

Supplemental Material

CBE—Life Sciences Education

Busch *et al.*

Supplemental Material for

Beyond gender and race: The representation of concealable identities among college science instructors at research institutions

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Tables S1 to S8

Legends for Datasets S1 to S4 available in the GitHub repository

Supplemental References

Table S1. Questionnaire items for science instructors, separated by pertinent research question; in instances where the text in the table is in brackets (< >), the item was updated to reference the participant’s specific identity. If the participant reported more than one CSI, they received parallel questions for each identity.

RQ1. To what extent do science instructors hold CSIs?		
<i>Identities of interest</i>	Do you identify as a member of the LGBTQ+ community?	Yes
		No
		Decline to state
	[If yes LGBTQ+] Please select the word or words that best describe your identity(ies) within the LGBTQ+ community.	Lesbian or Gay
		Bisexual
		Queer as it relates to my sexuality
		Asexual
		Pansexual
		Transgender man
		Transgender woman
		Genderqueer or gender nonbinary
		An identity not listed, please describe
		Decline to state
	I most closely identify as	Someone who has or has had depression
		Someone who does not have depression
		Decline to state
	I most closely identify as	Someone who has or has had anxiety
		Someone who does not have anxiety
		Decline to state
	I most closely identify as	Growing up in a low-income household
		Growing up in a middle-income household
		Growing up in a upper-income household
		Decline to state
	I most closely identify as	Someone who has or has had an addiction to drugs or alcohol
		Someone who has not had an addiction to drugs or alcohol
		Decline to state
	I most closely identify as	A first-generation college student
		A non-first-generation college student (at least one of my parents or guardians has a bachelor's degree or equivalent)
		Decline to state
	I most closely identify as	Someone who struggled academically in college
		Someone who did not struggle academically in college
		Decline to state
	I most closely identify as	Having a disability
		Not having a disability
		Decline to state
	Which option most closely reflects your	I transferred to a 4-year institution from a 2-year college, a community college, a junior college, or a technical college
		I transferred to a 4-year institution from another 4-year institution

	undergraduate college experience?	I started my college career at the same 4-year institution from which I graduated
		If none of the above reflect your experience, please describe
		Decline to state
<i>Perceived concealable</i>	Do you perceive that your <identity> is concealable; that is that people may not know that you identify this way unless you tell them?	Yes, people may not know I identify this way
		No
RQ2. To what extent are science instructors revealing their CSIs to undergraduates?		
<i>Extent of reveal</i>	Considering the last time you taught the science course you indicated earlier in the survey, to what extent did you reveal your <identity> to undergraduates enrolled in that course?	I reveal this identity to all undergraduates in this course (e.g., I reveal my identity to the whole class).
		I reveal this identity to some undergraduates in this course (e.g., during office hours).
		I do not reveal this identity to undergraduates in this course.
RQ4. What are the primary reasons why instructors conceal or reveal their CSIs?		
<i>Reasons to conceal identity</i>	Please select all of the factors that influenced your decision to conceal your <identity> from some or all undergraduates in this course.	I typically do not share my <identity> with others.
		I did not feel my <identity> was relevant to the course content.
		I had never thought about revealing my <identity> to all students in this course.
		I did not feel my <identity> was relevant to the students in this course.
		I did not feel like I had a personal enough relationship with the students in this course.
		I thought revealing my <identity> to all undergraduates in this course was inappropriate.
		I was concerned students would have a negative opinion about my <identity>.
		I did not know others in the department, such as other faculty or instructors, who had revealed a similar identity to people in the department.
		I was concerned that revealing my <identity> would waste class time.
		I was concerned that revealing my <identity> would result in poor course evaluations.
		I was concerned that I would be subjected to departmental disciplinary action for revealing my <identity>.
		I was concerned I could be fired for revealing my <identity>.
<i>Reasons to reveal identity</i>	Please select all of the factors that influenced your decision to reveal your <identity> to all undergraduates in this course.	I wanted to be an example to my students of someone who <holds this identity>.
		I wanted to be known as a supporter of individuals who also <hold this identity>.
		I felt that revealing my <identity> to students in this course was appropriate.

		I felt my <identity> was relevant to the students in this course.
		I wanted to serve as a mentor to students <with this identity>.
		I thought revealing my <identity> could make students more comfortable.
		I thought revealing my <identity> could make me more relatable to students.
		I prefer to live authentically or be open with others about my <identity>.
		I typically share my <identity> with people.
		I thought I could better engage students in the course material by making a connection between my <identity> and the course content.
		I thought revealing my <identity> could help students understand me or my circumstances better.
		I felt like I had a personal relationship with the students in the course.
		I felt my <identity> was relevant to the course content.
		I knew others in the department, such as other faculty or instructors, who have revealed a similar identity to people in the department.

Table S2. Evidence-based justification for including each identity as a concealable stigmatized identity.

Identity	Evidence as a concealable stigmatized identity
Anxiety	Anxiety is inversely related to persistence in science majors among undergraduates (England et al., 2017, 2019) and is widely considered to be a concealable stigmatized identity in many contexts (Chaudoir & Fisher, 2010; Henning et al., 2019; Quinn et al., 2014; Quinn & Chaudoir, 2009; Quinn & Earnshaw, 2011; Quinn et al., 2009).
First-gen college student	First-generation college students are less likely than continuing generation students to persist in STEM (Dika & D’Amico, 2016) and the identity is considered concealable (Henning et al., 2019).
Depression	Depression functions as a concealable stigmatized identity for undergraduates in research experiences (Cooper et al., 2020) and undergraduates with more depressive symptoms have worse academic performance (DeRoma et al., 2009). Like anxiety, depression is considered a concealable stigmatized identity in many different contexts (Chaudoir & Fisher, 2010; Chaudoir & Quinn, 2010; Henning et al., 2019; Quinn et al., 2014; Quinn & Chaudoir, 2009; Quinn & Earnshaw, 2011; Quinn et al., 2009).
Low income growing up	Growing up in a low-income household is associated with lower likelihood of choosing to pursue a STEM major (Niu, 2017) and is concealable (Henning et al., 2019).
Struggled academically in college	Struggling academically during college is a common reason that undergraduates leave STEM majors (Harris et al., 2020; Ost, 2010; Seymour, 1995; Seymour & Hewitt, 1997) and can carry negative stereotypes in part due to the competitive nature of college science courses (Canning et al., 2020).
LGBQ+	LGBQ+ identities are a common example of concealable stigmatized identities in various contexts (Chaudoir & Fisher, 2010; Chaudoir & Quinn, 2010; Henning et al., 2019; Quinn & Chaudoir, 2009; Quinn & Earnshaw, 2011; Quinn et al., 2009) and LGBQ+ undergraduates have lower STEM retention than their straight peers (Hughes, 2018).
Community college transfer student	Community college transfer students report experiencing transfer shock when making the transition to a four-year institution (Lakin & Elliott, 2016) which may help to explain the lower completion levels of STEM coursework among transfer students compared to undergraduates who remain at a four-year institution for their entire college experience (Bahr et al., 2017).
Has a disability	Students with disabilities have historically been excluded from higher education and frequently experience negative interactions with peers and instructors (Moon et al., 2012) and there are many hidden disabilities that are commonly considered concealable stigmatized identities (Chaudoir & Fisher, 2010; Chaudoir & Quinn, 2010; Quinn & Chaudoir, 2009; Quinn & Earnshaw, 2011; Quinn et al., 2009).
Addiction/substance use disorder	Substance use disorder is inversely related to academic growth (Rattermann, 2014) and is considered a concealable identity with a great amount of stigma associated (Barry et al., 2014; Quinn et al., 2014; Quinn & Chaudoir, 2009; Quinn & Earnshaw, 2011; Quinn et al., 2009).

Trans/nonbinary	Although gender is often considered to be a visible identity, that is not always the case and considering the prevalence of anti-trans legislation across the country (Trans Legislation Tracker, 2023) coupled with the lower STEM retention of trans and nonbinary undergraduates compared to their cisgender peers (Maloy et al., 2022), we included trans/nonbinary gender identities in the current study.
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Table S3. Questionnaire items for science undergraduates.

RQ3. How does the prevalence of CSIs among instructors compare to undergraduates?			
<i>Identities of interest</i>	Do you identify as a member of the LGBTQ+ community?	Yes	
		No	
		Decline to state	
	[If yes LGBTQ+] Please select the word or words that best describe your identity(ies) within the LGBTQ+ community.		Lesbian or Gay
			Bisexual
			Queer as it relates to my sexuality
			Asexual
			Pansexual
			Transgender man
			Transgender woman
			Genderqueer or gender nonbinary
			An identity not listed, please describe
			Decline to state
	Please indicate how you most closely identify. You do not need to have a formal diagnosis to identify as currently or previously struggled with depression or a depressive disorder.		Currently or having previously struggled with depression or a depressive disorder
			Having never struggled with depression
			Decline to state
	Please indicate how you most closely identify. You do not need to have a formal diagnosis to identify as currently or previously struggled with anxiety or an anxiety disorder.		Currently or having previously struggled with anxiety or an anxiety disorder
			Having never struggled with an anxiety disorder
			Decline to state
	What is your best guess for the yearly income of the household in which you grew up?		Low income (less than \$25,000)
			Middle-low income (\$25,000-\$49,999)
			Middle income (\$50,000-\$99,999)
			Middle-high income (\$100,000-\$199,999)
			High income (\$200,000 or higher)
		Decline to state	
	I most closely identify as		Someone who has or has had a substance use disorder or addiction to drugs or alcohol
			Someone who has not had a substance use disorder or addiction to drugs or alcohol
			Decline to state
What is your parent/guardian's highest completed level of education? If you have more than one parent/guardian with differing levels of education, choose the parent/guardian with the highest completion level.		Did not complete high school	
		High school diploma or GED	
		Some college but no degree	
		Associate degree (for example: AA, AS)	
		Bachelor's degree (for example: BA, AB, BS)	
		Master's degree (for example: MA, MS, Meng, MSW, MBA)	
		Higher than a Master's degree (for example: PhD, MD, JD)	

		Other (please describe)
		Decline to state
	<i>I most closely identify as</i>	Someone who struggled academically in college
		Someone who did not struggle academically in college
		Decline to state
	Do you identify as having a disability?	Yes
		No
		Decline to state
	Which option most closely reflects your undergraduate college experience?	I transferred to a 4-year institution from a 2-year college, a community college, a junior college, or a technical college
		I transferred to a 4-year institution from another 4-year institution
		I have attended the same 4-year institution for my entire undergraduate experience
		If none of the above reflect your experience, please describe
		Decline to state

Table S4. Distribution of instructor and undergraduate participants by state.

State	% instructors	% undergraduates	State	% instructors	% undergraduates
AL	1.3	0.0	MS	1.6	0.0
AR	0.1	0.0	MT	0.2	0.0
AZ	8.2	6.9	NC	3	0.0
CA	10.9	1.4	NE	1.8	8.3
CO	3.3	0.0	NH	0.4	0.0
CT	2.2	0.0	NJ	1	0.0
DC	1.2	0.0	NM	0.2	0.0
DE	1.1	0.0	NV	0.6	0.0
FL	4.4	0.0	NY	3	32.0
GA	1.7	0.0	OH	2.5	0.2
HI	1.4	0.0	OK	3	0.0
IA	1.4	2.3	OR	1.4	32.8
IL	2.9	0.0	PA	4.7	9.8
IN	2.4	0.0	RI	0.9	0.0
KS	0.7	0.0	SC	4.8	1.2
KY	0.5	0.0	TN	0.7	0.0
LA	0.3	0.0	TX	4.4	0.0
MA	5.2	0.0	UT	1.7	0.0
MD	1.7	0.0	VA	3.5	0.0
ME	0.1	0.0	WA	2.4	4.8
MI	2.9	0.0	WI	2.4	0.0
MN	1.1	0.0	WV	0.3	0.0
MO	0.7	0.0			

Table S5. Distribution of instructor and undergraduate participants by discipline.

Discipline	% instructors (by course subject)	% undergraduates (by major)
Biology/Life sciences	54.3	33.9
Chemistry	15.6	2.2
Geosciences	9.3	1.2
Physics	20.8	0.2
Engineering	NA	10.9
Mathematics and Statistics	NA	1.2
Computer Science	NA	3.9
Multiple science majors	NA	9.9
Multiple STEM majors	NA	2.6
Non-STEM major	NA	14.9
Other STEM major	NA	19.0

Table S6. Race/ethnicity, gender, and age demographic breakdown of science instructor participants.

Demographic	Identity	Percent (n)
Race/ethnicity	White	76.20 (951)
	Asian	9.62 (120)
	Hispanic, Latino/a, or of Spanish origin	5.05 (63)
	An identity not listed (including multiracial)	2.72 (34)
	Black or African American	1.52 (19)
	American Indian or Alaska Native	0.40 (5)
	Pacific Islander	0.16 (2)
	Decline to state	4.32 (54)
Gender	Man	54.57 (681)
	Woman	42.63 (532)
	Genderqueer or nonbinary	0.40 (5)
	An identity not listed	0.08 (1)
	Decline to state	2.32 (29)
Age	28-32	2.8 (35)
	33-37	15.06 (188)
	38-42	14.90 (186)
	43-49	21.15 (264)
	50-59	19.23 (240)
	60-69	15.54 (194)
	70+	4.25 (53)
	Decline to state	7.05 (88)

Table S7. Frequency for each reason to conceal a CSI was selected across all 10 CSIs out of all instances where an instructor reported a CSI and did not reveal the identity to all undergraduates (n=1414).

Reason to conceal identity	Percent (n)
I typically do not share my identity with others	55.9 (791)
I did not feel my identity was relevant to the course content	54.2 (766)
I had never thought about revealing my identity to all students in this course	46.7 (661)
I did not feel my identity was relevant to the students in this course	40.8 (577)
I thought revealing my identity to all undergraduates in this course was inappropriate	39.5 (558)
I did not feel like I had a personal enough relationship with the students in this course	39.2 (554)
I was concerned students would have a negative opinion about my identity	21.9 (309)
I did not know others in the department, such as other faculty or instructors, who had revealed a similar identity to people in the department	21.4 (302)
I was concerned that revealing my identity would waste class time	16.1 (228)
I was concerned that revealing my identity would result in poor course evaluations	15.3 (217)
I was concerned that I would be subjected to departmental disciplinary action for revealing my identity	6.9 (97)
I was concerned I could be fired for revealing my identity	4.0 (57)

Table S8. Frequency for each reason to reveal a CSI was selected across all 10 CSIs out of all instances where an instructor reported a CSI and revealed the identity to all undergraduates (n=228).

Reason to reveal identity	Percent (n)
I wanted to be an example to my students of someone who holds this identity	80.3 (183)
I wanted to be known as a supporter of individuals who also hold this identity	69.3 (158)
I felt that revealing my identity to students in this course was appropriate	66.2 (151)
I felt my identity was relevant to the students in this course	59.6 (136)
I wanted to serve as a mentor to students with this identity	56.6 (129)
I thought revealing my identity could make students more comfortable	50.4 (115)
I thought revealing my identity could make me more relatable to students	46.1 (105)
I prefer to live authentically or be open with others about my identity	40.4 (92)
I typically share my identity with people	35.1 (80)
I thought I could better engage students in the course material by making a connection between my identity and the course content	22.8 (52)
I thought revealing my identity could help students understand me or my circumstances better	19.7 (45)
I felt like I had a personal relationship with the students in the course	18.9 (43)
I felt my identity was relevant to the course content	18.4 (42)
I knew others in the department, such as other faculty or instructors, who have revealed a similar identity to people in the department	5.7 (13)

Dataset S1 (separate file available on GitHub). For each CSI a participant reported, the extent to which they reveal that identity to undergraduates in the course they teach most often.

Dataset S2. (separate file available on GitHub) Summary of the prevalence of concealable stigmatized identities among instructors, whether they reveal their identity to all undergraduates in the course they teach most often, and the percent of undergraduates from a national sample who reported each identity.

Dataset S3. (separate file available on GitHub) For each CSI a participant reported, the combinations of reasons they selected as to why they reveal the identity from all undergraduates in the course they teach most often.

Dataset S4. (separate file available on GitHub) For each CSI a participant reported, the combinations of reasons they selected as to why they conceal the identity from all undergraduates in the course they teach most often.

GitHub repository: <https://github.com/carlybusch/Beyond-gender-and-race>

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