

Why students leave STEM?

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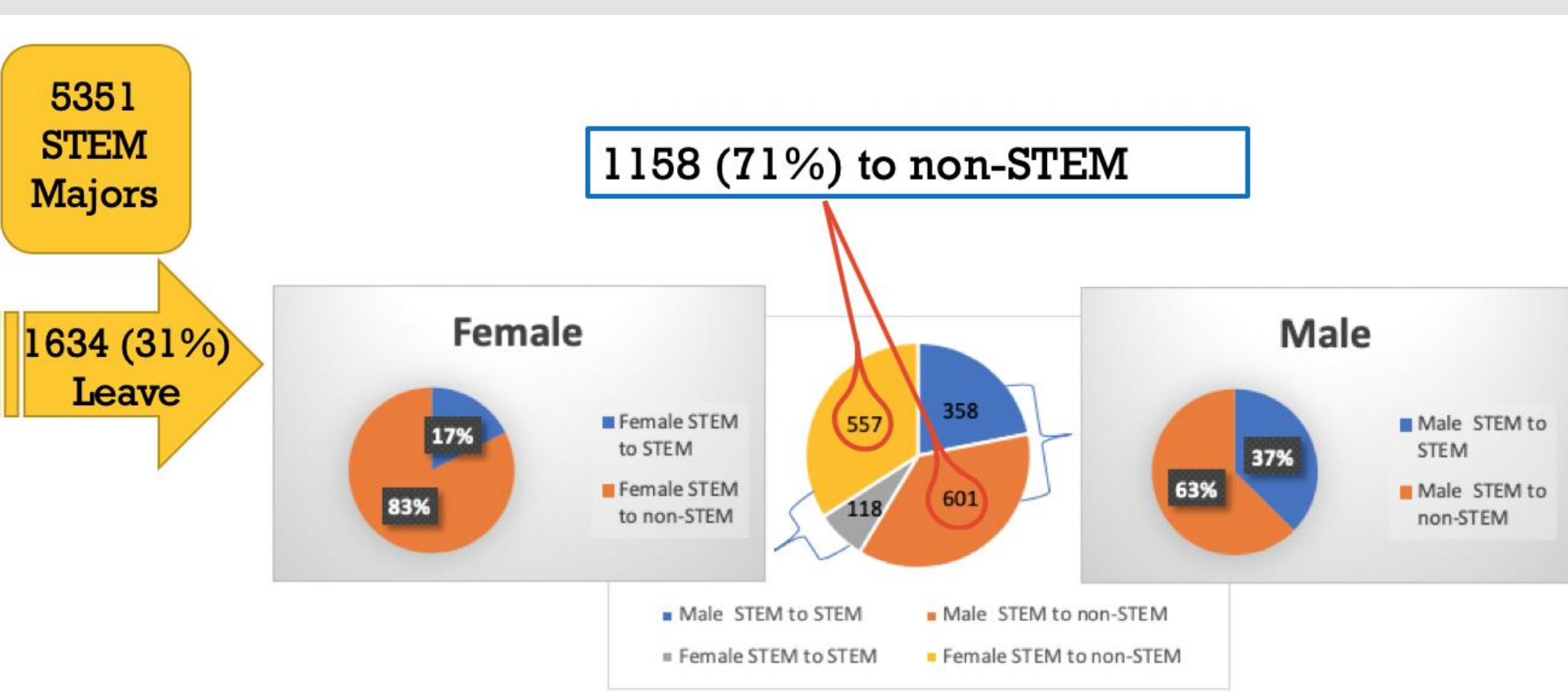
Research Questions

The goal of this project was to examine students who started college as Science, Technology, Engineering, and Mathematics (STEM) majors and switched. We asked why they chose those majors in order to gain insight into their experiences in and out of STEM fields.

- 1) When did the students switch out from their initial STEM majors and move into other majors?
- 2) To what majors did students switch?
- 3) How did students' STEM learning experiences relate to their major switching?

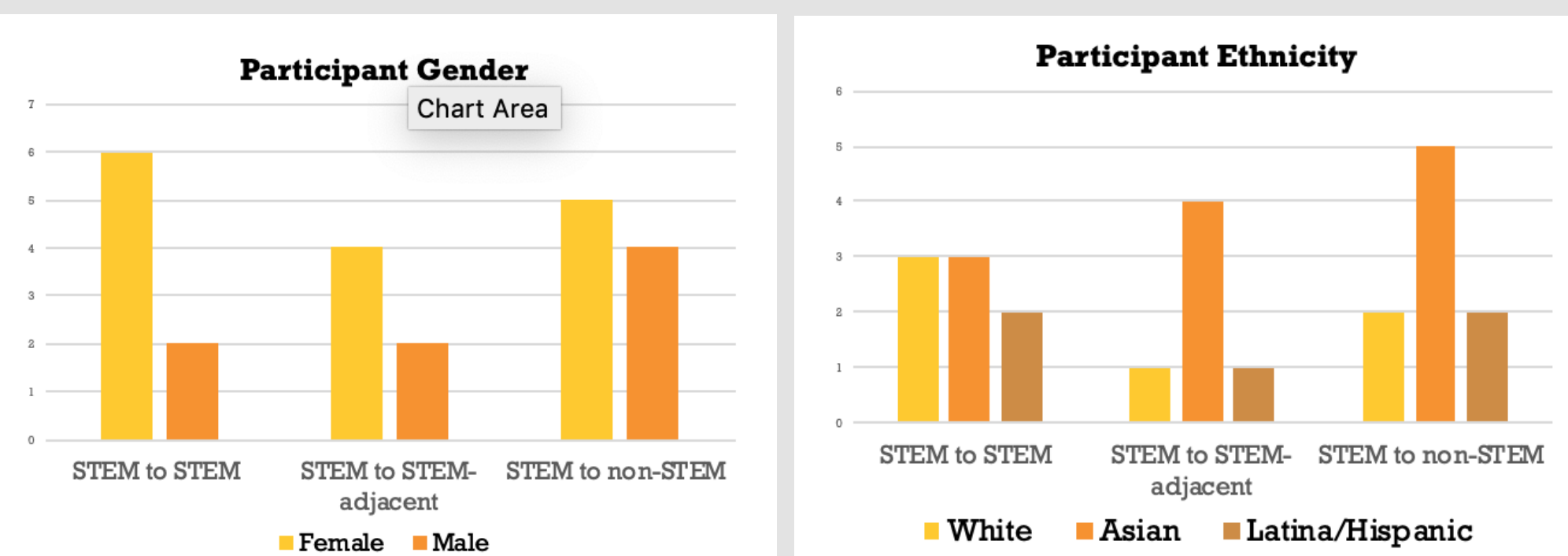
Introduction

- Many students who chose STEM majors are leaving their initial majors.
- Among 5351 students who started in CNSM & COE from fall 2014 to fall 2017, 31% students left their initial majors.
- 71 % of switchers moved to non-STEM majors.



Methods

- Interviewed 23 students who switched from their initial STEM majors from 2013-2017.
- Participants were asked:
 - ✓ their decision-making process for choosing the initial STEM majors and for switching majors
 - ✓ their experiences as STEM and non-STEM majors
 - ✓ their images about STEM fields/disciplines and STEM careers



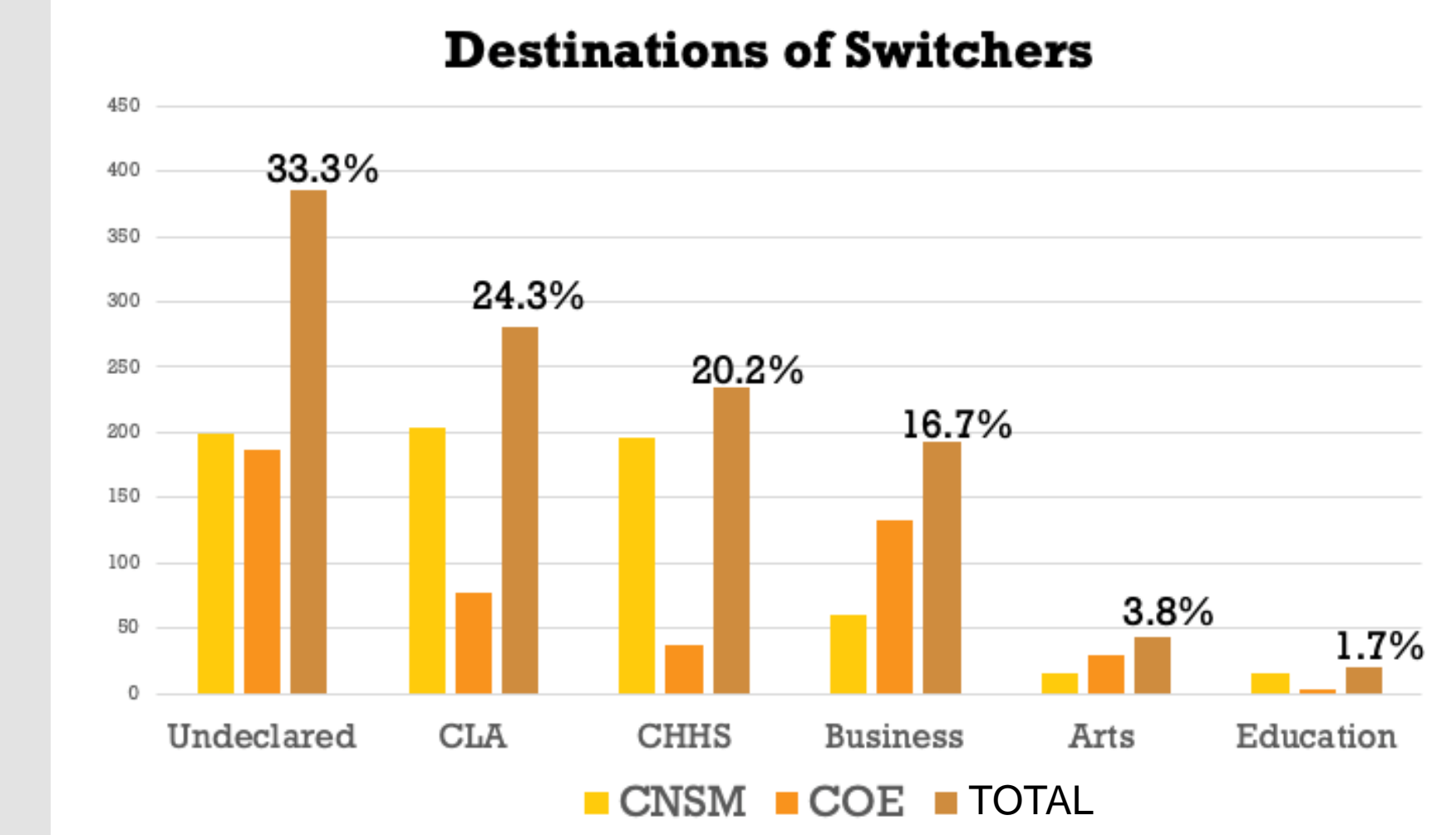
- The interview data was analyzed thematically utilizing constant comparative methods.

Results

When and Where?

- Largest proportion of students left their initial STEM majors by the end of the first year.
- 85% students made their decisions of switching out of their initial STEM majors within two years.
- Arrangement of the switchers' final destinations by college:
Undeclared (33.3%) > College of Liberal Arts (24.3%) > College of Health and Human Services (20.2%) > College of Business (16.7%) > College of the Arts (3.8%) > College of Education (1.7%)

Semester	2	3	4	5	6	7	8	9
Cohort Year								
2013	197	1	82	74	40	30	15	16
2014	148	4	95	86	39	22	11	14
2015	158	1	75	60	29	23	0	0
2016	133	14	69	62	0	0	0	0
2017	124	5	0	0	0	0	0	0
Total	760	25	321	281	108	75	26	30



Factors Leading to a Switch in Major

Course related factors: Quality of instruction, Experiences w/instructors

"Physics labs were totally nonsense. It seemed like most of the time, the physics lab instructor was just as lost as we were, and everyone just wanted to fill out the worksheets and get out of there including the instructor. So, I didn't really feel like it was constructive." (Daniel, SS, Male, White)

"They just expected you already know the things. They kind of assume that when you ask them questions, you're doing it because you're lazy because you're not trying to figure it out first." (Chris, SN, Male, Asian/European)

"I look [chemistry] over the summer, the classes were really small, so it did feel more intimate and the professors were very, very understanding. And it was like 'we know that this class is very difficult.... If you are struggling, we are totally free to help you out.' And it really showed in their efforts, and so it was a good learning environment, very supportive.... there wasn't a single moment in that class where I thought it was easy, it challenged me a lot. But I didn't feel overwhelmed even though the pacing was very fast." (Lily, SS, Female, Asian)

Context related factors: Class size => interaction, Advisement, Parental Pressure

"I feel in general that the [STEM] field can be lonely because people are just studying all the time, and there isn't [initially an] expectation for you to study with other people." (Carl, SN, Male, Asian/Pacific Islander)

"I understand because it's like a big lecture hall, and it is hard to really help students one-on-one." (Jacee, SS-adj, Female, Asian)

"The 100 Engineering class was a lecture course with 100 people and you're just kind of in the back.... I don't think they were rude or anything like it, just like ... 'huh, you're going through it, you know you're one in 100', 'okay, I go to class, I do the work.'" (Calvin, SN, male, Half Asian)

"In my program within President's Scholars, we had to do semester advising. They didn't exactly prepare me into finding what I wanted to do. It was more like just a check in. So, I would say a lot of it was on me.... I can't necessarily say that I had a resource to look at." (Joshua, SS, Male, Asian/Pacific Islander)

"I went to the advisor in STEM once, and I didn't have a really good experience. I was asking whether I should add this, it was a biostatistics class, to my schedule... she told me, 'Oh, it's up to you'.... I needed support and like, 'what have you seen other students do?' She was like, 'Well, it's up to you, do you think you can handle it?' I didn't feel she helped me very much." (Angela, SN, Female, Pacific Islander)

"I didn't really choose to be quite honest, my mom wanted me to be a doctor, so most logical answer for me... in order to reach all the medical school requirements, just do Bio because that was obviously what you would get your degree and get all of the requirements done" (Angela, SN, Female, Pacific Islander)

Student related factors: Interest, Career

"Yeah, taking the lab classes, the lab classes are my favorite portions of any class. They are just fun but I decided, 'Oh, I want to do more with the environment instead of specific animals or people... I'm doing [biology] 212 class right now and we are doing plants in our section, and I'm like, 'Oh, this is fun. Why can't I do more of this?' You know." (Danae, SS, Female, Asian)

"I didn't exactly have an image [about biomedical engineers]. I think that's maybe a factor why I didn't stay in it." "I think what made me select biochem over regular chemistry was the fact that I wanted to go to pharmacy school. There're more things aligned with being a biochemistry as opposed to a chem major for the pre-reqs that I had to fulfill for pharm school." (Joshua, SS, Male, Asian/Pacific Islander)

Conclusion / Discussion

- We found that students often feel isolated and a lack of community in introductory courses. At a school that has many commuter students, it is sometimes more difficult for classmates to meet.
- Those students who remained in STEM adjacent or another STEM major typically reported making connections with "their people" – meaning other students in their major – as a large part of their success in STEM courses.
- Often, students weren't sure how their major could relate to future careers.
- Interestingly, no students mentioned being part of a STEM learning community which indicated that learning communities may help to retain students in their STEM major.

Implications for Action

- Advising meeting was held to share data. Rich discussion followed.
- Undergraduate faculty advisors are discussing actions such as having students sit together in class and working on pedagogy with part-time lecturers who usually teach introductory courses.
- More ways to explore careers and career options in STEM-STEM or STEM adjacent careers could be beneficial.

Next Steps / Future Directions

- Conduct additional interviews.
- With a larger group, we can begin to look at patterns within demographic groups.
- Re-evaluate data to look more deeply at STEM identity and how this relates to STEM switchers.