The Impact of COVID-19 Pandemic on Undergraduate Students' Interest in the STEM Field

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Abstract

We investigated the self-reported impacts of COVID-19 on the academic experiences of STEM students, including those from traditionally marginalized backgrounds, at one liberal arts college. Historically, STEM success and graduation rates are lower for students from marginalized groups and we predicted that these preexisting inequities would be exacerbated. From a survey of 391 participants, students reported receiving worse grades and fewer hands-on experiences during COVID-19, leading to lower motivation levels and negative mental health. Interestingly, there were positive effects: students reported developing new hobbies, improving relationships, and self-growth. These likely occurred because students had more time to themselves. We are continuing to analyze data for different outcomes for students from marginalized groups. Our data will be shared with campus faculty in hopes of improving course instruction, lessening inequities, and potentially making up for the lost academic time.

Introduction

- National data indicate that PEER (Persons Excluded due to Ethnicity or Race; Asai, 2020) and first-generation college students' interest in pursuing STEM is equivalent to their White, non-PEER counterparts, but these students are less likely to graduate with STEM degrees (Witham et al., 2015)
- Women STEM students also feel less supported in STEM classrooms (De Grandi et al., 2021)
- Changes imposed by COVID-19, including the switch from in-person to hybrid/ virtual learning; increased coursework; and pre-recorded lectures with a lack of student-professor communication (Pagoto et al., 2021) may exacerbate inequities
- Purpose: To evaluate how COVID-19 negatively or positively impacted students' academic motivation and career aspirations with the hopes of improving course instruction.

Method

- 391 students self-reported responses to a 21-question survey about impacts of COVID-19 on the academic experiences of STEM students
- The survey consisted of 18 closed-ended (including demographics) and 3 open-ended questions and was distributed through the University Registrar's office
- The survey was administered online from Feb. 14-25, 2022
- Respondents had the option to enter into a lottery to win one of 10 $20 Amazon gift cards

The following shows examples of open vs. close ended questions:

Open ended: *Has the pandemic impacted you positively in any way? Please explain.*

Closed ended: *To what extent did COVID-19 impact the following:* (*5 point scale of Large negative impact (1) to Large positive impact (5)*)

Your grades/GPA
Your interest or passion for STEM
Your learning in the STEM courses taken during COVID-19
Ability to get the in-class in-person lab experiences you need
Opportunity to get a relevant internship or research experience

Results

- Reported NEGATIVE impacts on school life:

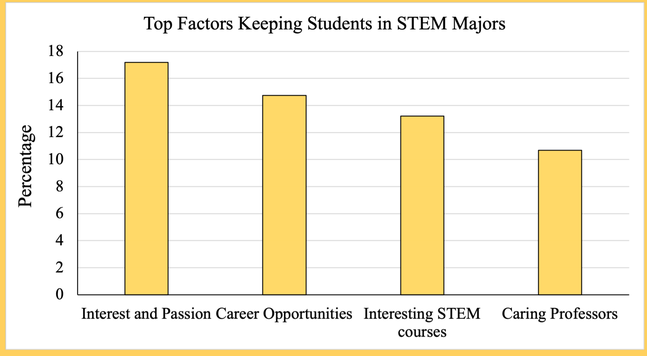
"Felt separated from reality."

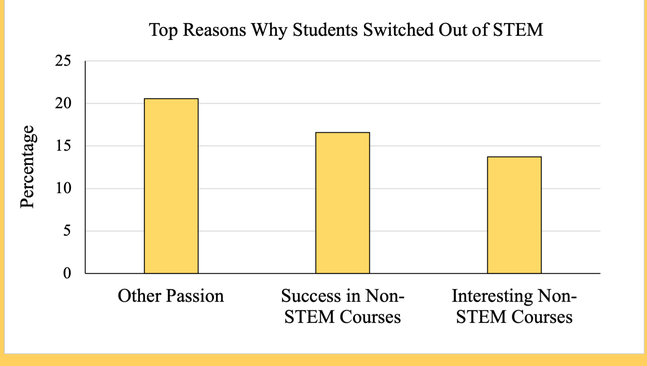
"Impossible to understand [material] because I didn't have access to all the normal resources."

- Reported POSITIVE impacts on school life:

"[The pandemic] taught me to be flexible and learn how to teach myself, therefore allowing me to discover the learning strategies that worked for me."

"[Because of the pandemic, I could] reanalyze social structures and commit to fighting for beneficial social change."





- In terms of STEM success in particular, domestic students reported less success in their STEM courses taken during COVID than international students, $t(232)=2.204$, $p=0.029$ ($M_I=3.21$, $M_D=2.87$) and learning, $t(234)=3.922$, $p<0.01$; ($M_I=2.74$, $M_D=2.17$)
- Domestic students were affected more by quality of STEM courses than international students, $t(234)=3.832$, $p<0.01$ ($M_I=2.62$, $M_D=2.09$)
- Similar differences were found between White students and PEER students.

40%
of students of all identities equally reported feeling pushed away from STEM

For students who felt "pushed away" from STEM, the top reasons were:

15.65%
Believed STEM courses were poorly taught

13.91%
Didn't receive the grades in STEM courses that they wanted/needed

Conclusions

- Students' experiences in STEM majors in most cases, regardless of their race and immigration status, had been equally influenced by the pandemic positively or negatively, with *two exceptions*:

1. White students reported a more negative impacts on their learning in STEM classes compared to PEER students
2. Domestic students reported more negative impacts including less success and more impact on learning

- One possible explanation could be that privileged students are not as used to having to adapt to changes, whereas international and PEER students are more "resilient" and experienced in responding to challenges.

Limitation: Our data were gathered from one small liberal arts college, which might not be representative enough to generalize to all STEM students.

Future Directions:
- Reporting the results to STEM course instructors
- Conducting focus groups to further discuss problems STEM students faced

Recommendations

- Academic Institutions: Provide make-up opportunities such as online and/or in-person workshops on basic lab skills; provide internship opportunities or resources for obtaining an internship
- Professors: Be mindful about the assigned course load; Utilize more class time for work; Allow extensions
- University Counseling Services: Visit classrooms to directly speak to students instead of putting pressure on already stressed-out students to make the first move
- Employers: Provide extra internships; Extend deadlines; Provide more opportunities for students at higher level grade levels

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