Transitioning to Remote Education During the COVID-19 Pandemic: Impacts on Motivation, Focus, and Priorities of College Students

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Abstract

The coronavirus (COVID-19) pandemic brought unprecedented challenges to higher education. When utilized correctly, online education can be an efficient way of delivering instruction materials and engaging students from an array of geographical areas with instantaneous communication. Emergency responses taken during the COVID-19 pandemic resulted in in-person courses suddenly transitioning to remote courses. To assess this transition, Michigan State University students completing courses within the Department of Animal Science were asked to complete a survey to assess student motivation, focus, and priorities resulting from the transition to emergency remote teaching (ERT). Responses were analyzed using the Proportional Odds Model. Student participation, motivation, and focus were significantly influenced by students' internet speed during ERT. Students with slower internet speed were more likely to actively participate in ERT courses ($P<0.0001$). Students with faster internet speeds reported a decrease in focus and motivation ($P<0.0001$). A shift in students' priorities was also found. While coursework remained a priority, respondents indicated that coursework was a lower priority after the transition ($P<0.0001$). Upper-level undergraduates tended to prioritize free time above other activities ($P<0.0001$). Findings from this study will aid in beneficial preparation should there be continuation of online instruction or future crises.

Introduction

Pandemics have occurred throughout the course of human history, bringing disruption to daily life. The 2020 SARS-CoV-2 (COVID 19) pandemic is no exception and has imposed unprecedented challenges to the U.S. educational system. In March 2020, many institutions transitioned their traditional in-person classrooms to online aiming to reduce the exposure and, consequently, the spread of COVID-19. The rapid switch to an online classroom resulted in the implementation of emergency remote teaching (Hodges et al., 2020). Emergency remote teaching is not to be confused with online education. Online education requires students and faculty to have accessible high-quality internet and preparation for instruction (Hodges et al., 2020). While online education is shown to offer beneficial aspects in higher education and learning, the unprecedented threat of COVID-19 forced a rapid switch of in-person taught courses to an online format that was likely not sufficient to provide a high-quality online educational experience (Hodges et al., 2020; Taylor, 2002).

The impacts of COVID-19 are continuously reported. To date, student health and wellbeing have been of a major concern. Survey data has consistently indicated an increase in depression, anxiety, and thoughts of fear, worry, difficulty concentrating, and disrupted sleeping patterns among university students (Copeland et al., 2021; Aristonvnik et al., 2020; Huckins et al., 2020; Son et al., 2020; Wang et al., 2020; Zimmermann et al., 2020). Reports detailing effects of ERT on student educational practices has included a lack of accessibility, increased workload within courses, decreased time spent studying, lost jobs or internships, and delayed

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graduation. However, some publications have indicated adequate technology and accessibility and an increase in time students spent studying during ERT (Aristovnik et al., 2020; Aucejo et al., 2020). This study aims to identify shifts in student motivation, focus, due to ERT based on internet speed, residence, and class year of undergraduate students in the Department of Animal Science at Michigan State University.

As the threat of COVID-19 continues to heighten and cause universities to continue with some form of remote or online education, assessing shifts in student motivation, focus, and priorities during ERT will help instructors to adapt, understand, and communicate more effectively with students.

Material and Methods

Michigan State University ERT Timeline

On March 11, 2020, Michigan State University immediately transitioned from in-person instruction to online. The intent was to resume in-person courses on April 20, two weeks before the end of the semester. Three days later, the decision was made to hold courses online for the remainder of spring semester, including final examinations. Nearly two weeks following the transition to ERT, MSU offered students the option to obtain their course grades as scalar (0.0 - 4.0) or binary (satisfactory or unsatisfactory). Grades reported as binary had no effect on the students' grade point average (GPA).

Survey

This study was deemed exempt by MSU Institutional Review Board. It was noted that results of the survey would not be viewed until the conclusion of the semester.

Instructors from five courses across the Department of Animal Science curriculum offered students the opportunity complete a survey to assess the impact of the transition to ERT. The courses were selected to represent students from all class years and departmental demographics. Courses included traditional class year 1 (freshman) course, Introduction to Animal Agriculture; class year 2 (sophomore) courses, Introductory Beef Cattle Management and Companion Animal Biology and Management; class year 3 (junior) course, Genetic Improvement of Domestic Animals; and class year 4 (senior) course, Ethical Issues in Animal Agriculture. The survey included questions pertaining to student motivation, focus, and priorities changes because of ERT via internet speed, residence, and class year (Supplemental 1; S1). Although students were instructed to only complete the survey once, a few students enrolled in more than one of the included courses completed the survey more than once (n=27). None of the surveys submitted by the same individual contained differing responses and duplicates were removed prior to analysis. To assess internet speed, respondents were directed to Speedtest by Ookla (https://www.speedtest.net/) and asked to report the upload and download speed provided by the website's calculation. We assumed that the internet speed measured during the survey was the same used by the students while attending their courses. Additionally, students were asked to select their class year (S1, Q3).

Statistical analyses

Revised from Skinner (2019), the observed internet speed measured for each student was grouped into three bins (<5MBps, 5MBps-25MBps, and >25MBps). Binned internet speeds were used in subsequent statistical analyses.

Statistical analyses were performed for three groups of questions describing changes on student focus (Q13), motivation (Q12) and priorities (Q8-Q9) after courses transitioned to ERT (S1). All analyses were performed on R (R Core Team, 2020), using the Proportional Odds Model (POM, also known as the cumulative logit model) and fitted using the functions cumulative link model (clm) and cumulative link mixed model (clmm) available on the package ordinal (Christensen, 2019). Comparisons of the fixed effects were accessed using the Likelihood ratio tests for all variables using the functions Anova.clm and Anova.clmm available on the package RVAideMemoire (Hervé, 2020). The responses given for the questions related to student focus and motivation were analyzed as ordered responses. For example, for the question "Have you been actively participating in your MSU course(s) since starting remote/virtual learning?" there were three possible answers (the option "Others" was removed from the analysis as the number of students responding to that option was minimal); a) Yes, participation remains the same as prior to remote/virtual learning; b) Yes, participation has declined in some or all courses since starting remote/virtual learning; and c) No. In this case, the responses a, b and c were analyzed as ordered scale going from 1 to 3 and then fit in the POM. We assessed if changes in student motivation and focus were due to internet speed, class year, or residence (rural, suburban, and urban) during ERT.

Student priorities were accessed via Likert Scale for a series of activities (coursework, working, free time, and other). Students were asked to provide the priority of each activity before and after transitioning to ERT. Then for each activity, a POM was fitted having explanatory variables of class year (1 through 4), the effect of ERT, and the random effect of the respondent.

Results and Discussion

The survey resulted in a 54.3% response rate (n=245) out of the total number of invited participants (n=451). Of the five courses surveyed, 76% of respondents (n=186) were enrolled in only one of the courses, 22% (n=53) were enrolled in 2 of the courses, and the remaining 6 students were enrolled in 3 or more of the 5 surveyed courses. Surveyed respondents were reflective of the departmental distributions of race (Table 1) and class year (Table 2).

Respondents were asked about their prior college online course experiences (Table 3). In general, there was a divide between students having never completed an online college level course and successfully completing an online course with a passing grade. Michigan State University encouraged students to return to their permanent residence

Table 1. Percentage of Respondents and Department of Animal Science Students by Race

Race	Percentage of Respondents	Departmental Percentage[1]
African American	4.0%	3.0%
Asian	4.0%	0.7%
Hispanic/Latinx	2.0%	3.0%
Native American or Alaska Native	1.0%	0.7%
White	86.0%	89.0%
Two or More	2.0%	2.0%
Other	0.4%	0.6%

[1]Percentages include the average of past 19 years.

Table 2. Percentages of Respondents by Class Year

Class Year[1]	Percentage of Respondents	Departmental Percentage[2]
First	35%	13%
Second	16%	16%
Third	26%	33%
Fourth	22%	39%

[1]Class year was indicated by the respondent (S1;Q3)
[2]MSU Registrar's Office Report, Spring 2020 Enrollment

Table 3. Percentages of Respondent Experiences Completing a College Online Course prior to ERT

Experience	Percentage of Respondents
None	42.0%
Yes, successfully (passing grade)	51.0%
Yes, unsuccessfully (failing grade)	1.0%
Yes, some successfully and others unsuccessfully	6.0%

after the transition to ERT. Most of the respondents (78.8%) were residing in their permanent residence, which included rural (39.2%), suburban (30.6%) or urban (30.2%) locations. Only 2.4% of the respondents remained living on campus, either in a dorm or campus housing, and 14.3% remained in off-campus housing following the transition to ERT.

Table 4. Primary Device Utilized to Access ERT Course(s)

Device	Percentages of Respondents
Laptop/Computer	95.0%
Tablet	3.0%
Cell Phone	2.0%

Internet Access

With a majority of students reporting that they returned to their permanent residence, many students were relying on different internet access prior to ERT. While half (50.8%) of respondents indicated that they did not feel their internet access was a limiting factor to their remote education, approximately 38.5% of the respondents felt their ERT experience was limited due to internet access. Most respondents (95%) used their laptop or computer to access ERT course material (Table 4). Students residing in a rural setting had slower internet speed than those living in suburban or urban areas. These findings are in agreement with Aristovnik et al. (2020) which indicated most North American college students have a computer frequently available (93.6%) and an ideal internet connection for online learning (70.5%).

Student Participation

Nearly all respondents (98%) indicated that they remained active in their coursework following the transition to ERT (S1; Q11), however, there was a variation in participation activity. Among the explanatory variables used to explain the shift in participation, only internet speed was statistically significant (Table 5). Students with slower internet speed (<5 MBps) were more likely to continue to actively participate in their courses after the transition to ERT. Students with faster internet speed were more likely to decrease their class participation (Figure 1). Students enrolled in an online class can access other internet content simultaneously which may result in decreased focus and participation. We believe that students who have faster internet were more likely to report a decrease in participation because their internet speed allowed them to view multiple internet browser windows during class. Alternativity, students who experience slower internet speeds may have limited abilities to access multiple websites at the same time.

Student Focus and Motivation

Before the completion of the semester, MSU offered an alternative grade option for students. Students could obtain their course grades as scalar (0.0 - 4.0) or binary (satisfactory or unsatisfactory). Courses reported as binary scores allowed the students' GPA to remain unadjusted. We were interested to know if the grade option effected student focus and motivation on ERT coursework.

Focus was defined as attention on course topic(s). Overall, respondents indicated student focus was course dependent and not based on the grade option (69.3%). Twenty-five percent of the respondents indicated a decrease

Table 5. Tests for fixed effects (internet speed, residence, and class year) for student participation, motivation, and focus

		Participation		Motivation		Focus	
Effects	**Df[1]**	**Chi Sq[2]**	**P value**	**Chi Sq**	**P value**	**Chi Sq**	**P value**
Internet Speed	2	107.59	<0.0001	97.21	<0.0001	94.73	<0.0001
Residence	2	1.15	0.56	2.26	0.32	2.29	0.31
Class Year	4	3.28	0.51	6.98	0.13	1.14	0.88

[1]Degrees of Freedom
[2]Likelihood Ratio Chi-squared value

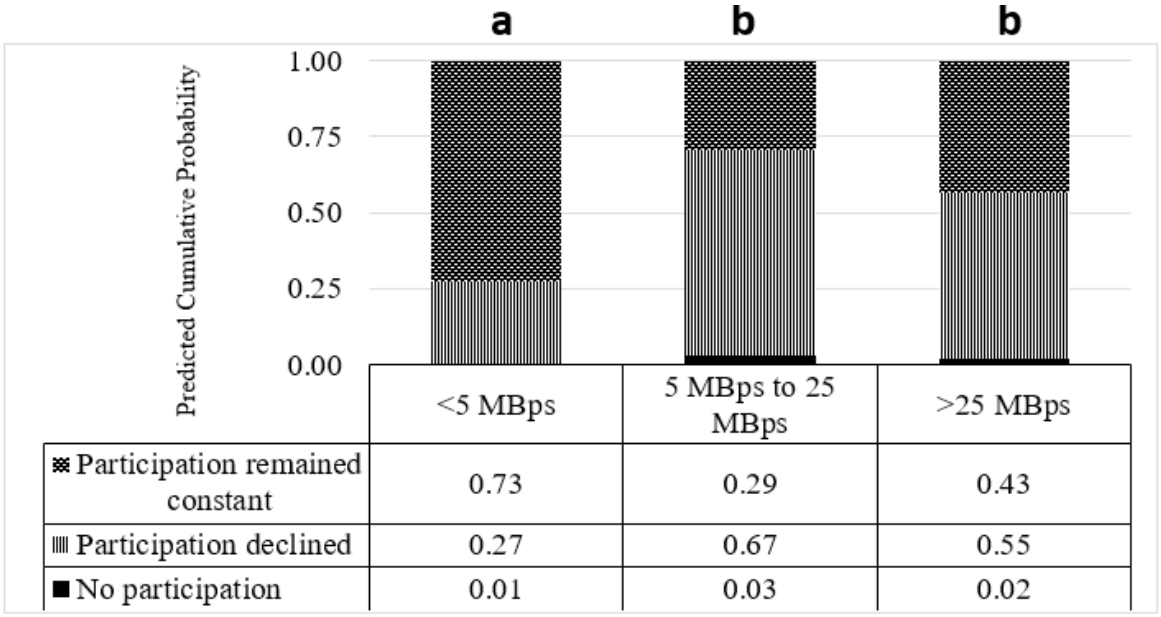


Figure 1. Distribution of respondents' participation in ERT coursework by internet speed. Changes in participation after the transition to ERT based on respondents' internet speed (<5MBps, 5 to 25MBps, and >25 MBps). Predicted cumulative probabilities indicated the likelihood of how a respondent with the internet speed would respond. a,b Values with different superscripts within a column are significantly different (P< 0.05) for the odds ratios between the bins (averaged across the thresholds and residence).

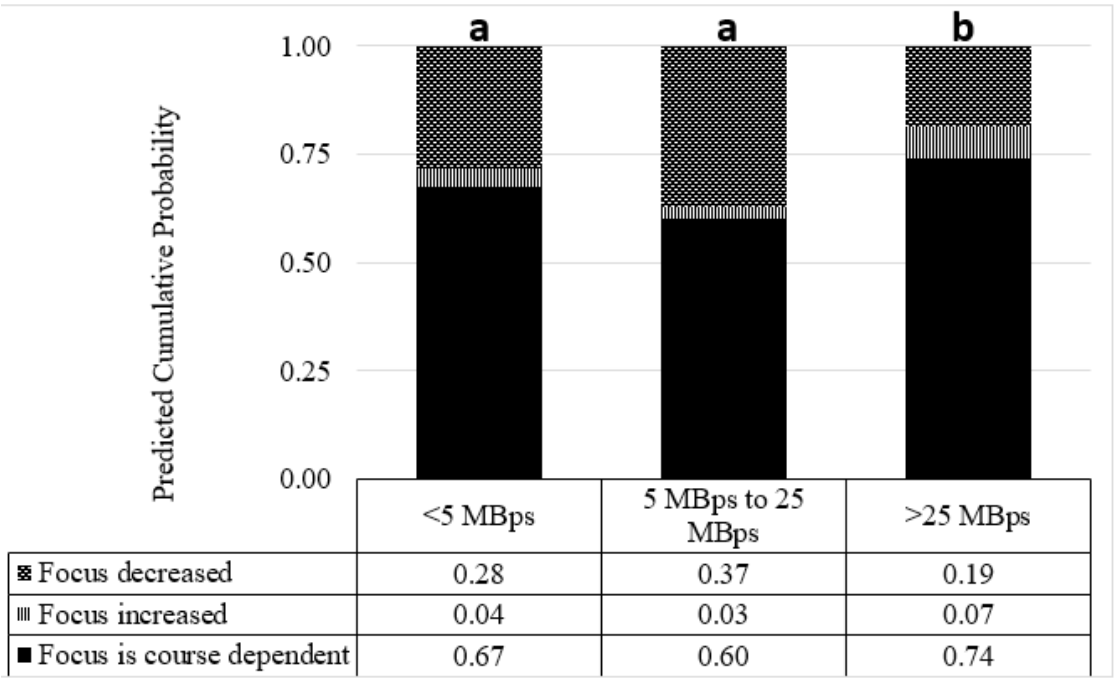


Figure 2. Distribution of respondent's changes of focus in ERT coursework by internet speed. Student focus in ERT coursework based on respondents; internet speed (<5MBps, 5 to 25MBps, and >25MBps). Respondents wit faster internet speed (>25MBps) were more likely to have decreased focus in ERT coursework. a,b Values with different superscripts within a column are significantly different (P<0.05) for the odds ratios between the bins (averaged across the thresholds and residence).

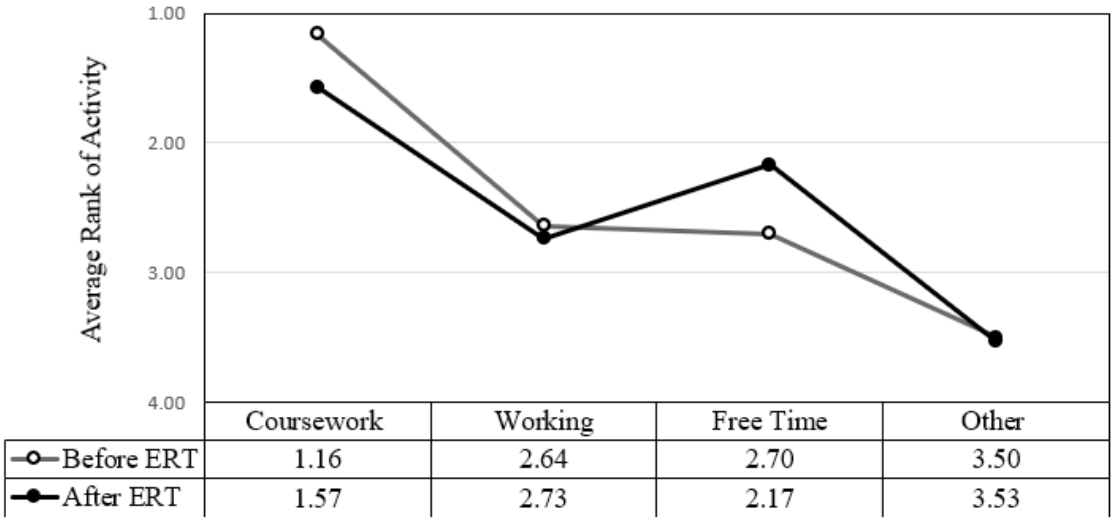


Figure 3. Respondents' ranking of average weekday activities. Respondents were asked to rank their prioritization of weekday activities. Answering one for any activity indicated the highest priority while a rank of four indicated lowest priority.

Table 6. Tests for the fixed effects (class year and ERT1) for priorities (coursework, working, free time, and other)

		Coursework		Working		Free time		Other	
Effects	**Df[2]**	**Chi Sq[3]**	**P value**	**Chi Sq**	**P value**	**Chi Sq**	**P value**	**Chi Sq**	**P value**
Class year	4	7.96	0.09	8.18	0.08	10.44	0.03	9.80	0.04
ERT[1]	1	73.19	<0.0001	1.70	0.19	57.21	<0.0001	0.90	0.34

[1]Emergency Response Teaching
[2]Degrees of Freedom
[3]Likelihood Ratio Chi-squared value

in focus after the grade option. Internet speed had an overall significant effect on student focus ($p<0.0001$). Respondents with faster internet (>25 MBps) were more likely to have decreased focus in ERT coursework (Figure 2). Student residence and class year did not seem to influence student focus after the grade option was announced (Table 5).

Student motivation was defined as a desire to learn or perform well, and this remained stable for 80% of the respondents after the option for GPAs to remain untouched. However, internet speed was associated with the students who remained motived in the ERT coursework (Table 5). Students with intermediate internet speed (5 to 25 MBps) experienced the highest decrease in motivation while students with fastest internet speed (> 25 MBps) experienced the greatest shift in focus in their ERT coursework. Student's residence and class year did not affect the respondents change in motivation or focus in ERT coursework.

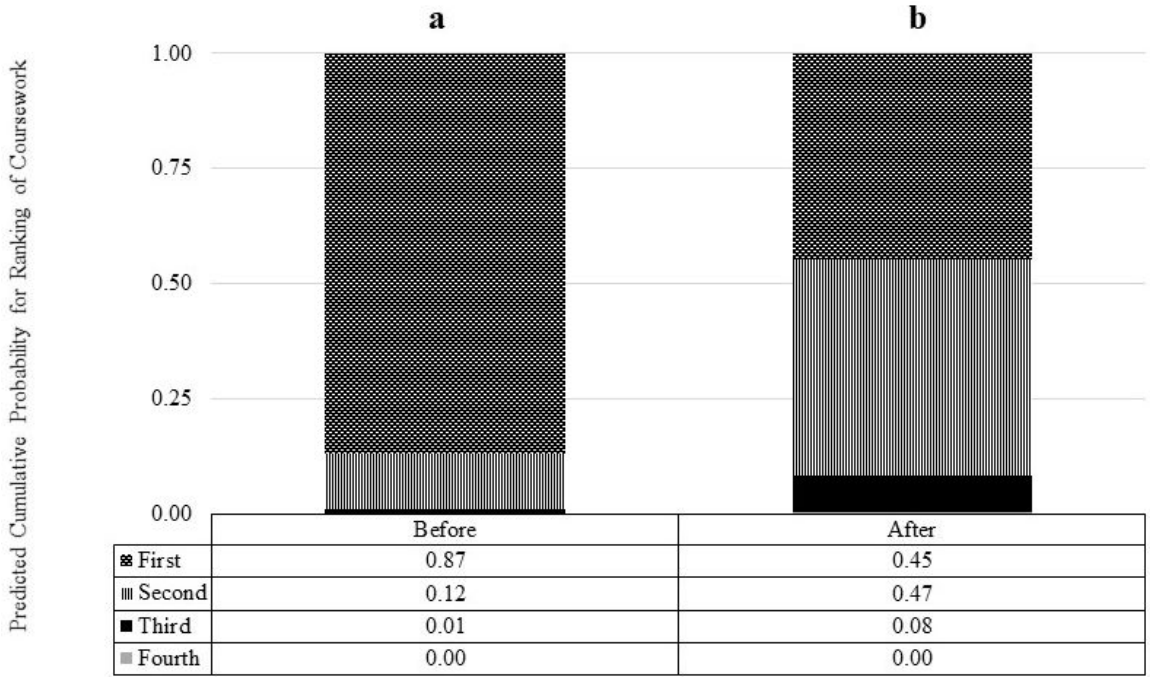
Most survey respondents returned to their permanent residence during COVID-19 and remained at their permanent residence to attend ERT classes and study. This type of environment may be inconducive to learning or present challenges for self-discipline in learning (Bao, 2020). Internet speed and use may be an indicator of socioeconomic status (Bucy, 2000; Rohman and Bohlin, 2013). Therefore, students of a higher socioeconomic status, having faster internet speeds, may have more distractions or experience less stress or hardships, allowing for decreased focus and motivation in ERT course expectations (Aucejo et al., 2020).

Student Priorities

Respondents were asked to rank their priorities (coursework, working, free time, and other) prior to and after ERT (Figure 3). Overall, coursework remained the top priority for students after the transition to ERT. We were interested in assessing student priorities associated with class year and the transition to ERT.

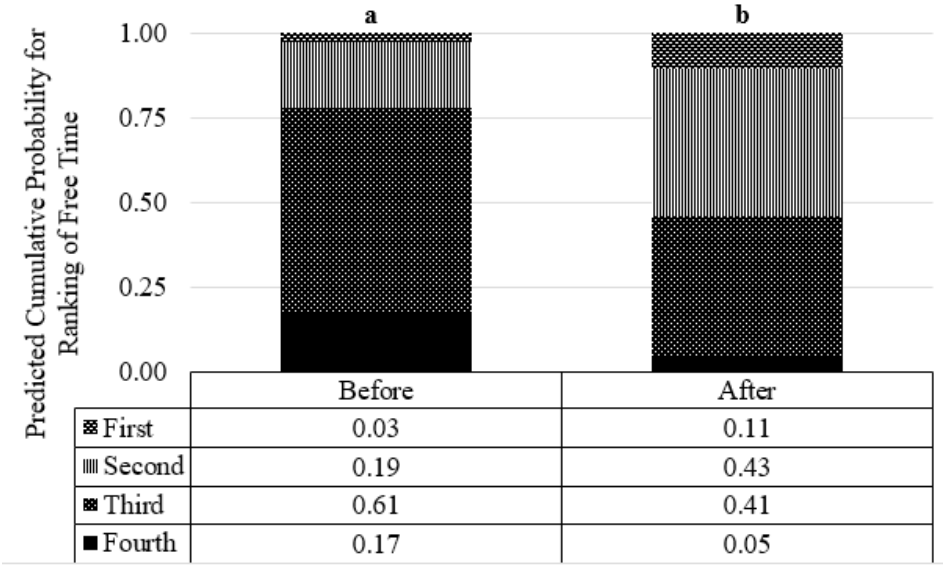
Regardless of class year, coursework remained a priority for respondents. We found that the transition to ERT significantly affected the students ranking of coursework (Table 6). Furthermore, our analyses showed that respondents indicated that coursework was considered less important after the transition to ERT (Figure 4).

Class year or the transition to ERT did not affect student priorities placed on working (Table 6). Working was ranked second and third prior to ERT coursework by 37.2% and 38.4% of respondents, respectively. After ERT, work was ranked second by 33.5% and third by 41.4% of the respondents. This may not be surprising as the cost that accompanies higher education has tripled for public universities since the 1980s (Castellanos and Holcomb, 2020). Additionally, concern from students has been documented in additional school related items such as textbooks, housing, food, and utilities (Patton-López et al., 2014). The transition to ERT was not accompanied by a tuition reimbursement or an alleviation in the cost of living, therefore, work may have remained steady in rankings to maintain an expected or needed income. In addition, students with asynchronous courses may have felt they had



	Before	After
First	0.87	0.45
Second	0.12	0.47
Third	0.01	0.08
Fourth	0.00	0.00

Figure 4. Distribution of respondents' ranking of coursework as a priority before and after the transition to ERT. Respondents indicated that coursework was ranked lower after the transition to ERT. a,b Values with different superscripts within a column are significantly different (P<0.05).



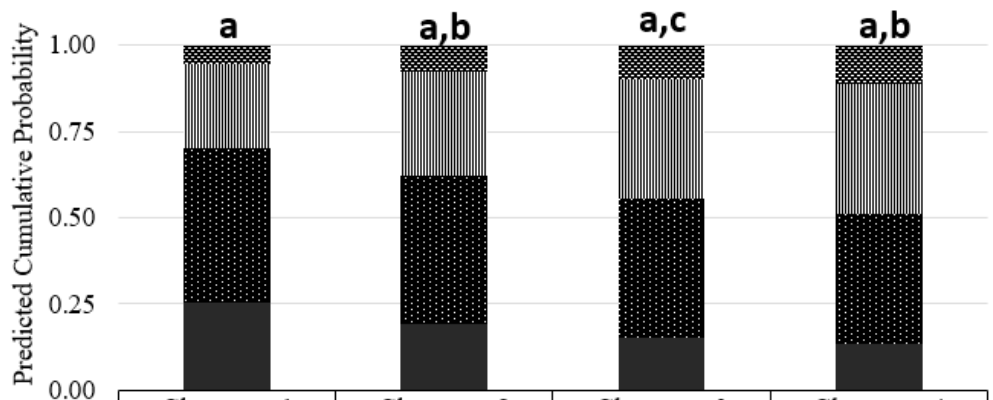
	Before	After
First	0.03	0.11
Second	0.19	0.43
Third	0.61	0.41
Fourth	0.17	0.05

Figure 5. Distribution of respondents' ranking of free time as a priority before and after the transition to ERT. Prior to ERT, students indicated free time as a third priority. Free time resulted in a more equal distribution among second and third after ERT courses were in place. [a,b]Values with different superscripts within a column are significantly different ($P < 0.05$).

an increase in time and could continue to work after the switch to ERT because their course material was available online. Recently, Aucejo et al. (2020) has reported that working students suffered, due to the COVID-19 pandemic, a decrease in wages or hours, loss of job, or family income.

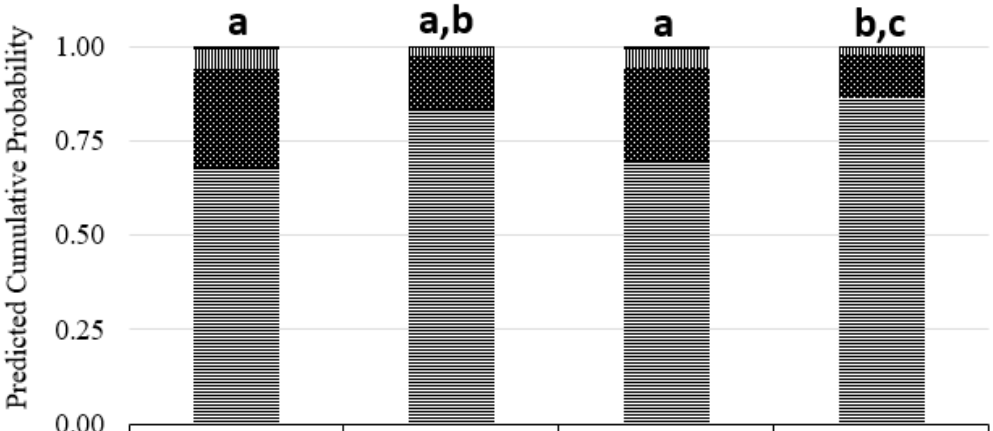
Both ERT and class year affected student's ranking of free time as a priority (Table 6). Prior to ERT, most of the students ranked free time as a third priority (Figure 5), generally behind coursework and working. Post ERT transition, free time was ranked nearly equally as second and third priorities, generally behind coursework.

Significant differences were found between class year 2 (sophomore) and 3 (junior) and between 3 and 4 (senior) students (Figure 6). As students advanced in their college career, they tended to prioritize free time above other activities. A commonly acknowledged phenomenon, "senioritis", relates a decrease in motivation towards college to a faded novelty of the college experience (Chickering, 1967; Kubota and Olsta, 2006). A students' learning environment becomes stagnant, and students may prioritize free time more readily than students earlier in their college career. Under COVID-19 pandemic conditions, students may have had more free time due to removing commutes to campus, no travel between on-campus classrooms, reduced in-person socializing, and other mandated restrictions on activities. Class year 2 and 3 students at Arizona State University demonstrated a reduction of study time (hours/week) during ERT (Aucejo et al., 2020). Potentially, the students at Michigan State University also prioritized free time over time spent studying during ERT. While the



	Class year 1	Class year 2	Class year 3	Class year 4
First	0.05	0.08	0.10	0.11
Second	0.24	0.30	0.35	0.37
Third	0.45	0.43	0.40	0.38
Fourth	0.25	0.19	0.15	0.13

Figure 6. Distribution of respondents' ranking of free time as a priority based on class year. The further along respondents were in their college career, the higher priority was placed on free time as a second priority compared to third. [a,b,c,d] Values with different superscripts within a column are significantly different (P<0.05).



	Class year 1	Class year 2	Class year 3	Class year 4
First	0.05	0.08	0.10	0.11
Second	0.05	0.02	0.05	0.02
Third	0.26	0.14	0.25	0.11
Fourth	0.68	0.83	0.70	0.87

Figure 7. Distribution of respondents ranking of "other" as a priority based in class year. Respondents of class year 1 and year 3 were similar in that a higher priority was placed on "other" compared to respondents of year 2 and year 4. [a,b,c] Values with different superscripts within a column are significantly different (P<0.05).

survey asked students to prioritize activities, it is possible the increased amount of free time led students to rank this option higher during ERT.

The survey allowed for respondents to rank "other" activities with coursework, working, and free time. While "other" activities were ranked consistently as the fourth priority, class year 1 (freshman) and 3 (juniors) ranked "other" priorities differently than class year 4 (seniors) students (p=0.04). Freshmen (25.6%) and juniors (24.2%) had an increase of ranking "other" in the third category while seniors continued to rank "other" as a fourth or last priority (Figure 7). Eighty-eight and 73 respondents provided a description of what other activities were being prioritized before and after ERT, respectively (data not provided). In general, most students identified the "other" category to be extracurricular activities (57%), exercise (18%), or assisting with the home or family (9%). After ERT, the definition of the "other" shifted with 44% of the entered text identified as assisting with the home or family, followed by exercise (16%) and extracurricular activities (14%). Freshmen and junior status are accompanied by unique experiences. Freshmen students who are new to college life, are eager to establish their place within the college experience. Freshmen can do this is by partaking in extracurricular activities such as volunteering, intramural sports, clubs, study groups, and religious support groups. It was found that there is a significant relationship between freshmen students' sense of identity and involvement in extracurricular activities (Lounsbury et al., 2008).

Michigan State University and other institutions have continued into a third semester of majority online instruction. Future studies are needed to assess additional shifts in

student motivation, focus, and priorities, as well as benefits and successful techniques used by ERT instructors. By assessing these additional shifts and techniques, instructors can gain a better insight to the implications of ERT and be better prepared should there be a need to implement ERT in the future.

Summary

The transition to ERT due to COVID-19 greatly affected the way instructors provided course content to students. This study determined the effects of internet speed, residence, and class year on student motivation, focus, and priorities. The results show that student participation was negatively correlated to internet speed, yet nearly 39% of the student respondents felt their ERT experience was limited by internet access. The binary grade option did not influence student motivation or focus. Rather, student internet speed during ERT affected student motivation and focus. The shift in students' priorities was noteworthy; while work maintained a relatively stable priority after the transition to ERT, student emphasis on coursework declined while time spent on 'free' activities increased. Properly identifying weaknesses that resulted from a time of crisis is key to instructional improvement. Assessing students' change in motivation, focus, and priorities during ERT will aid in beneficial preparation should there be continuation of online instruction or another transition in the future.

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