Revealing the Queer-spectrum in STEM: Undergraduate student responses to diverse gender identity and sexual orientation demographics questions

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Background

Heterosexist and gender-normative expectations prevalent in STEM education may lead to inequity for queer-spectrum individuals[1-4] Queer-spectrum (neither cisgender nor heterosexual) people in STEM experience under-representation[5] and the following:

- Exclusion from networking and resources; harrassment[6]
- Competence questioned; more negative work environment[6]
- "Silent" ("irrelevant") identity – not to be discussed[7]
- Decreased sense of belonging[8]
- Marginalization and devaluing; decreased professional success[6]

Counting queer people is vital to create systemic reform[9]

Research on the experiences of queer-spectrum individuals is limited by current demographic practices.

- Most surveys use cisheteronormative questions[9-12] rooted in a binary conception of gender
- No consensus on best practices[e.g.9-12]

Without providing options to self-identify we cannot[9]

- know about specific problems
- provide targeted support

Our work responds to the recent increase in literature on developing queer-inclusive survey questions and the call for inclusive demographic practices[9,11]. It is informed by identity development theory and master narrative theory, which explain the importance of developing one's own identities, including sexual orientation and gender identity, and how overarching cultural norms influence identity development[13].

Research Questions:
1. Are queer-spectrum students under-represented in computer science and engineering courses, relative to national data?
2. Which demographics questions produce the most informative data?
3. How do demographics questions compare with open-response answers?

Study Context

- Participants: undergraduates in engineering & computer science
- Survey questions part of two research projects in 2017-2020:
  - 4-institution study supporting diversity, equity, and inclusion as part of regular course work[14]
  - student engagement study at one institution; academic advisors sent surveys to students, no incentive
- The gender and sexual orientation questions were part of a larger set of demographics questions
- Survey questions were not originally developed to study queer-spectrum identities

Methods

Data collection
- Survey included conventional, queered, or open-ended questions (Table 1, see results for survey questions)
- Surveys were administrated in Qualtrics at students' convenience

Analysis
- Percent of individuals by identity
- Fisher's exact test for all comparisons

Table 1: Survey type administered by institution and semester

Institution and student level	Conventional	Queered	Open-ended
Public R1 A - First Year	S18, F18	S19	F19
Public R1 A - Upper Level			F19
Private - First Year	F17, F18	S19, F19	
Public R1 B - First Year	F17, S18, F18	S19, F19	
Public R1 B – Senior		F19, S20	
Public R1 B - All levels		F19	
Public Teaching - Introductory		F19	

Findings (in progress)

Queer identities are under-represented

- ~2.9% of the US population has a queer gender identity[9]; 0.66% of our students did (Table 2, $p<.0001$)
- People with queer-spectrum genders are under-represented in our dataset by at least 2/3
- In comparison, women are under-represented by less than 1/2 in our dataset.
- Lack population data on queer sexual orientations

Table 2: Queer-spectrum and cisgender/heterosexual student identities[A]

	Gender			Sexual Orientation		
	n	Queer	Cis	n	Queer	Heterosexual
Overall	2744	0.66	96.73	1737	14.10	82.98
Public R1 A	1611	0.43	96.71	604	8.94	85.93
Private	224	2.25	97.75	224	12.50	87.50
Public R1 B	894	0.67	96.46	894	18.01	79.80
Public Teaching	15	0	100	15	13.33	86.67

A: Percents may not add up to 100% due to responses such as "prefer not to respond," "I do not understand the question," or blank answers.

Conventional surveys with an "other" option capture fewer queer gender identities than queered survey (Tables 3 and 4a p=.0023)

Table 3: Conventional survey across all institutions (n=2542)

Please indicate your sex	%
Male	72.54
Female	25.73
Other **OR** I do not identify as either. I identify as (blank) **OR** preferred gender	0.43
Prefer not to respond	0.43
Left Blank	0.08

Table 4a: Queered gender across all institutions (n=1737)

Please indicate the gender(s) you affiliate with:	%
Female/feminine	28.61
Genderqueer/genderfulid	0.35
Intersex	0.06
Male/masculine	67.88
Nonbinary/thirdgender	0.29
Transgender	0.35
Two-spirit	0.12
Prefer not to respond	0.81
I don't understand	0.98
A gender not listed here:	0.98
Left blank	1.32

Table 4b: Sexual orientation across all institutions (n=1737)

Please indicate the sexual orientation(s) you feel describe you most closely.	%
Asexual	4.26
Bisexual	4.43
Gay	1.38
Lesbian	0.63
Pan/Omnisexual	0.75
Straight/Heterosexual	74.32
Queer	0.52
Prefer not to respond	2.01
Don't understand	1.15
Self identify	0.40
Left Blank	3.40

Sexual orientation is relevant

- Some wrote it in for the general identity/ experience question on surveys where orientation wasn't asked

Allowing respondents to choose multiple options on the queer survey is important

- 83% of those with a queer gender chose multiple options
- 10% of those with a queer sexual orientation chose multiple options

Open-response only survey is not better than the queer options survey (Table 5)

- Some were confused about the question (*"I affiliate with all genders because I'm not transphobic or sexist"*).
- Identities students listed are on queered survey
- Did not prevent hostile answers (e.g. *"Attack Helicopter"*); these were <1% of responses for all survey types

Table 5: Consolidated open-ended responses (n=1007)

Please indicate the gender(s) you affiliate with:	%
Female/woman	20.16
Nonbinary/genderfluid	0.50
Male/man	76.07
Transgender	0.10
Inclusive answer (e.g. everyone)	0.50
Sarcastic/hostile answer	0.50
Heterosexual	0.60
Prefer not to answer	1.59

Discussion

Queer identities are relevant
- Ignoring queer identities is common and problematic[3,7,9,11,13]
- Some students wrote in sexual orientation when not asked
- Queer people overwhelmingly want inclusive demographics[11]

Queered survey balances self-identification with data quality and analysis needs
- Identities provided in the open ended question are well represented by the queered survey options
- Revisions from responses and further testing can improve the queered demographic question options

Cisheteronormative responses indicate underlying hostilities
- It is vital to center marginalized communities in decision-making
- Queer-inclusive survey questions make an inclusivity statement
- Inclusive questions do not harm cishetero participants[8]

Identity categories are necessary for quantitative analyses
- Giving participants options to select their own categories, as well as provide for open-ended responses, allows individuals to pick their category, rather than having researchers try to interpret identity categories

Counting is vital for systemic reform, but it is not enough[9]
- Inclusive demographic questions are only a first step - it is vital to research queer students' experiences to address underlying systems of oppression

Future Work
- Further research on queer demographics surveys
- Research on problems queer-spectrum individuals face in STEM
- Development of practices to address existing problems

Do you want to use our survey questions?

Contact us to learn about helping test survey 2.0

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