, two-thirds of FTEs and TTEs chose the asynchronous OT over the synchronous method during the sudden and necessary closure of campuses (Fig. 2). The asynchronous choice was made perhaps because of the lack of time for the educators to plan and process the situation. It could also be because of their prediction that their students were not able to cope with synchronous settings in the middle of a natural crisis. One advantage of the asynchronous format for students was that the content was readily available to access, allowing flexibility in their schedules during this challenging time. Researchers Konjengbam and Nagayoshi (23) observed similar findings in their study.

Although all FTEs found their FT resources beneficial while transitioning to remote teaching, the FTEs at the 2-YI reported the preclass content to be much more helpful than the participants at the 4-YI. 2-YI students often include adult

Table 2. *Positive aspects and challenges that the TTEs and FTEs experienced during their transition to OT*

Identified Themes	TTEs	FTEs
	Positive responses	
Student peer support	6% (n = 1) "By the time we switched, my classes had bonded and we were a community."	4% (n = 1) "They continue reaching out with each other."
Synchronous class meetings	22% (n = 4) "Synchronous study sessions and office hours have been helpful for the students."	30% (n = 7) "Synchronous meetings are working well for the students who regularly attend."
Synchronous group work	0% (n = 0)	9% (n = 2) "I can break them in groups and have them reconnect and work together like before the break."
Adjusting to the online format	17% (n = 3) "Not too bad. The students were great with the fast pivot"	44% (n = 10) "I am so thankful for the skills that I developed to do flipped teaching. They were easily transferable to do fully online teaching."
Online teaching transition	17% (n = 3) "Other than changes outside of our course, the transition was smooth."	47% (n = 11) "The switch was relatively seamless."
Educational technology	61% (n = 11) "Still working problems on my screen at home no differently than when in class, and students were more comfortable."	52% (n = 12) "We switched to an online homework platform that students found helpful. I also created videos that walked students through the homework examples."
	Challenges	
Virtual labs	11% (n = 2) "There was no hands-on learning with specimens and difficulty in forming groups for lab exercises."	4% (n = 1) "Trying to figure out how to do labs online was challenging."
Communication	11% (n = 2) "Complete loss of communication from students because they did not have the equipment required to switch online."	13% (n = 3) "Some students just don't read the directions."
Student engagement	0% (n = 0)	30% (n = 7) "Understanding whether students are listening in group sessions. They do not show their video and turn their mic off. So, I feel like I am talking to myself. That lack of feedback is weird."
Adjusting to the online format	33% (n = 6) "Was not easy for students or myself."	4% (n = 1) "It is very difficult."
Faculty-student interaction	22% (n = 4) "Very difficult to engage students either synchronously or asynchronously, whereas in class you can see their faces and respond in real time."	26% (n = 6) "The lack of student interaction detracts a lot from the class."
Synchronous group work	0% (n = 0)	39% (n = 9) "The group work and in-class activities have been a major hurdle."
Online assessment	33% (n = 6) "Inability to proctor and confirm students are not using books, notes, online websites that offer test bank questions/answers."	17% (n = 4) "We have no way for trustworthy proctoring. So, meaningful grades are not possible."
Time commitment	44% (n = 8) "Extremely time consuming."	52% (n = 12) "Exhausting, it takes twice as long to do online what can be done in the classroom."
Educational technology	56% (n = 10) "Tech issues, internet, converting work to pdf, using eBooks, figuring out how to do labs, not all students could load the software."	43% (n = 10) "It was extremely difficult to learn (let alone, apply) new technology (e.g., TSM) when the internet doesn't comply."

FTE, flipped teaching educator; OT, online teaching; n, number of participants; TTE, traditional teaching educator.

learners with outside commitments and technical deficiencies. Cooper and Richards (24), in their study in adult learners in graduate medical education, found that these students have more obligations. The flexibility to utilize resources in the asynchronous format is vital for these students. Chaves (25) and Twigg (26) demonstrated that students must use resources in the asynchronous form to succeed in courses. However, it must be noted that the in-class content among all the resources was less valuable ($P < 0.05$) because two-thirds of the participants chose an asynchronous approach and did not utilize the existing activities. Those who used the in-class activities expressed that they could modify them to the online setting to engage students remotely. However, there remained two constraints in the remote setting: student engagement and group work management. Cavinato et al. (27) suggested that active learning strategies such as more group work and remote synchronous sessions helped engage students. Venton and Pompano (17) reported that active learning promoted deeper learning in the online setting.

The qualitative data provided a more in-depth analysis of the educators' experiences during their transition to OT. Six themes were identified as positive. The students worked

Table 3. *Comparison of asynchronous and synchronous teaching experiences among the TTEs*

Asynchronous		Synchronous	
Feedback	**Number**	**Feedback**	**Number**
What has been your experience thus far in suddenly switching to the online teaching format?			
Challenging	5	Challenging	3
Time-consuming	3	Not challenging	3
Not affected	1	Neutral	1
What worked well in your online teaching?			
Weekly contact	3	Lecture videos	3
Creating lecture videos	2	Student interaction	2
Being flexible	2	Technology assistance	2
None	1		
What did not work well in your online teaching?			
Technology	3	Examinations	3
Student responsibility	3	Laboratory section	2
Communication	1	Student engagement	2
If you had prior online teaching experience, what aspects did you find helpful during COVID-19?			
Lecture recording experience	3	Technology	2
Familiarity with management software	2	None	1
Previously established course	1		
How confident were you with your online teaching?			
Confident	4	Confident	4
Not confident	3	Not confident	2
Neutral	2	Very confident	1
What were some challenges that you faced when moving your lecture class to the online format?			
Student adjustment	5	Student adjustment	3
Technology	2	Technology	2
Unprepared	1		

Number, number of participants; TTE, traditional teaching educator.

with peers in their classrooms before the COVID-19 pandemic. Since they were already acquainted, they maintained peer interaction even in the remote setting when the courses were switched to online. The FTEs reported that the synchronous format, where they could keep the small group activities by utilizing the breakout rooms on Zoom, helped engage students as before. Because FTEs already had the FT training, including educational technology to record lectures, and had prepared preclass activities, it was easier for them to provide these resources.

The qualitative data indicated several constraints that faculty participants faced during their transition to OT. One of the challenges was switching the hands-on laboratory activities to a remote setting. Others have reported the same in biology and preclinical medical students (28, 29). Faculty-student communication was reported to be an issue, since

Table 4. *Comparison of asynchronous and synchronous teaching experiences among the FTEs*

Asynchronous		Synchronous	
Feedback	**Number**	**Feedback**	**Number**
What has been your experience so far in switching from flipped teaching to fully online teaching?			
Experienced a smooth transition	9	Pleased with synchronous meetings	3
Experienced a difficult transition	6	Experienced a difficult transition	3
		Flipped teaching helped transition	2
What has been working well in your online teaching?			
Preclass materials	12	Synchronous meetings	5
Students	1	Preclass materials	2
Technology	1		
Overall	1		
What is not working well in your online teaching?			
Student engagement	6	Group work	3
Technology	4	Student engagement	2
Lack of interaction	3	Education technology	2
Labs and activities	2		
What parts of FT were helpful in your transition to online learning?			
Preclass materials	12	Preclass materials	5
Combination of FT activities	3	Student effort	1
		Previous preparation	1
What were some challenges that you have faced when moving your course to the online format?			
Time	5	Technology	3
Technology	4	Group work	3
Lack of interaction	3	Lack of interaction	2
Students	2		

FT, flipped teaching; FTE, flipped teaching educator; Number, number of participants.

some students were not reading instructions and therefore were not meeting deadlines. Assessing student engagement was another challenge, since not all students used the camera feature. Leal Filho et al. (30) and Cavinato et al. (27) also found the participation of students challenging in the remote setting. Some faculty reported that they were talking to themselves while in their synchronous sessions because they lacked interaction with the students. Although a few faculty found synchronous activities engaging to students, most of the FTEs reported that the small group activities were challenging to execute. Another challenge was related to assessments. Proctoring exams was also a concern, as was the preparation time for transitioning classes. Adapting to unfamiliar educational technology such as Zoom, breakout rooms, and the Respondus LockDown Browser to assess students was a significant player among most participants, for themselves and their students (27).

As per the study design, the two cohorts differed in their experiences with FT, although both had completed their training. The students from *cohort 1*'s STEM classes expressed their experience as more favorable than those from *cohort 2* (unpublished data). One explanation could be that *cohort 1* had been using FT for many semesters and therefore had greater experience than *cohort 2*, who were beginning their FT implementation for the first time. A study by Tang et al. (16) reported that the students were dissatisfied with OT alone but OT in the flipped format helped engage students, suggesting that blending FT with OT is beneficial.

One limitation of this study was the sample size. There were only 23 participants in the FT group and 18 in the TT group. The confusion led by the sudden closure of campuses made it difficult to recruit additional STEM faculty to participate in the study.

Conclusions

On the basis of the results from this study, it could be concluded that FTEs were more confident in their transition to OT than TTEs. Both TTEs and FTEs selected the asynchronous over the synchronous mode of OT during their sudden transition due to COVID-19. The FT resources were helpful during the transition to an entirely online environment. FTEs from the 2-YI expressed that the resources were more beneficial than those from the 4-YI. Thus, FT can play a significant role in making educators more flexible and prepared for a changing environment.

Future Directions

More studies related to perfecting the adaptable nature of FT would be beneficial. It is crucial to assess how faculty adapt to their courses in a way that incorporates the best of what has been learned so that their courses take advantage of both remote and on-campus opportunities and synchronous and asynchronous learning modes. It is also essential to harness how technology can be used and examine the way students learn after being taught remotely.

GRANTS

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DISCLOSURES

No conflicts of interest, financial or otherwise, are declared by the authors.

AUTHOR CONTRIBUTIONS

C.G. conceived and designed research; C.G. and P.D. performed experiments; C.G., C.S., and C.B.-W. analyzed data; C.G. interpreted results of experiments; C.G. prepared figures; C.G. and C.S. drafted manuscript; C.G., P.D., S.D., E.H., G.B., L.B., and S.L. edited and revised manuscript; C.G., C.S., P.D., S.D., E.H., G.B., L.B., J.F. S.L., and C.B.-W. approved final version of manuscript.

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