

Chapter

Lessons Learned during the Transition to Online Learning in a University Nutrition and Exercise Department

Angela S. Anderson, Heather Cox, Renee Eaton, Nicolin Girmes-Grieco, Michelle S. Rockwell and Deborah J. Good

Abstract

In the spring semester of 2020, the COVID-19 pandemic led to an unprecedented shift from face-to-face learning to an instantaneous online learning environment. At the time, the department of Human Nutrition, Foods, and Exercise (HNFE) at Virginia Tech had few online class offerings. Twenty-nine Spring 2020 HNFE classes were transitioned from traditional face-to-face offerings to online delivery models. Many members of the HNFE faculty have strong pedagogical training, but the immediate pedagogical shift in the middle of the semester gave little time for adequate course design geared toward online learning. As such, the purpose of this study was to evaluate student perceptions of the transition to online learning. A departmental survey employing quantitative and qualitative questions was used to assess students' learning experiences in the spring of 2020 and then re-employed at the conclusion of the Fall 2020 semester to re-assess students' online course experience and identify if the department was improving in online course delivery. An additional component of the survey specifically evaluated students' self-perceived motivation for learning. Examples of educational and logistical strategies in online learning environments implemented by instructors and findings of students' experiences from both surveys will be shared.

Keywords: synchronous learning, virtual environment, virtual learning, MUSIC model, dietetics, STEM

1. Introduction

The pandemic caused by the outbreak of the severe acute respiratory virus coronavirus, SARS-CoV-2, will be remembered as a major event in our world history, and its impacts were also felt in higher education. In the spring semester of 2020, in consultation with the Centers for Disease Control and Prevention and local health

agencies, many institutions of higher education initially extended spring breaks and rapidly shifted to an online learning environment for the remainder of the semester. It is important to differentiate this hurried shift into an online environment, compared to a situation in which instructors could develop a well-planned, and intentional online course. In the case of the department of Human Nutrition, Foods, and Exercise (HNFE) at Virginia Tech, there was only one undergraduate online class taught out of 29 courses (3.4%) offered in the Spring 2020 prior to the COVID-19 pandemic, although five online offerings (62.5% of courses) were available during the 2019 Summer semesters. Colleges and universities around the world transitioned to online environments for all courses, rather than the alternative of discontinuing the spring semester. At Virginia Tech, a large research 1 (R1) university with approximately 30,000 undergraduates, this decision came through an email to faculty, staff, and students on March 11, 2020 from President Tim Sands [1]. Spring break was extended by one week to give instructors the time to make the transition from face-to-face teaching to a 100% online environment. Students were not allowed to return to campus except in special circumstances. Some had left books and other notes behind in their dorm rooms or campus apartments. Others were stranded overseas or dealing with situations not conducive to online learning. Similar to other reports published on student mental health at that time (i.e., [2, 3]), a survey from Hokie Wellness (a health-promotion service of Student Affairs) indicated that approximately 65% of students at Virginia Tech reported increased stress, anxiety, and mental health concerns compared to the semester prior to the COVID-19 pandemic (personal communication).

Instructors in each Virginia Tech college were recruited to serve as “Continuity Partners” and held webinars and online help sessions to quickly train colleagues in transitioning their courses online, and to troubleshoot issues for instructors and students in this transition. These instructors generally had previous experience and training in online teaching and learning but were also transitioning their own courses. While these trainings undoubtedly helped Virginia Tech instructors get courses ready, they did not compensate for the abrupt shift in the delivery of content for courses, ranging from small classes of 5–25 students to large lectures of greater than 200 students. Lab courses presented additional barriers in content delivery due to the need for specialized equipment and space.

A number of published studies have examined the use of planned digital learning platforms. A meta-analysis of 25 online courses in Nutrition and Dietetics programs over a 30-year period, including during the COVID-19 pandemic, described barriers to online learning even for students who were technologically and emotionally prepared for the experience. The authors noted that student access to the internet, as well as lack of instructor training in the delivery of online platforms, resulted in differences in equity and access to education during the pandemic [4]. Subsequent studies have analyzed the impact of this switch from face-to-face to online courses. For example, 62% of 526 students surveyed in a study published by Dietetics instructors from the University of New Mexico, felt that the COVID-19 pandemic had negatively impacted their learning, with 48.5% indicating that they felt they learned less material during the COVID-19 pandemic than before [2]. These data point to a supposition that many instructors did not have the training for delivery of online courses prior to the COVID-19 pandemic.

Singh and Thurman reviewed the different platforms and methodologies available from 1988 to 2018 and published a report in 2019 that came to the conclusion that online education is an umbrella term encompassing both online learning and online teaching [5]. For the purpose of this study, we used the most common term, online learning, as defined by Singh and Thurman, as this term covers both synchronous and

asynchronous platforms and is synonymous with distance education. This term also focuses on the learning component of the platform, which we were interested in for this analysis.

We assessed the transition to online learning platforms in the HNFE department, which prepares students for careers in healthcare, nutrition, dietetics, and exercise science, with a survey that went out to more than 900 HNFE undergraduates. The goal of this study was to survey the change in attitudes toward online learning, assess positive and negative outcomes of the transition, determine valuable tools for students and instructors, and barriers to online learning that could be identified. Both the Spring 2020 and Fall 2020 surveys used the MUSIC model of academic motivation [6], as well as general survey questions and open-ended text responses.

2. Data gathering

Several HNFE instructors had participated in professional development courses in online learning, but no amount of training adequately prepared the instructors for the complete and sudden pivot to online learning that took place in March 2020. Recognizing the need to learn from this abrupt delivery shift, the authors administered a survey at the end of Spring 2020 to assess the transition to online learning. After data collection and analysis, the survey was refined and sent to students at the end of Fall 2020 to again assess student perceptions of online learning. The text of the surveys can be found in the supplemental appendix materials.

Survey outcomes included student demographics, attitudes about online learning, interactions with the online learning environment, positive and negative outcomes of the transition to online learning, valuable tools for online learning, barriers to online learning, and student motivation per each HNFE class taken, as measured by the MUSIC model [6]. The Institutional Review Board at Virginia Tech considered this survey study exempt from human subjects review. Surveys were distributed using the Qualtrics survey software platform (Qualtrics XM, Provo, UT, USA). Students who completed the survey were entered into a random drawing for one of 20, \$25 gift cards to Amazon. The drawing was performed two times, once in the Summer of 2020 and once in the Winter of 2021.

2.1 Demographics of students completing the surveys

Demographics of the students that completed the survey were collected (**Table 1**). The first survey was given in June 2020 and 302 students completed the survey. The second survey was given in January 2021 and 229 students completed the survey. For the spring 2020 survey question on demographics regarding academic standing, students were instructed to provide the academic year that they just finished at the end of spring 2020.

2.2 Lessons learned from spring 2020

Managing online course delivery proved to be a steep learning curve for many students. As shown in **Figure 1**, only 30.6% had taken an online class before and only another 6% had participated in a hybrid (50% face-to-face and 50% online) class, leaving 64.4% of students who had never participated in online learning. Of the 152 students who responded to the open-ended question comparing how they felt at the end of spring 2020 compared to when they first transitioned in March, 52.6%

Academic standing	Spring	Freshman (12.9%)	Sophomore (26.2%)	Junior (39.7%)	Senior (8.3%)	Graduated (12.9%)
	Fall	Freshman (16.1%)	Sophomore (22.1%)	Junior (26.6%)	Senior (33.7%)	Other (1.0%)
Gender	Spring	Male (11.9%)	Female (88.1%)			
	Fall	Male (11.0%)	Female (89.0%)			
Ethnicity	Spring	White (86.4%)	Black (1.7%)	Asian (6.9%)	Multiple (4.3%)	Other (0.7%)
	Fall	White (80.4%)	Black (1.5%)	Asian (13.1%)	Multiple (3.5%)	Other (1.5%)
First Generation	Spring	Yes (10.9%)	No (89.1%)			
	Fall	Yes (11.6%)	No (88.4%)			
Transfer	Spring	Yes (9.6%)	No (90.4%)			
	Fall	Yes (10.0%)	No (90.0%)			

Students who completed the surveys in the Summer of 2020, n = 302 (Spring) or students who completed the second survey in the Winter of 2021, n = 229 (Fall).

Table 1.
Demographics.

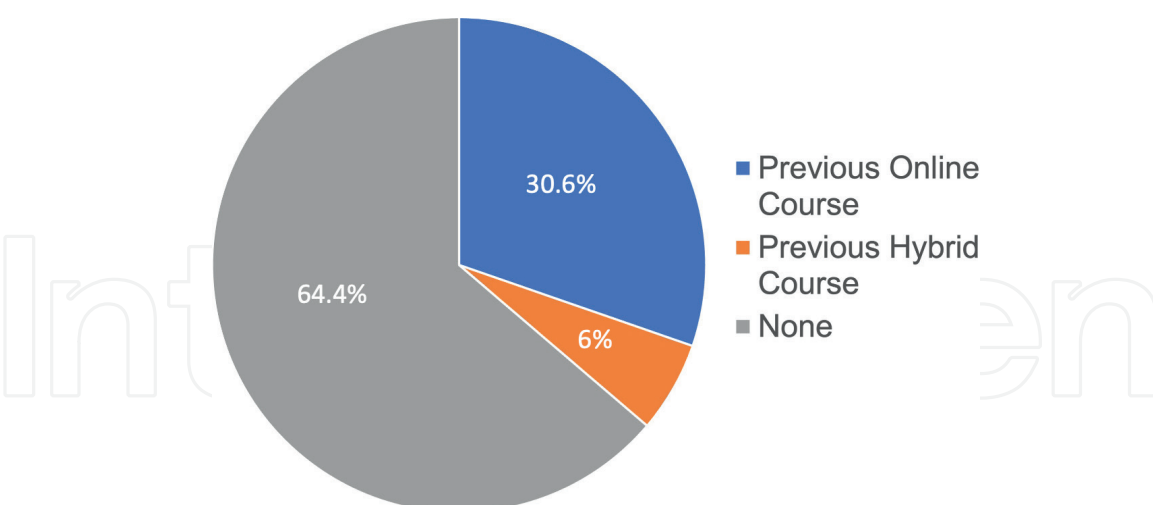


Figure 1.
Previous experience with online courses. Students in Spring 2020 who had previous taken an online or hybrid course.

reported that the shift in class format was stressful until they got used to the new format, 16.4% mentioned that they needed to work on time management to adapt to the switch, but they had more autonomy, 13.8% mentioned that they preferred face-to-face classes, 11.2% preferred the online classes, and 4.6% mentioned that the switch led to the class being harder or having more class work. Overall, the theme was that the transition was bumpy for many students and that some instructors did not transition as smoothly (or as seamlessly) as others.

Several course instructors moved their classes to asynchronous learning, the only model of online learning many knew. Other instructors continued to meet during class time synchronously and lectured over Zoom. The biggest barriers students had to asynchronous learning were:

- Distractions from friends, classmates, family, pets, etc.
- Lack of quiet or private place to participate in class
- Lack of reliable/stable internet connection
- Not able to participate in classes due to others needing to use shared technology; issues related to taking tests (i.e., proctoring, time on tests)
- Unclear communications or expectations from instructors about class.

Synchronous learners mentioned the same barriers, except they added a barrier about confusion on how to use the video conference software or technology application for class, and did not rate as high that sharing technology with family or others was a barrier to participating in class synchronously.

The question remained whether, despite barriers, the students enjoyed the new online learning environment. When students were asked what mode of delivery for a class they preferred, 67.4% said face-to-face, citing that face-to-face learning:

- Provided a better learning environment
- They felt more focused and awake
- They learned more in face-to-face classes
- Were able to ask questions on material and instructions for assignments
- Felt class was slower paced than watching videos
- Felt that there were more personal stories from the professor that related to the topic, more group activities/projects as well as labs, cooking, and oral presentations
- Felt that the professor was more engaging in face-to-face classes and were able to build relationships with the professor and the TAs, meet guest speakers in person, as well as see demonstrations face-to-face
- Liked the firm schedule, which gave accountability
- They did not have to worry about internet problems.

On the other hand, 18.1% thrived in the online learning environment citing that online learning:

- Was easier
- They were able to sleep-in and not be so tired

- Felt that they paid more attention because they were not as distracted as they were in big lecture classes
- Liked completing the course work at their own pace, managing their own time, completing work on their own time schedule, and liked the flexibility
- Liked that they could pause videos and re-watch them
- Some felt that they participated more online
- Liked that they could participate when not in town
- Liked that they did not have to race across campus to make it to class or have to travel to campus.

A total of 14.5% of students preferred a hybrid model citing that:

- They liked some face-to-face contact to ask questions
- They paid better attention when in class
- Liked the interaction with classmates
- Felt they gained a better understanding of the material
- Liked having video lectures to watch/re-watch at their own pace
- They liked to work at their own pace.

Another factor in whether online learning was successful was access to the internet and the student's location. In the spring of 2020 when the campus closed for the most part, 65.2% of students returned to their family's homes to complete their online learning. Most of the remaining students stayed in town (31.1%). This was in contrast to fall 2020, where 29% of students were on-campus, 67% off-campus but in town, and only 3.1% remained at their family's home. The location of online learning was important when it came to accessing the internet. In the spring of 2020, 92.5% "always" (57.2%) or "usually" (35.3%) had access to reliable internet. This changed as students moved back to town where 85.8% identified as "always" (17.8%) or "usually" (67%) had access to reliable internet.

Many tools are available to facilitate online environments, including learning management software (LMS), polling apps, video conferencing, video recording and playback, breakout rooms for discussions, and discussion forums. We assessed which tools were perceived by students to be most helpful during the transition to online learning. As shown in **Figure 2**, students rated the LMS as the most effective tool. At our university, this is the Canvas™ platform (Instructure Inc., Salt Lake City, UT). Voice over videos which students could re-watch were given the next highest rating, followed by synchronous videos, likely created via the university-supported video conferencing (Zoom, Zoom Video Communications, San Jose, CA) environment. In comparing effective tools used in the online environment from spring to fall 2020, there was little change (**Figure 2**) with the LMS and pre-recorded voice over videos given the highest scores.

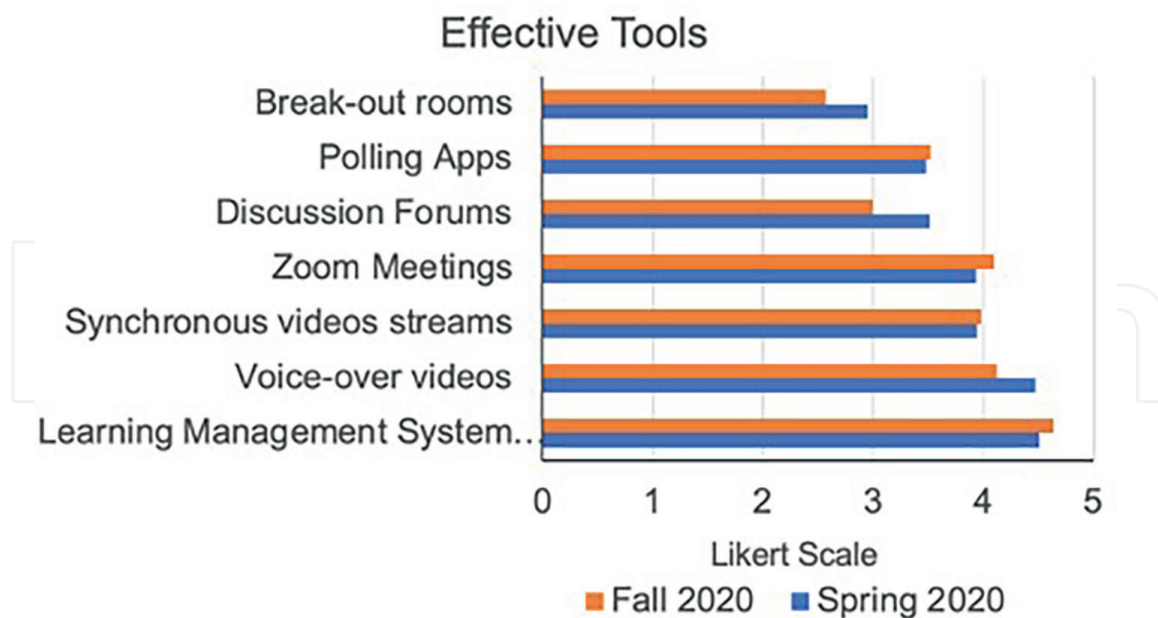


Figure 2. Student perception of effective tools in Spring 2020 (blue) and Fall 2020 (orange). Likert scale on which tools were useful with 1 (strongly disagree/not useful) and 5 (strongly agree/useful).

Lastly, we wanted to know whether students felt motivated to learn in this new environment. Using the MUSIC model for student perception of motivation to learn, we assessed in each HNFE class, their eMpowerment, Usefulness, Success, Interest, and Caring (**Figure 3**). The MUSIC model of academic motivation (<https://www.themusicmodel.com>) is a validated survey [7–9] that can guide instructors to identify areas to improve student motivation [6]. eMpowerment measures whether students perceive that they have control in their learning environment. Usefulness measures whether students perceive that the coursework is useful to their future. Success measures whether students perceive that they can succeed at the coursework. Interest measures

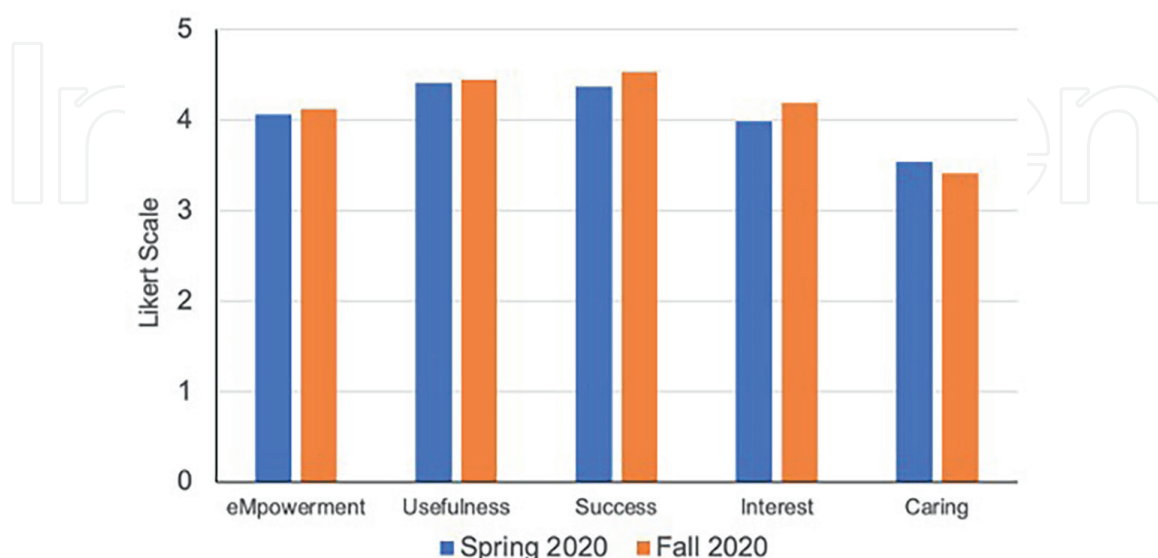


Figure 3. Comparison of MUSIC Model for Academic Motivation scores Spring 2020 (blue) and Fall 2020 (orange). Likert scale scoring is used on which tools were useful with 1 (strongly disagree/not important) and 5 (strongly agree/important).

whether students perceive that the instructional methods and coursework are interesting and enjoyable. Caring measures whether students perceive the instructor cares about whether they succeed in the coursework and about their well-being. The question remained: Were these five dimensions of classroom design being met in this new online environment? **Figure 3** outlines the aggregated results from all HNFE classes.

Overall students rated Usefulness and Success as the highest variables, indicating that the coursework was useful to their future careers, and they felt they could be successful. They rated eMpowerment and Interest as the next highest variables, still in the “somewhat agree” category, that they felt mostly in control of their learning environment and that the coursework was interesting. Of concern was the Caring rating at a “somewhat agree” to “somewhat disagree.” This was one of the biggest takeaways from the survey, namely that the online environment did not provide the same level of feeling cared for as a face-to-face environment. A limitation of the responses to the Caring measurement, was that it was the section with the lowest percentage of student responses, as students may have suffered from survey fatigue.

2.3 Lessons learned from fall 2020

After an entire semester of almost exclusive online learning, we administered a follow-up survey to assess how students’ perceptions had changed and if we, as instructors, were doing a better job at teaching online. Compared to the second half of the Spring 2020 semester, more instructors were teaching synchronously during scheduled class periods with 46.6% of HNFE classes taught synchronously, 44.6% taught asynchronously, with the remaining courses delivered in blended formats. Synchronous instruction was mediated through Zoom (Zoom Video Communications, San Jose, CA, USA). So how did students interact in this synchronous Zoom classroom? A total of 18.6% of students indicated that they joined via Zoom but did not participate. When a student needed to ask the professor a question, 20.9% indicated that they would ask through audio, while 43.3% only asked questions using the chat. For those instructors that used Breakout Rooms through Zoom, 93.1% of students indicated that they participated in the breakout rooms, while 6.9% indicated that they left the Zoom if Breakout Rooms were used. In general, instructors desired for students to have their cameras on during the Zoom to increase the sense of community. Students, on the other hand, for the most participated with their cameras off (32.2% participated in Zoom with their cameras on, 67.8% with their cameras off). There were 97 comments given by the students for not turning on their cameras.

These comments were organized into the following themes (unranked order):

- Cameras not being required
- Felt uncomfortable/self-conscious
- Did not want to turn theirs on if others were not required
- They were multi-tasking while during class
- Felt it was easier to focus with the camera off
- They were still in bed or their environment was distracting (i.e. messy, room-mates), or they were not presentable for class

- Their internet worked better
- In large lectures, they felt too many people were watching them if their camera was on.

We wanted to assess whether students still felt there were barriers to both synchronous and asynchronous learning and whether these barriers changed as they gained more experience with online learning. For synchronous learning, many of the same barriers still existed with distractions from friends, classmates, family, pets, etc. during class as the greatest barrier, followed by a lack of a quiet or private place to attend class, and reliable/stable internet connection. Issues related to taking tests (i.e., proctoring, time on tests) were mentioned by a greater number of students, as was having a requirement to have their video on during class, and attending class meetings as scheduled due to family or others needing to use shared technology increased as a barrier (**Table A1**). There were fewer comments about instructors having unclear communications or expectations about attending class. There was less confusion about how to use the video conference software or other technology applications for class.

For asynchronous classes, distractions from friends, classmates, family, pets, etc. were still the biggest barrier and access to reliable/stable internet connection stayed as the 3rd most frequent barrier. For the asynchronous classes, there was an increased barrier to unclear communications or expectations from instructors, and issues related to taking tests (i.e., proctoring, time on tests) (**Table A2**). Barriers that decreased for asynchronous classes included a lack of a quiet or private place to participate in class and attending class meetings as scheduled due to family or others needing to use shared technology.

Students were asked about their perception of rigor for online learning in both surveys (**Figure 4**). Compared to Spring 2020, students' perception that online classes should be easier increased by Fall 2020, with 62% compared to only 37% in the spring agreeing that online learning should be easier than traditional face-to-face learning (**Figure 4**). Fewer individuals were neutral in Spring 2020 (12%) versus Fall 2020 (22%), while those that agreed that online classes should have the same rigor went down to 16% in the Fall compared to 47% in the Spring (**Figure 4**). Therefore,

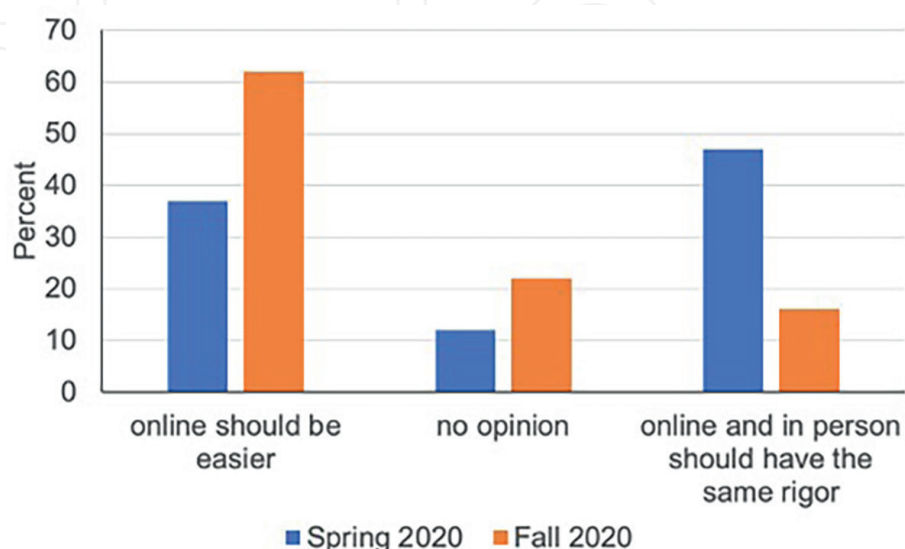


Figure 4. Student perception of course rigor expectations for Spring 2020 (blue) and Fall 2020 (orange).

from Spring 2020 to Fall 2020, there was a shift toward the belief that online courses should be less rigorous than face-to-face courses. Some of the reasons that students cited for this perception included that due to increased self-learning, it is harder to understand the material, harder to focus, and harder to get help, so the expectations cannot be the same. Others mentioned that there was a perception that some instructors added more work or increased the rigor because they thought students had more time. Others mentioned the barriers of internet reliability issues and mental health issues got in the way of learning, so rigor should be reduced. And overall, students felt that assignments should be better adapted for one type of learning or the other, rather than just transferred as is to an online environment.

Students were again surveyed to assess their motivation for learning and for instructors to see in which areas they were improving and in which areas they needed to focus on. The MUSIC model results were surprising, as the results mirrored the spring 2020 results (**Figure 3**). Again, the highest variables for student motivation for learning were in Usefulness and Success with a “somewhat agree” to “agree” rating, followed by eMpowerment and Interest with “somewhat agree,” and again Caring was rated at a “somewhat agree” to “somewhat disagree.”

The survey also asked students to reflect on how their perceptions of online learning had changed from Spring 2020 to the end of Fall 2020. The positives most frequently mentioned about online learning included (unranked order):

- An improved perception of online learning as a whole
- They felt better adapted for online learning
- Felt that the instructors had increased preparedness
- Felt more disciplined
- Enjoyed the flexibility of online learning
- Felt that being back in town for their online learning improved their perception.

Many students still felt that the online learning environment included negatives such as (unranked order):

- Feeling an increased difficulty to succeed in classes
- Felt more distracted
- Felt there was more work
- Felt that the instructors did not always consider student’s challenges
- Felt that some instructors still did not adequately adapt and there was still poor instruction or course preparation.

A smaller number of students mentioned that they felt that it was harder to learn, they felt isolated from other students, having poor internet connectivity reduced their learning, still felt that there were unclear expectations from some instructors, it was

hard to ask questions, and they had poor motivation in an online learning environment. Lastly, the students identified the biggest challenges they had when comparing their current online learning to that of Spring 2020. The most frequent challenges were that they felt burned out, struggling with the demand of self-teaching, setting a learning schedule and deadlines, and having less autonomy than during the spring.

2.4 General reflections from the surveys

Although students stated that they preferred face-to-face instruction, they enjoyed the autonomy that online learning allowed, albeit struggling with the discipline and motivation needed for online learning. Consistently, students mentioned that the distractions from friends, classmates, family, pets, etc. during class were the biggest challenge for both synchronous & asynchronous learning. The students preferred having access to lecture material via posted videos to watch or re-watch to enhance their learning. Overall, many indicated that a blended model of synchronous and asynchronous learning would meet the desire for flexibility and enough structure to stay on track.

Overall, these data gave the instructors of HNFE tangible ways to improve student learning from the lessons learned from the surveys. Ways to improve included being thoughtful about the workload assigned because self-learning takes more time, having clearer assignment instructions since students are not always present in real-time to ask questions, and increasing ways that students feel “cared” for throughout the semester since students at times felt isolated and missed the interactions with other students.

3. Conclusions

The current study used survey-based research to assess the abrupt transition to online learning that occurred in March 2020 in a nutrition and exercise department at a large research 1 (R1) university. The subsequent Fall 2020 semester when instructors had more time to develop online courses was also assessed and the results were compared between the two semesters. With the initial transition to online learning in March 2020, students encountered barriers to their learning which were different than when they were back on campus in the fall. Specifically, a distraction from friends, family, and pets during class time was a significant issue. Additionally, sharing technology with others in the home seemed to affect reliable internet connections for coursework. Students also reported unclear communications and expectations from instructors about class, likely brought on by the quick transition and lack of online course training by instructors for online learning modalities. These findings of unclear communication from instructors were consistent with another study on STEM students’ perception of the COVID-19 transition to online learning [10]. Students perceived that online learning environments had improved by Fall 2020 in terms of clarity of expectations and their own knowledge of using online tools. However, even with only 3% of students still working from their family home (96% on campus or in off-campus housing; 1% mixed location), distraction during class time, and sharing the internet were still major factors that students perceived to affect their learning.

An interesting finding when comparing the surveys from both semesters was that by Fall 2020, students perceived that online courses should be easier/less rigorous than face-to-face courses. A 2021 study found that during the COVID-19 transition to

online learning, students in STEM disciplines stated that they perceived an increased difficulty and workload for online courses, compared to what they expected had the class been face-to-face [10]. To date, and to our knowledge, no other studies have asked about perceived rigor for an online versus face-to-face course, so further study of this finding may be an important avenue for investigation, especially as more online courses become available.

This study employed the MUSIC model of academic motivation [6], which has been employed in both undergraduate and graduate/medical student groups as an assessment of student motivation to learn [6, 7, 11–14]. We found that the Usefulness of the course to their future and the ability to Succeed in the course were the highest indicators for academic motivation in both the spring and fall semesters. Of concern from the MUSIC model data, was that the Caring dimension of the MUSIC model revealed the lowest score for both semesters indicating a need to be more intentional in an online learning environment to make students feel cared for. A recent study of students in online courses found that students perceived being cared for by instructors who made clear acknowledgments about mental health and provided resources on mental health in course materials [15]. Additionally, students in this same study reported an exacerbation of depression when courses did not provide both formal and informal interaction time between students and the professor, due to increased feelings of isolation [15]. More research should be done to investigate ways to increase caring and connectedness in online environments. Our study appears to be the first to employ the MUSIC model of academic motivation to learn in assessing online courses.

Most universities have moved back to having the majority of their courses in a face-to-face environment as the educational changes brought on by the COVID-19 pandemic have diminished. However, the online learning environment has not been completely left behind and lessons learned during the pandemic can inform future online learning environments for students. These lessons include the understanding that nothing takes the place of being present and accessible to students. This seems to be more challenging in an online learning environment. Instructors should consider adding time and online spaces for interaction in their online courses. For face-to-face classes, there are ways to incorporate some of the benefits of online learning. Examples include making lecture videos available to students, using Zoom for office hours and review sessions as needed, pivoting to online learning when the professor becomes unavailable, and finding ways to allow students to increase their autonomy, while still providing formal and informal interactions in the online environment.

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Conflict of interest

The authors declare no conflict of interest.

A. Appendix

Barriers	Spring 2020 Rank (number of students reporting)	Fall 2020 Rank (number of students reporting)
Distractions from friends, classmates, family, pets, etc. during class	1 (82)	1 (124)
Unclear communications or expectations from instructors about attending class	2 (66)	5 (63)
Reliable/stable internet connection on my end	3 (56)	3 (87)
Issues related to taking tests (i.e., proctoring, time on tests)	4 (54)	4 (77)
Lack of quiet or private place to attend class	5 (51)	2 (92)
Confusion about how to use the video conference software or application for class	6 (21)	8 (19)
A requirement to have my video on (not just my microphone)	7 (14)	6 (33)
Attending class meetings as scheduled due to family or others needing to use shared technology	8 (11)	7 (21)
Lack of live or closed captioning or ASL interpreters	9 (11)	9 (10)
Attending class meetings as scheduled due to time zone differences	10 (4)	12 (1)
Access to assistive technology software	11 (tied) (1)	10 (tied) (2)
Access to assistive technology hardware	11 (tied) (1)	10 (tied) (2)

Table A1. Concerns for synchronous learning. Concerns are listed in ranked order from highest to lowest number of students citing the barrier in Spring 2020. Relative ranking for Fall is provided.

Barriers	Spring 2020 rank (number of students reporting)	Fall 2020 rank (number of students reporting)
Distractions from friends, classmates, family, pets, etc. during class	1 (92)	1 (82)
Lack of quiet or private place to attend class	2 (64)	5 (51)
Reliable/stable internet connection on my end	3 (44)	3 (56)
Attending class meetings as scheduled due to family or others needing to use shared technology	4 (36)	8 (11)
Issues related to taking tests (i.e., proctoring, time on tests)	5 (35)	4 (54)
Unclear communications or expectations from instructors about attending class	6 (28)	2 (66)
Confusion about how to use the video conference software or application for class	7 (13)	6 (21)
A requirement to have my video on (not just my microphone)	8 (11)	7 (14)
Lack of live or closed captioning or ASL interpreters	9 (10)	9 (11)

Barriers	Spring 2020 rank (number of students reporting)	Fall 2020 rank (number of students reporting)
Attending class meetings as scheduled due to time zone differences	10 (7)	10 (4)
Access to assistive technology software	11 (6)	11 (3)
Access to assistive technology hardware	12 (3)	12 (0)

Table A2.


Concerns for Asynchronous Learning. Concerns are listed in ranked order from highest to lowest number of students citing the barrier in Spring 2020. Relative ranking for Fall is provided.

Author details

Angela S. Anderson, Heather Cox, Renee Eaton, Nicolin Girmes-Grieco,
Michelle S. Rockwell and Deborah J. Good*
Virginia Tech, Blacksburg, VA, USA

*Address all correspondence to: goodd@vt.edu

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