Supplemental Material

Busch *et al*.

Supplemental material for

Unveiling concealable stigmatized identities in class: The impact of an instructor revealing her LGBTQ+ identity to students in a large-enrollment biology course

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This supplement document contains the following:

Copy of survey items analyzed

At the beginning of the semester, your instructor shared a single slide that included some personal information about herself.

On the slide with personal information about herself, your instructor revealed that she was a member of the LGBTQ+ (Lesbian, Gay, Bisexual, Transgender, Queer+) community. To what extent do you remember this?

- o Do not remember at all

- o Remember somewhat clearly

- o Remember very clearly

(Fall 2020 only) Having my [instructor] reveal her LGBTQ+ identity:

- o Had a **very negative** impact on my experience in the course

- o Had a **moderately negative** impact on my experience in the course

- o Had a **slightly negative** impact on my experience in the course

- o Had **no impact** on my experience in the course

- o Had a **slightly positive** impact on my experience in the course

- o Had a **moderately positive** impact on my experience in the course

- o Had a **very positive** impact on my experience in the course

Please explain why having your instructor reveal her LGBTQ+ identity had a **positive** impact / **no impact** / a **negative** impact on your experience in the course.

To what extent do you agree with the following statement about any STEM (Science, Technology, Engineering and Mathematics) instructor who is LGBTQ+:

I think it is completely appropriate for instructors to reveal that they are a member of the LGBTQ+ community.

- o Strongly disagree

- o Disagree

- o Somewhat disagree

- o Somewhat agree

- o Agree

- o Strongly agree

Please explain why you think it is **appropriate** / **not appropriate** for instructors to reveal that they are a member of the LGBTQ+ community in the classroom.

To what extent do you agree with the following statements:

My instructor revealing her LGBTQ+ identity in the classroom increased my likelihood of approaching her for mentorship or guidance.

- o Strongly disagree
- o Disagree
- o Somewhat disagree
- o Somewhat agree
- o Agree
- o Strongly agree

My instructor revealing her LGBTQ+ identity in the classroom made me feel more connected to her.

- o Strongly disagree
- o Disagree
- o Somewhat disagree
- o Somewhat agree
- o Agree
- o Strongly agree

My instructor revealing her LGBTQ+ identity in the classroom increased my confidence in my ability to pursue a career in science.

- o Strongly disagree
- o Disagree
- o Somewhat disagree
- o Somewhat agree
- o Agree
- o Strongly agree

My instructor revealing her LGBTQ+ identity in the classroom increased my sense of belonging in the course.

- o Strongly disagree
- o Disagree

- o Somewhat disagree

- o Somewhat agree

- o Agree

- o Strongly agree

My instructor revealing her LGBTQ+ identity in the classroom increased my sense of belonging in the science community.

- o Strongly disagree

- o Disagree

- o Somewhat disagree

- o Somewhat agree

- o Agree

- o Strongly agree

I most closely identify as

- o Man

- o Woman

- o Non-binary

- o Other, please describe _____

- o Decline to state

I most closely identify as

- o American Indian or Alaska Native

- o Asian or Asian American

- o Black or African American

- o Hispanic or Latinx

- o Native Hawaiian or Pacific Islander

- o White

- o More than one race/ethnicity

- o Other, please describe _____

- o Decline to state

Do you identify as a member of the LGBTQIA* community? *lesbian, gay, bisexual, transgender, queer/questioning, intersex, asexual/aromantic

- o Yes
- o No
- o Decline to state

I most closely identify as

- o Agnostic (does not have a definite belief about whether God exists or not)
- o Atheist (believes that God does not exist)
- o Buddhist
- o Catholic
- o Latter-day Saint (formerly Mormon)
- o Protestant
- o Hindu
- o Jewish
- o Muslim
- o Nothing in particular
- o Other, please describe _____
- o Decline to state

I most closely identify with

- o Currently or having previously struggled with anxiety or an anxiety disorder
- o Having never struggled with an anxiety disorder
- o Decline to state

I most closely identify with

- o Currently or having previously struggled with depression or a depression disorder
- o Having never struggled with depression
- o Decline to state

Literature-supported justification for predictor variables in the regression models.

Drawing from prior literature, we hypothesized that students' LGBTQ+ identity would predict to what extent a student was impacted by the instructor revealing a shared identity because LGBTQ+ undergraduates have reported that knowing an instructor who is LGBTQ+ would make them feel more comfortable in the course (Cooper & Brownell, 2016) and increase their sense of belonging (Linley et al., 2016). Additionally, we hypothesized that students' gender would affect the impact of learning about their instructor's LGBTQ+ identity because undergraduate men have been found to be 6.2x more likely to perceive jokes about gay and lesbian people as funny while women were 4.0x more likely to perceive them as offensive (Cooper et al., 2018) and straight cisgender women undergraduate and graduate students have been found to hold more affirming LGBT attitudes than men (Woodford et al., 2012). We predicted that students' religious identities would affect the impact of their instructor's LGBTQ+ identity because individuals who identify as Christian (*Faith Positions*, 2021; Wilcox, 2020; Woodford et al., 2012; Worthen et al., 2017) or Muslim (Abraham, 2010; *Faith Positions*, 2021; Habib, 2010) have historically had unfavorable perceptions of LGBTQ+ individuals and LGBTQ+ identities, or opposing LGBTQ+ views. Further, race and ethnicity may affect the impact of an LGBTQ+ instructor. In a study of undergraduate and graduate students, straight white students were found to have more affirming LGBT attitudes than Black students (Woodford et al., 2012), however more recent studies of undergraduate students' LGBT attitudes found no relationship to ethnicity (Copp & Koehler, 2017; Worthen, 2018). Additionally, there may be a disproportionate benefit of an instructor coming out on students of color because members of marginalized groups may feel greater empathy toward each other (Cooper, Nadile, et al., 2020; Spanierman et al., 2012; Wade & Brittan-Powell, 2001). We also chose to include an additional concealable stigmatized identity (CSI) that students did not know whether they shared with the instructor: a history of anxiety and/or depression. We hypothesized that students with a CSI may be disproportionately impacted by an instructor revealing another concealable stigmatized identity (Cooper, Gin, et al., 2020; Quinn & Earnshaw, 2011), so we chose to include whether a student had a history of anxiety and/or depression in the model.

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Quinn, D. M., & Earnshaw, V. A. (2011). Understanding Concealable Stigmatized Identities: The Role of Identity in Psychological, Physical, and Behavioral Outcomes: Concealable Stigmatized Identities. *Social Issues and Policy Review*, *5*(1), 160–190. https://doi.org/10.1111/j.1751-2409.2011.01029.x

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Table S1. Coding rubric for why the instructor revealing her LGBTQ+ identity had a positive impact on students' overall course experiences.

Theme	Description of Theme	% (n)
Increase connectedness, makes instructor more "human"	Student reports that the instructor revealing her LGBTQ+ identity made her seem more relatable and humanized the instructor, and the student is more comfortable approaching the instructor because she revealed her LGBTQ+ identity.	45.6 (62)
Helps to create an inclusive environment free from judgement	Student reports that the instructor revealing her LGBTQ+ identity made the course community feel more welcoming and accepting for students of all backgrounds. Student feels the instructor would not judge them if they came to her with a problem or revealed a piece of personal information to her.	25.7 (35)
Normalizes LGBTQ+ identities and benefits LGBTQ+ students	Student reports that the instructor revealing her LGBTQ+ identity helps to reduce the stigma around the LGBTQ+ community by providing a positive role model who is LGBTQ+ and a successful scientist. Further, the instructor revealing her LGBTQ+ identity provides LGBTQ+ students a role model who shares an important identity, which likely leads to increased sense of belonging for LGBTQ+ students either in the class or in science in general.	18.4 (25)
Impact on the representation of LGBTQ+ individuals in science	Student reports that the instructor revealing her LGBTQ+ identity was a unique experience and few or none of their previous instructors have shared their LGBTQ+ identities.	13.2 (18)
Student is also LGBTQ+	Student reports that the instructor revealing her LGBTQ+ identity positively impacted their overall course experience because they are also a member of the LGBTQ+ community.	10.3 (14)
Shows instructor is confident	Student reports that the instructor revealing her LGBTQ+ identity made the instructor seem more confident and brave.	2.9 (4)

Table S2. Coding rubric for why the instructor revealing her LGBTQ+ identity had no impact on students' overall course experiences.

Theme	Description of Theme	% (n)
Does not change student's view of course, the teaching or learning in the course, or is otherwise not related to course content	Student reports that the instructor revealing her LGBTQ+ identity does not change their perception of the course in any way, including the material or the instructor's teaching ability.	60.9 (39)
LGBTQ+ identities are normal and no cause for judgement	Student reports that the instructor revealing her LGBTQ+ identity did not impact them because they do not judge others based on their LGBTQ+ identities, or do not see LGBTQ+ identities as noteworthy. Student does not care about their instructor's sexual orientation.	21.9 (14)
No impact personally, but mentions the potential positive impact for other students	Student reports that the instructor revealing her LGBTQ+ identity did not impact them personally, but they acknowledge that other students (primarily LGBTQ+ students) may benefit or have a positive impact from the instructor revealing her LGBTQ+ identity.	6.3 (4)
Student is not LGBTQ+	Student reports that the instructor revealing her LGBTQ+ identity did not impact their course experience because the student is not a member of the LGBTQ+ community. These students did not provide additional explanation for the lack of impact, only that they do not identify as LGBTQ+.	4.7 (3)

Table S3. Coding rubric for why it would be appropriate for a STEM instructor to reveal their LGBTQ+ identity during class.

Theme	Description of Theme	% (n)
Empowers LGBTQ+ community and normalizes LGBTQ+ identities	Student reports that an instructor revealing their LGBTQ+ identity provides a role model for LGBTQ+ students and helps to reduce the stigma around LGBTQ+ identities by providing a positive example of someone who identifies as LGBTQ+ in STEM.	28.9 (118)
Increases relatability and connectedness of instructor; helps students get to know them	Student reports that an instructor revealing their LGBTQ+ identity helps them relate to their instructor and makes it easier for them to form relationships with and feel connected to their instructor.	27.5 (112)
It is the instructor's choice to decide what to share and they are free to share what they want	Student reports that an instructor revealing their LGBTQ+ identity is appropriate because the instructor has free speech and the freedom of choice on what information to reveal about themselves.	22.5 (92)
It is important to the instructor and who they are	Student reports that an instructor revealing their LGBTQ+ identity is an important part of the instructor's identity, and therefore is important and appropriate to share with others, including in the context of a STEM classroom.	18.9 (77)
Builds community and trust in the classroom	Student reports that an instructor revealing their LGBTQ+ identity helps to create an inclusive environment in the classroom and signals to students that all perspectives will be valued.	13.2 (54)
Sharing a LGBTQ+ identity is the same as sharing other information or personal details	Student reports that an instructor revealing their LGBTQ+ identity is appropriate because instructors would share non-LGBTQ+ identities or other personal information without question and sharing an LGBTQ+ identity is no different.	9.3 (38)
It does not impact the student's education or the instructor's ability to teach	Student reports that an instructor revealing their LGBTQ+ identity does not impact an instructor's ability to teach or a student's ability to learn in a course.	5.9 (24)

Student does not care, or it does not matter to them	Student reports that an instructor revealing their LGBTQ+ identity does not matter to the student, and the student does not care if instructors choose to reveal their LGBTQ+ identity or not.	4.2 (17)
It is not inappropriate	Student reports that an instructor revealing their LGBTQ+ identity is appropriate simply because it is not inappropriate.	3.2 (13)

Table S4. Coding rubric for why it would not be appropriate for a STEM instructor to reveal their LGBTQ+ identity during class.

Theme	Description of Theme	% (n)
Not relevant to course material	Student reports that an instructor revealing their LGBTQ+ identity is irrelevant to course content.	65.0 (13)
Makes student uncomfortable or student worries other students would be uncomfortable	Student reports that an instructor revealing their LGBTQ+ identity would make them uncomfortable or might make others in the course feel uncomfortable if their instructor revealed an LGBTQ+ identity.	25.0 (5)
Promotes certain beliefs or world views	Student reports that an instructor revealing their LGBTQ+ identity promotes a certain set of beliefs or morals and that is inappropriate because an instructor should remain objective.	10.0 (2)
Student does not care, or it does not matter to them	Student reports that an instructor revealing their LGBTQ+ identity does not matter to the student, and the student does not care if instructors choose to reveal or conceal their LGBTQ+ identity.	10.0 (2)
Feels forced or asking for attention	Student reports that an instructor revealing their LGBTQ+ identity is forced or unnatural in the context of a STEM course and therefore is inappropriate.	10.0 (2)
It is a personal choice or preference	Student reports that an instructor revealing their LGBTQ+ identity is a personal choice for instructors to make.	5.0 (1)
STEM should be objective	Student reports that an instructor revealing their LGBTQ+ identity is not appropriate because science/STEM fields in general should be objective and avoid more sensitive subjects.	5.0 (1)

Table S5. Demographics of students who completed the survey, disaggregated by semester of enrollment.

	Fall 2019	Fall 2020
	% (n) (N = 221)	% (n) (N = 254)
LGBTQ+ status		
Yes	12.7 (28)	16.9 (43)
No	81.0 (179)	72.8 (185)
Decline to state	6.3 (14)	10.2 (26)
Gender identity		
Man	34.8 (77)	28.3 (72)
Woman	62.0 (137)	63.0 (160)
Non-binary	0.9 (2)	0.0 (0)
Decline to state	2.3 (5)	8.7 (22)
Religious identity		
Christian - Catholic	19.9 (44)	13.0 (33)
Christian - Protestant	6.3 (14)	5.5 (14)
Latter-day Saint	0.9 (2)	2.0 (5)
Christian (non-denominational or other denomination)	8.6 (19)	5.9 (15)
Muslim	4.5 (10)	5.1 (13)
Hindu	2.3 (5)	4.3 (11)
Buddhist	0.5 (1)	2.0 (5)
Jewish	1.4 (3)	0.8 (2)
Other	7.7 (17)	5.9 (15)
Agnostic	24.0 (53)	20.5 (52)
Atheist	9.5 (21)	11.4 (29)
Not religious	9.0 (20)	12.2 (31)
Decline to state	5.4 (12)	11.4 (29)
Race/Ethnicity		

American Indian or Alaska Native	0.5 (1)	0.0 (0)
Asian or Asian American	16.7 (37)	21.7 (55)
Black or African American	1.8 (4)	4.3 (11)
Hispanic or Latinx	15.4 (34)	12.2 (31)
Native Hawaiian or Pacific Islander	0.5 (1)	0.0 (0)
White	42.5 (94)	40.6 (103)
More than one race/ethnicity	12.2 (27)	6.7 (17)
Other	6.3 (14)	4.7 (12)
Decline to state	4.1 (9)	9.8 (25)
History of Anxiety and/or Depression		
Now or previously	61.5 (136)	61.0 (155)
Never	30.3 (67)	25.2 (64)
Decline to state	8.1 (18)	13.8 (35)

Table S6. Proportion of students who remembered their instructor revealing her LGBTQ+ identity, disaggregated by demographic group.

| Identity	% (n)	Identity	% (n)
LGBTQ+ status		**Race/ethnicity**	
Yes	94.4 (67)	White	91.4 (180)
No	90.1 (328)	Asian or Asian American	92.4 (85)
Decline to state	100.0 (17)	PEER	91.7 (77)
Gender identity		Decline to state	85.7 (6)
Man	86.6 (129)	**History of anxiety and/or depression**	
Woman	93.3 (277)	Now or previously	92.8 (271)
Decline to state	100.0 (1)	Never	88.5 (116)
Religious identity		Decline to state	84.0 (21)
Christian (e.g., Catholic, Protestant)	91.8 (134)	**Semester of enrollment**	
Muslim	91.3 (21)	Fall 2019	91.0 (201)
Other (e.g., Hindu, Buddhist, Jewish)	94.9 (56)	Fall 2020	90.2 (229)
Not religious (i.e., agnostic, atheist)	89.8 (185)		
Decline to state	91.7 (11)		

Table S7. Summary of logistic regression model of whether students remembered the instructor revealing her LGBTQ+ identity and students' LGBTQ+ status, gender, religion, race/ethnicity, history of anxiety/depression, and semester of enrollment.

| Variable	B	SE B	β	*p*
Intercept	58.70	790.93	2.42	.94
LGBTQ+ (yes)	0.12	0.58	0.04	.84
Gender (woman)	0.29	0.41	0.13	.48
Religion (Christian)	0.56	0.47	0.27	.23
Religion (Muslim)	0.47	1.12	0.09	.68
Religion (other)	0.54	0.68	0.19	.43
Race/ethnicity (Asian)	0.08	0.51	0.04	.87
Race/ethnicity (PEER)	0.04	0.51	0.02	.94
Anxiety/Depression (yes)	0.49	0.41	0.23	.23
Semester of enrollment (2020)	-0.03	0.39	-0.01	.94

B represents unstandardized coefficients. β represents standardized coefficients. Focus categories are provided in parentheses in column 1. Reference groups are non-LGBTQ+, men, not religious, white, no history of anxiety and/or depression, and 2019 semester.

Figure S1. Student responses for each of the five outcomes – Instructor approachability: willingness to approach the instructor for mentorship or guidance, Instructor-student connectedness: feeling connected to the instructor, Student confidence: confidence in their ability to pursue a career in science, Student class belonging: sense of belonging in the course, Student science belonging: sense of belonging in the scientific community – for a) LGBTQ+ students, b) non-LGBTQ+ students, c) men, d) women, e) Christian students, f) Muslim students, g) students of other religions, h) students who are not religious, i) white students, j) Asian students, k) PEER students, l) students with a history of anxiety and/or depression, m) students with no history of anxiety and/or depression, n) students enrolled in fall 2019, and o) students enrolled in fall 2020.
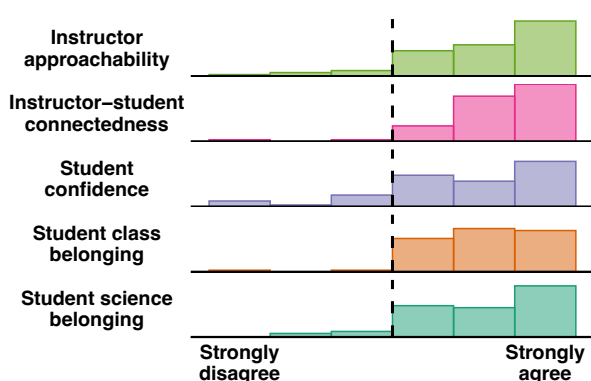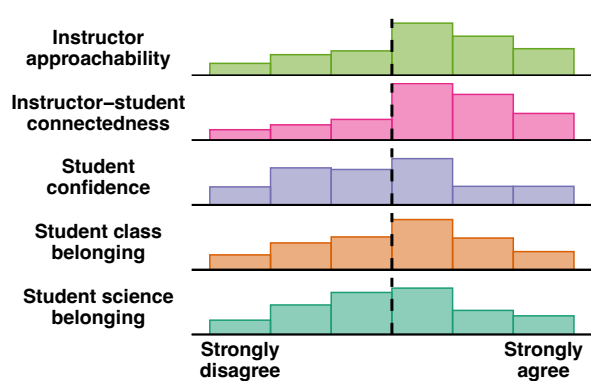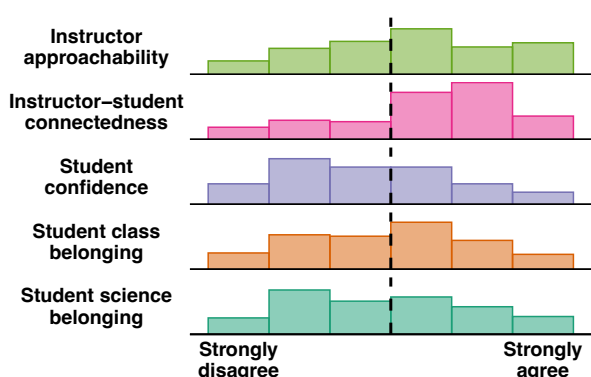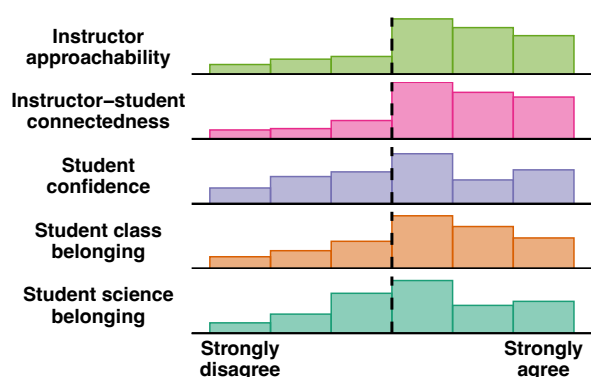
e) Christian

f) Muslim
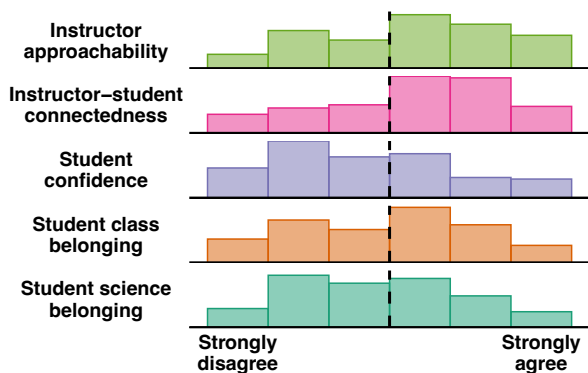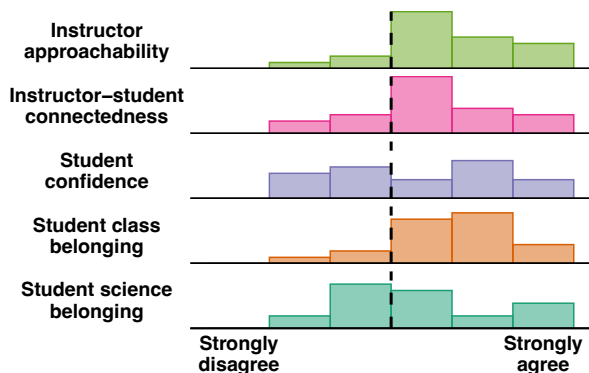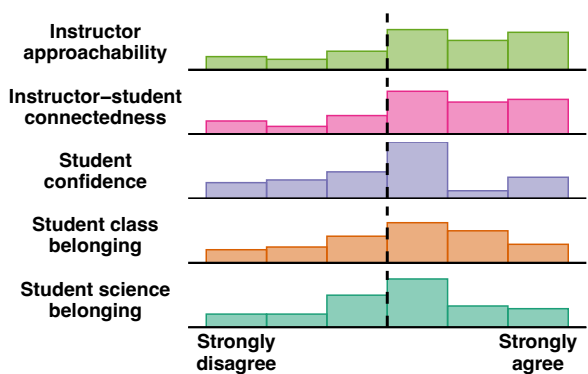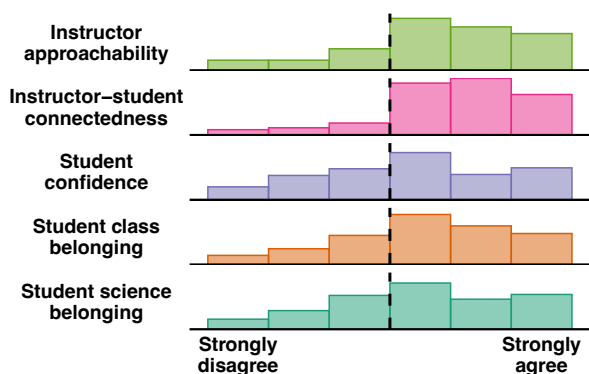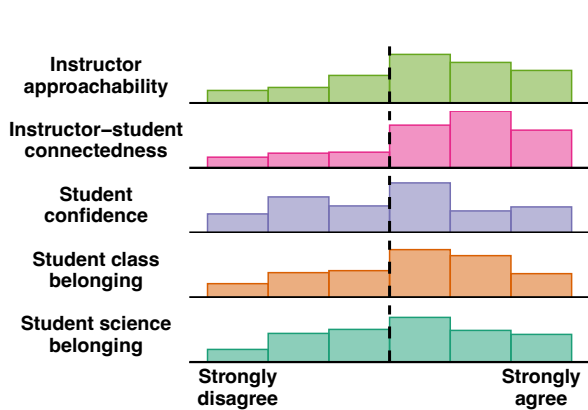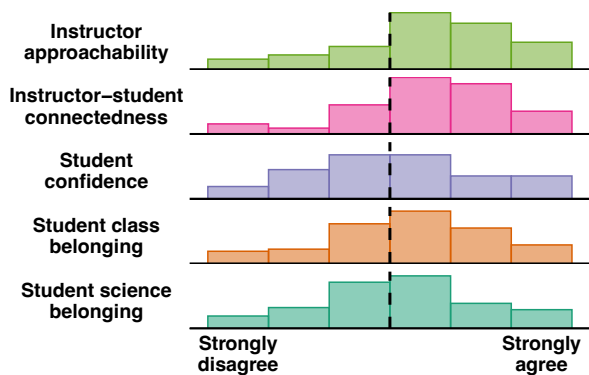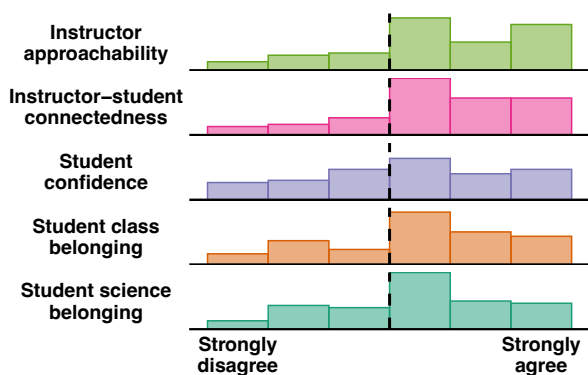
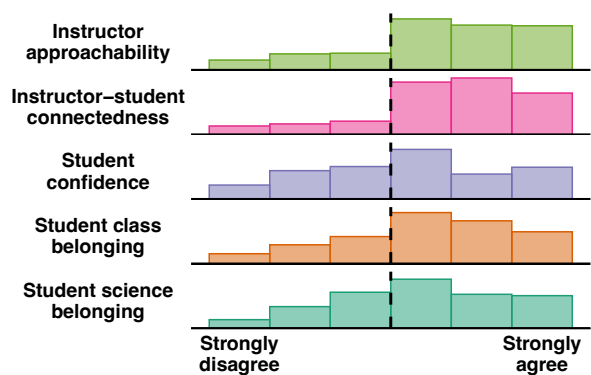g) other religions

h) not religious
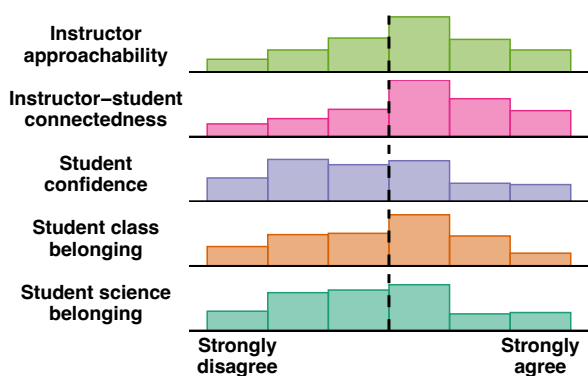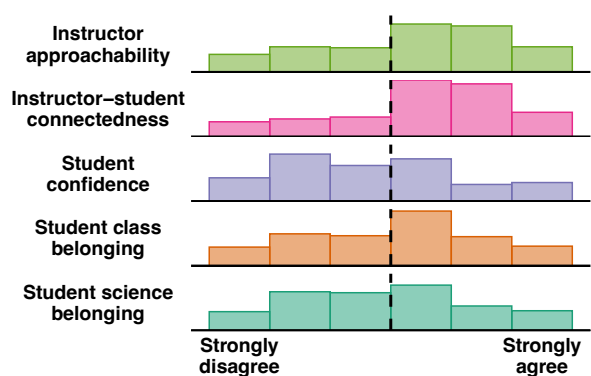
i) white

j) Asian

k) PEER

l) history of anxiety/depression

m) no anxiety/depression
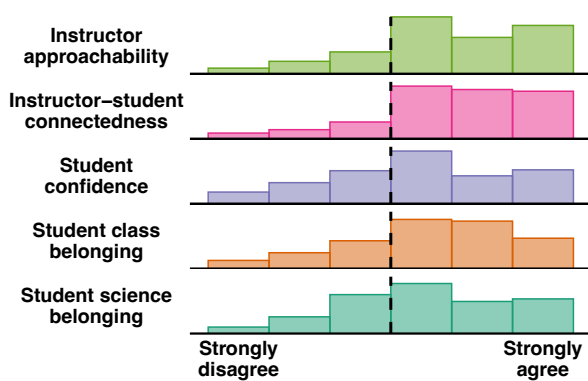

n) fall 2019

o) fall 2020

Table S8. Summary of ordinal regression models of the relationship between each of the five outcomes of interest and students' LGBTQ+ status, gender, religion, race/ethnicity, history of anxiety/depression, and semester of enrollment.

Outcome	Variable	B	SE B	t-value	OR	p
Willingness to approach for mentorship	LGBTQ+ (yes)	1.25	0.31	4.069	3.49	<.001
	Gender (woman)	0.39	0.23	1.696	1.47	.090
	Religion (Christian)	-0.33	0.23	-1.420	0.72	.156
	Religion (Muslim)	0.48	0.08	5.856	1.62	<.001
	Religion (other)	-0.38	0.31	-1.247	0.68	.212
	Race/Ethnicity (Asian)	0.30	0.25	1.194	1.35	.232
	Race/Ethnicity (PEER)	0.25	0.27	0.940	1.29	.347
	Anxiety/Depression (yes)	0.28	0.22	1.256	1.32	.209
	Semester (2020)	0.56	0.0002	3381.931	1.75	<.001
Feelings of connection with instructor	LGBTQ+ (yes)	1.47	0.31	4.791	4.35	<.001
	Gender (woman)	0.10	0.22	0.429	1.10	.668
	Religion (Christian)	-0.67	0.24	-2.830	0.51	.005
	Religion (Muslim)	-0.12	0.08	-1.383	0.89	.167
	Religion (other)	-0.44	0.32	-1.397	0.64	.163
	Race/Ethnicity (Asian)	-0.13	0.26	-0.499	0.88	.618
	Race/Ethnicity (PEER)	-0.03	0.27	-0.115	0.97	.909
	Anxiety/Depression (yes)	0.30	0.22	1.335	1.35	.182
	Semester (2020)	0.42	0.0002	2415.461	1.52	<.001
Confidence in their ability to	LGBTQ+ (yes)	1.30	0.30	4.294	3.68	<.001
	Gender (woman)	0.65	0.22	2.932	1.92	.003

pursue a career in science	Religion (Christian)	-0.75	0.23	-3.218	0.47	.001
	Religion (Muslim)	1.36	0.09	15.469	3.91	<.001
	Religion (other)	-0.35	0.31	-1.140	0.71	.254
	Race/Ethnicity (Asian)	0.13	0.25	0.534	1.14	.593
	Race/Ethnicity (PEER)	0.44	0.27	1.640	1.55	.101
	Anxiety/Depression (yes)	0.33	0.22	1.484	1.39	.138
	Semester (2020)	0.80	0.0002	5205.941	2.23	<.001
Sense of belonging in the classroom	LGBTQ+ (yes)	1.55	0.30	5.149	4.71	<.001
	Gender (woman)	0.58	0.22	2.564	1.78	.01
	Religion (Christian)	-0.58	0.23	-2.480	0.56	.01
	Religion (Muslim)	0.63	0.08	7.937	1.87	<.001
	Religion (other)	-0.67	0.31	-2.150	0.51	.032
	Race/Ethnicity (Asian)	0.17	0.25	0.682	1.19	.495
	Race/Ethnicity (PEER)	0.27	0.27	0.999	1.31	.318
	Anxiety/Depression (yes)	0.39	0.22	1.729	1.47	.084
	Semester (2020)	0.63	0.0002	3922.185	1.88	<.001
Sense of belonging in the scientific community	LGBTQ+ (yes)	1.60	0.30	5.289	4.95	<.001
	Gender (woman)	0.60	0.23	2.648	1.82	.008
	Religion (Christian)	-0.82	0.24	-3.435	0.44	.001
	Religion (Muslim)	0.70	0.08	8.954	2.01	<.001
	Religion (other)	-0.57	0.30	-1.864	0.57	.062
	Race/Ethnicity (Asian)	-0.03	0.25	-0.131	0.97	.896

Race/Ethnicity (PEER)	0.30	0.27	1.118	1.35	.264
Anxiety/Depression (yes)	0.42	0.23	1.851	1.52	.064
Semester (2020)	0.47	0.0002	2882.474	1.61	<.001

B represents unstandardized coefficients. OR represents the odds ratio (calculated as e^B). Focus categories are provided in parentheses in the variable column. Reference groups are non-LGBTQ+, men, not religious, white, no history of anxiety and/or depression, and 2019 semester.

Table S9. Summary of ordinal regression model of the relationship between students' perceived appropriateness of an instructor revealing their LGBTQ+ identity, gender, religion, race/ethnicity, history of anxiety/depression, and semester of enrollment.

Variable	B	SE B	t-value	OR	*p*
LGBTQ+ (yes)	1.38	0.39	3.52	3.96	<.001
Gender (woman)	0.30	0.26	1.16	1.35	.244
Religion (Christian)	-0.81	0.26	-3.16	0.45	.002
Religion (Muslim)	0.35	0.07	5.00	1.42	<.001
Religion (other)	-0.17	0.36	-0.48	0.84	.63
Race/ethnicity (Asian)	0.14	0.29	0.46	1.15	.64
Race/ethnicity (PEER)	-0.15	0.30	-0.49	0.86	.62
Anxiety/Depression (yes)	0.41	0.25	1.64	1.51	.100
Semester (2020)	0.12	0.0002	500.17	1.13	<.001

B represents unstandardized coefficients. OR represents the odds ratio (calculated as e^B). Focus categories are provided in parentheses in the variable column. Reference groups are non-LGBTQ+, men, not religious, white, no history of anxiety and/or depression, and 2019 semester.

Table S10. Proportion of students, disaggregated by LGBTQ+ status, who report knowing other LGBTQ+ instructors in STEM and outside of STEM.

	Yes % (n)	No % (n)
Have had another STEM college instructor reveal their LGBTQ+ identity in class		
Overall	6.0 (27)	94.0 (423)
LGBTQ+	11.3 (8)	83.1 (59)
Non-LGBTQ+	4.1 (15)	95.9 (349)
Decline to state LGBTQ+ status	23.5 (4)	76.5 (13)
Have had a non-STEM college instructor reveal their LGBTQ+ identity in class		
Overall	14.0 (63)	86.0 (386)
LGBTQ+	12.7 (9)	81.7 (58)
Non-LGBTQ+	13.2 (48)	86.5 (315)
Decline to state LGBTQ+ status	29.4 (5)	70.6 (12)
Are aware of any other STEM faculty members or scientists who identify as members of the LGBTQ+ community		
Overall	10.6 (48)	89.4 (404)
LGBTQ+	14.1 (10)	80.3 (57)
Non-LGBTQ+	8.0 (29)	92.0 (335)
Decline to state LGBTQ+ status	41.2 (7)	58.8 (10)