To: Ian Waitz, Vice Chancellor
From: Melissa Barnett, Associate Director for Research and Evaluation, Teaching + Learning Lab
Subject: Spring 2020 Remote Learning Experience
Date: August 14, 2020

MAIN FINDINGS

1. Compared to male respondents who struggled to maintain their pre-COVID-19 levels of collaboration with their peers (e.g., on psets, group work), their female counterparts had a more negative remote learning experience.

2. The more respondents were able to connect with others (e.g., instructors/TAs/peers) to obtain subject-related help the more positive their remote learning experience. This effect was muted for respondents who experienced greater stress since the move to remote learning.

3. Respondents who were more able to connect more with instructors/TAs/peers and who were able to maintain collaboration with peers experienced a more positive remote learning experience than those who were unable to maintain their pre-COVID-19 collaborative ties.

PURPOSE

Starting March 30, 2020, MIT moved all spring 2020 courses online due to the COVID-19 outbreak. Shortly thereafter, the APART team – in conjunction with Institutional Research (IR) and the Teaching + Learning Lab (TLL) – developed and administered an all-Institute survey to MIT students.[i] In this memo, I report my findings on survey respondents' remote learning experience during spring 2020.

DESCRIPTION

To begin, I tested several seemingly related survey items that focused on the remote learning experience. I found that the combination of the following three items yielded a robust index of remote learning:[ii]

1. "Generally, class sessions held on Zoom or similar technology were effective for my learning."
2. "I had a difficult time learning in this new, self-directed environment."[iii]
3. "I was able to focus during online sessions as well as I do in in-person classes."

Given the increasing focus on equity within higher education in recent years, I analyzed the effects of first generation status, sex, and race/ethnicity on the remote learning experience. Additionally, I included the following control variables in my analysis:[iv]

1. Level at MIT (i.e., undergraduate or graduate)
2. Location during spring 2020 (i.e., on campus, off campus in the U.S., or off campus outside of the U.S.)
3. Stress level during spring 2020 compared to pre-COVID-19
4. Ability to connect with instructors, TAs, and peers to obtain subject-related help
5. Extent to which collaboration with peers (i.e., p-sets, group work) was similar to pre-COVID-19 time
6. Access to adequate internet, hardware, and software after March 30th

I excluded from the current analysis the nine percent of respondents who did not complete the survey.[v] This resulted in 3,032 completed surveys. Still, many survey items included in this analysis suffered from missing data. I used multiple imputation to estimate the missing responses for items that had a fair amount of missing data. Using this approach, resulted in 2,624 respondents in my final analysis. Findings from the original data and imputed data yielded virtually identical results. As such, all findings reported here are based on imputed data.

ANALYSIS & FINDINGS

I found several variables significantly influenced students' remote learning experience:

- Undergraduate respondents reported having a more negative remote learning experience than graduate respondents.
- Hispanic respondents had a more negative remote learning experience compared to white respondents.
- Respondents who lived off campus in the U.S. had a more negative remote learning experience compared to respondents who lived on campus.
- Respondents who reported having more adequate access to the internet and software had a more positive remote learning experience than respondents who had less adequate access to the internet and software.

A more meaningful statistical measure is the effect size of each result. An effect size allows a generic appraisal of magnitude. I calculated the effect size for each significant result.[vi] Despite the results listed above being statistically significant, I found that their corresponding effect sizes were not substantive. Still, the experience for individual respondents within these groups was likely meaningful.

In addition to the variables listed above in the Description section, I analyzed all possible interaction combinations among the variables. For example, I analyzed whether the learning experience varied for first generation respondents by where they lived during spring 2020 or whether the experience varied for female respondents by their ability to collaborate with peers. Among all of the combinations, three generated significant results. Figures 1 – 3 provide detail on the significant combinations.

Figure 1.

Compared to male respondents who struggled to maintain their pre-COVID-19 levels of collaboration with their peers (e.g., on psets, group work), their female counterparts had a more negative remote learning experience.

Figure 2.

The more respondents were able to connect with others to obtain subject-related help the more positive their remote learning experience. This effect was muted for respondents who experienced greater stress since the move to remote learning.

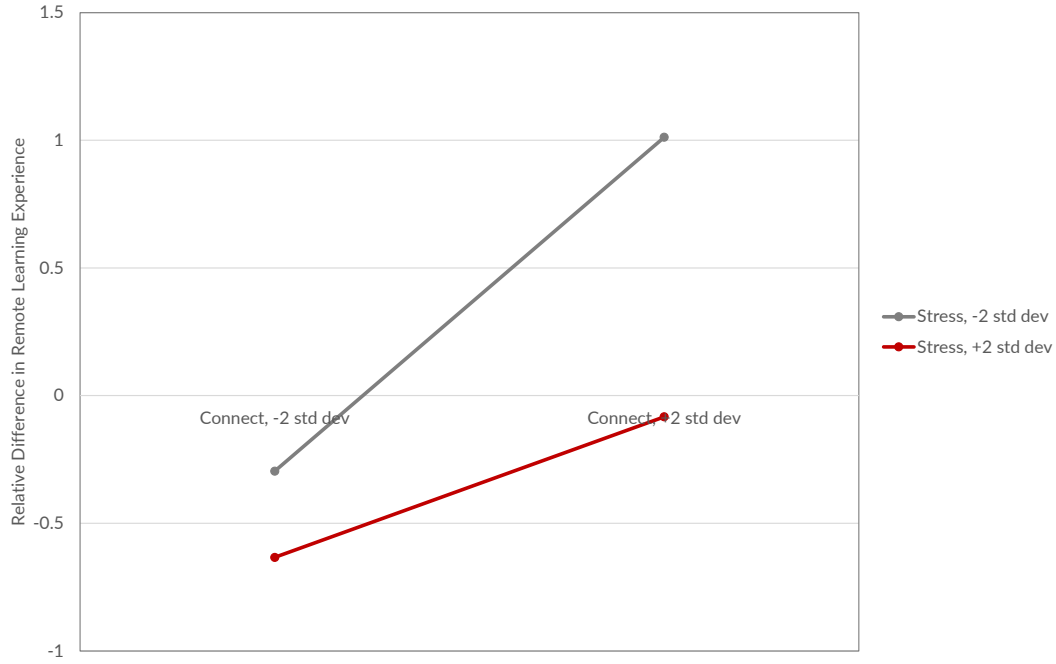
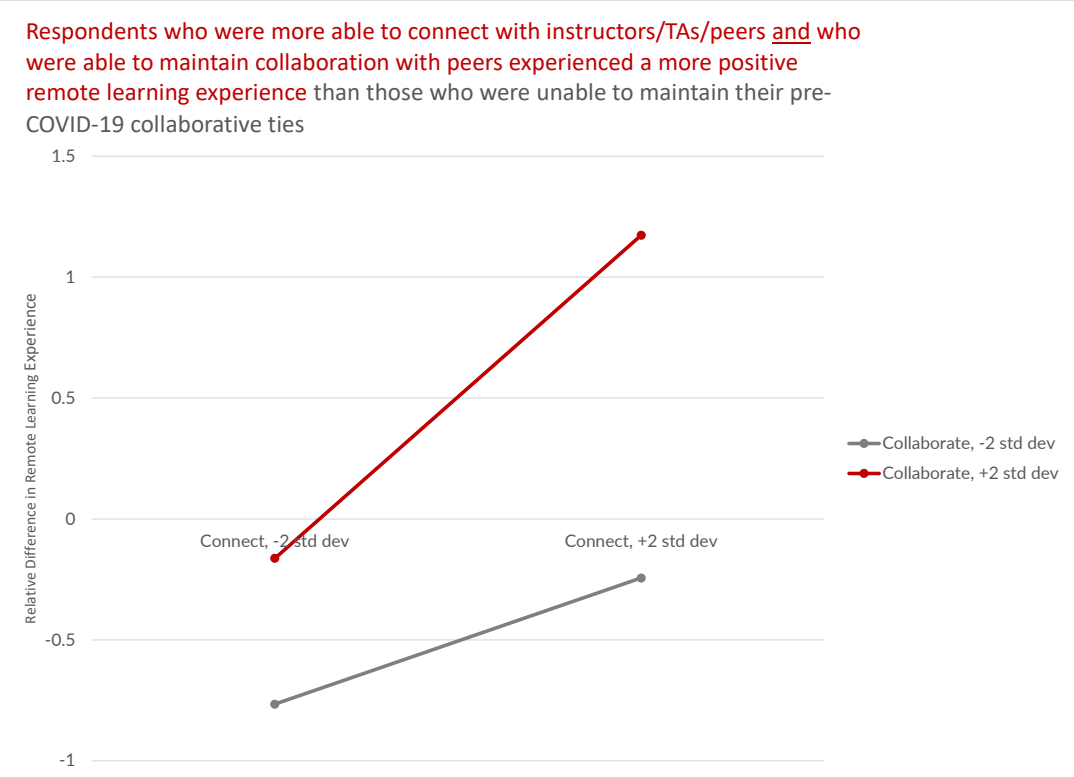


Figure 3.



Despite these three combinations being statistically significant, their corresponding effect sizes were not substantive.[vii] Yet, similar to the effects sizes for undergraduate respondents and respondents who lived off campus in the U.S., the experiences of, for example, female respondents who reported a more negative remote learning experience were likely significant at the individual level.

RECOMMENDATIONS

Despite the small effect sizes of the significant variables in my analysis, the effects were likely substantial for negatively affected individual respondents within the identified groups (undergraduate respondents, respondents who lived off campus in the U.S., etc.). Therefore, I recommend that efforts be made to better understand the needs of students most negatively affected by remote learning. One way to gain a better understanding would be to survey randomly selected respondents from each of these groups who reported having a negative remote learning experience during spring 2020. Alternatively, brief, structured conversations with these respondents may also contribute to understanding the specifics of the situation revealed by the current analysis.

MIT should also determine how best to support students who experience more challenging learning environments. This may involve working with instructors to brainstorm ways (e.g., offer learning options that are less bandwidth intensive) for students who do not have adequate internet and/or software access. Such changes will hopefully enable all students

to actively participate in the remote learning experience and have a more positive experience during the 2020-21 academic year.

Finally, I encourage the administration and instructors to continue to explore ways to encourage and aid student collaboration with peers and connection with subject-related instructors and staff and classmates. While MIT cannot eliminate student stress, administrators and instructors can locate, support, and promote select technological platforms and/or structural approaches that aim to increase student engagement.

IMPACT

My findings confirm what many have been hearing from and about students since the forced transition to remote learning. The current findings provide further support for the ongoing narrative surrounding student experiences with remote learning. Furthermore, the current analysis provides details on which student groups may require additional assistance and guidance during the coming academic year and underscores the power of connection and collaboration to shape a more positive remote learning experience.

REFFERENCES

Cohen, Jacob. 1992. "A Power Primer." *Psychological Bulletin* 112(1):155–159.

Bodner, Todd E. 2017. "Standardized Effect Sizes for Moderated Conditional Fixed Effects with Continuous Moderator Variables." *Frontiers in Psychology* 8:562 <https://www.frontiersin.org/articles/10.3389/fpsyg.2017.00562/full> (Accessed August 10, 2020).

[i] Thirty percent of students responded to the survey (see https://ir.mit.edu/remote-experience). In this memo, I refer to those who responded to the survey as respondents. When referring to all students, I use the word students.

[ii] I used exploratory factor analysis to create the remote learning index. Generally, an index represents a latent or intangible element of social life. Examples of such elements include: trust, hope, learning, and success. An index usually consists of several survey items in order to represent complex, social constructs.

[iii] This item was reversed coded so that all items included in the index were in the same direction and results could be easily interpreted.

[iv] A control variable is used to decipher if the findings are confounded by another variable or variables. Statistical control, therefore, subtracts the effects of a control variable in order to isolate the relationship between, for example, first generation respondents and the remote learning experience.

[v] Of that nine percent, 96 percent completed less than half of the survey items.

[vi] I divided each result by the standard deviation of remote learning. In this metric, the effect size for undergraduate respondents, for example, was 0.21 of a standard deviation, .012 of a standard deviation for Hispanic respondents, and 0.13 of a standard deviation respondents who lived off campus in the U.S. An effect size of 0.5 is considered a moderate effect (Cohen, 1992). For continuous variables, like access to internet and

software, I fully standardized the effect size using the standard deviation of each continuous variable (i.e. the resultant coefficient multiplied by its corresponding standard deviation and then divided by the standard deviation of remote learning). As such, a one standard deviation increase in access to the internet corresponded to a remote learning experience that was 0.12 of a standard deviation higher. Whereas, access to software corresponded to a remote learning experience that was 0.07 of a standard deviation higher.

[vii] To calculate the effect sizes of the interaction terms, I used the semi-partial correlations metric discussed in Bodner (2017). Additionally, Bodner (2017) provided guidelines on how to interpret semi-partial correlations, where .14 is small, .42 is moderate and .71 is large. Using Bodner's metric, all of the significant interaction effects were classified as small: female x collaborate was -.014, -.008 for stress x connect, and .01 for connect x collaborate. Notably, effect sizes for interaction effects tend to be smaller than effect sizes for main effects.