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Ours Lived Lived: Faculty Responses to STEM Students' Lived Experiences

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Our Lives Lived:
Faculty Responses to STEM Students' Lived Experiences

by
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Abstract

Science, technology, engineering, and mathematics (STEM) fields have historically had low undergraduate retention rates. To aid in counteracting this, classroom exercises, or 'belonging interventions' can play a vital role in keeping new STEM students motivated through the "cultural shock" period of the college transition. However, much is still unknown about STEM instructors' perceptions on belonging interventions in STEM classrooms. Would understanding students' lives and experiences in the past and present help them make better informed decisions in their teaching practices?

To answer this question, we drew upon results from a belonging intervention conducted by the Biology Education Research (BER) group at Portland State University. The activity was entitled: Our Lives Lived (OLL). The OLL activity was a self-report questionnaire exploring if STEM students agreed that various statements related to life and identity-related experiences pertained to them or not. Student responses (n=692) were compiled and presented to STEM instructors at PSU via a survey instrument.

Through both closed-ended quantitative questions and open-ended qualitative prompts, we elicited both the facultys' reception to the OLL exercise as well as their opinions on the values and applications of a belonging intervention exercise in their own classroom. We had an overall faculty n = 92 for complete responses, and a bimodal distribution in initial reception of learning about their students' lived experiences. Further, inductive coding of their open-ended responses revealed 8 emergent values and applications that instructors believe hold true for using a belonging intervention exercise in their classroom. Consequently, this supports our hypothesis that acknowledging the value of "belonging" in education may be beneficial to students and faculty alike in achieving educational and teaching successes

Background

Broad-access institutions have allowed populations from low-income families more opportunities to enroll in higher education a - resulting in a shift of an 18% increase in enrollment since 1990.[1] This does not correlate with the rate of retention for students, especially in the STEM field. An observation study by Malcom and Feder stated that in 2012, although 40% of students entering a 2-4 year postsecondary institution (e.g community colleges and universities) declared majoring in science, technology, engineering and mathematics (STEM), only between half and one-third of those succeeded in earning a degree after 4-6 years. [2] Culture has been identified as a "social, psychological, and structural" dimension of STEM education that ultimately connects students' sense of belonging in their academic pursuit. [3] This consequently ties to whether they see their pursuit as worthwhile for their "own good". For instance, in a traditionally male profession such as engineering, women are often left to question the cultural expectation that men are better suited to such studies, which leads to self-doubt. [4] How does an intangible force such as culture affect students' learning?

This ties in with the idea of "affective learning". [5] A process called metacognition describes a person's ability to become aware of and process information.[6] Affective learning, in the same sense, describes a students' capability to cope with mental processes - emotional and logical alike - that may arise during learning, which in turn outputs an emotional state that dictates their overall progression. [7] In a hypothetical sense, would one find it easy to focus on finishing their essay upon learning about the loss of their loved one? Probably not. In considering the role of affect in learning, Doctor Trujilo and Tanner explored what they dubbed the "dynamic model" of teaching. Whereas the "student deficit model" puts the blame on students for their failure at grasping a concept, the

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[1] National Center for Education Statistics. "Digest of Education Statistics" US. Department of Education, 2014
[2]Malcom, Shirley. "Barriers and Opportunities for 2-Year and 4-Year STEM Degrees: Systemic Change to Support Students' Diverse Pathways," ed. Michael Feder, The National Academies Press, January 14, 2016.
[3] Cabrera, A.F., Nora, A., Terenzini, P.T., Pascarella, E.T., and Hagedorn, L.S. "Campus racial climate and the adjustment of students to college: A comparison between white students and African-American students." Journal of Higher Education, 70, 134–160, 1999
[4] Cech, E.A., and Waidzunas, T.J. "Navigating the heteronormativity of engineering: The experiences of lesbian, gay, and bisexual students." Engineering Studies, 1, 1–24, 2011
[5] Trujillo, G., & Tanner, K. D. "Considering the role of affect in learning: Monitoring students' self-efficacy, sense of belonging, and Science Identity." October 13, 2017.
[6] Tanner KD. "Promoting student metacognition." CBE Life Sci Educ *11*, 113-120, 2012.
[7] Vermunt JD. "Metacognitive, cognitive and affective aspects of learning styles and strategies: a phenomenographic analysis." Higher Educ *31*, 25-50, 1996

"dynamic model" puts the blame on instructors for failing to acknowledge individual characteristics of students that might affect their learnings.

These individual characteristics are parts of a student's science identity, and it has often been described in tandem with the idea of "social belonging". Identity is described as a notion of oneself, and belonging in turn relates one's connection to the others. Exploring social belonging is inevitably an exploration of interrelated identities among individuals in a cohort. Evidence has suggested that students who opted out of STEM aren't necessarily less knowledgeable than their counterparts. [8] Instead, it is hypothesized that students chose to reject their professional identity within science due to cultural reasons. As a result, addressing worries regarding identities and social belonging may improve educational outcomes for students that are typically marginalized in STEM. [9]

To address this potential barrier, a recent study in 2020 introduced a customized belonging intervention exercise to a broad-access university (N = 1063) and monitored the participating freshmen's retention rates through the years. An experimental introductory writing course was dedicated toward reflecting upon one's experience in college, as well as reading upperclassmen's experiences regarding their freshmen transition period. The research found out that for the experimental group of students that took the belonging intervention courses, they had a higher rate of retention over three years compared to the group of students that did not participate in the intervention:

> *One year after the intervention, socially disadvantwestudents reported greater feelings of social and academic fit on campus in the treatment as compared with the control condition (B = 0.19, t = 2.20, P = 0.029).*

Thesis Questions

As much as we know about student outcomes from belonging interventions, little is known about the perspectives of instructors on such interventions. Would instructors also find value in belonging interventions, and if so, would it alter the way they teach? The overarching question we set out to answer was: To what extent do PSU STEM faculty value a social belonging intervention? Specifically, we asked:

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[8] Seymour E, Hewitt NM. "Talking about Leaving: Why Undergraduates Leave the Sciences." 1997

[9] G. M. Walton, G. L. Cohen, "A brief social-belonging intervention improves academic and health outcomes of minority students." *Science* **331**, 1447–1451, 2011.

a) How surprised are STEM faculty by the results of a belonging intervention focused on students' lived experiences?

b) To what extent do faculty see value in the social belonging intervention?

c) How might faculty incorporate the outcomes of a social belonging intervention into their own teaching practices?

Our hypothesis is that just as intervention on belonging can have an impact on shaping an inclusive culture for STEM pathways, instructors of said disciplines would likewise be intrigued by and find value and application in the exercise.

Materials and Methods

Our Lives Lived Activity

To understand how STEM instructors at Portland State University respond to an aggregate snapshot of students' lived experiences at PSU, we drew upon results from a belonging intervention - titled "Our Lives Lived" (OLL) - conducted by the Principal Investigator of the Biology Education Research (BER) lab over the course of three years (pre-COVID-19 pandemic), in 2017 to 2019. The OLL activity was completed by students anonymously and occurred in seven different STEM courses and trainings. The majority of participating courses were undergraduate STEM classrooms (with more than ~50 students), and approximately 20% were graduate courses or trainings.

In each setting the students were advised at he beginning that participating in the exercise could potentially trigger uncomfortable responses, and that participation was encouraged but completely optional. The vast majority of each classroom group opted in each time the exercise was conducted. Students were given a paper handout (OLL activity) which contained 34 different statement prompts, each pertaining to experiences that students in college might have experienced. They were asked to not put their names on the handout, and to answer "Yes" or "No" to each prompt. The prompts ranged from straightforward experiences such as: "I depend on financial aid for college.", to social identity prompts such as: "I know the meaning of an upside down pink triangle.". Prompts also included positive experiences such as: "I am comfortable holding hands with my partner walking in public." to extremely difficult ones such as: "I have friend, family member, or I experienced sexual assault or rape." A comprehensive list of the prompts that students answered

are detailed here to reveal the range of experiences to which students are asked to reflect upon (see OLL Survey in the Appendix).

After finishing OLL, the students would turn the worksheet upside down, the papers were then shuffled and randomly distributed back to the students. Each statement was read outloud, and each student then acted as a representative of the student whose OLL responses they now held. If the student had responded "Yes" to said question, they would raise their hand. Time was allowed for students to observe the proportion of hands raised for each statement, gaining an idea of the distribution of the students' lived experiences in the classroom. The process was replicated similarly for all participating classrooms, with a total N = 692 (numbers of participating students) for the project over three years of interventions.

For each prompt, we counted how many students answered "Yes", and converted it into a percentage of the total N within a classroom group. Results were compiled and the fraction of students that responded "yes" to each response was calculated.

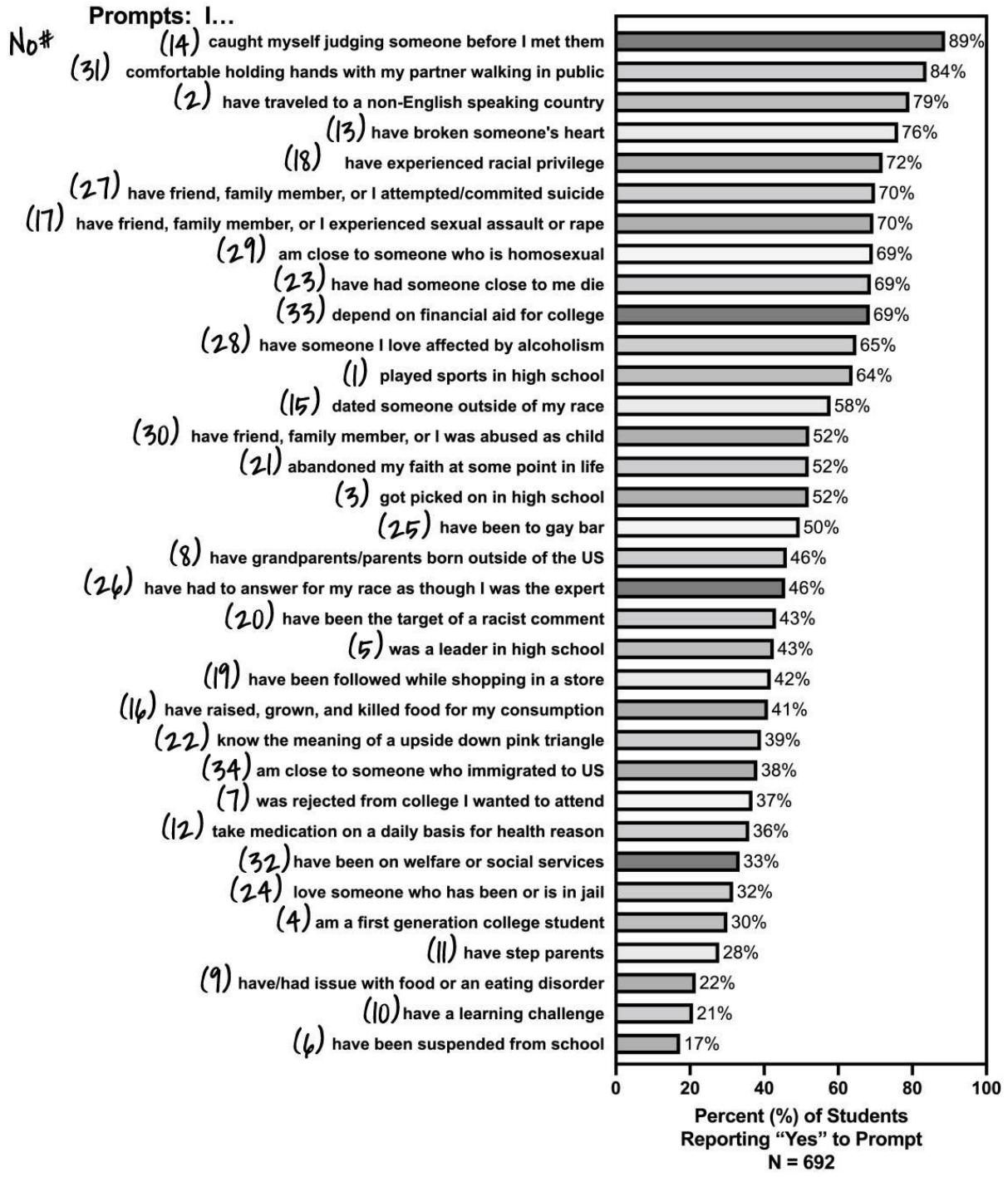

Figure M1: The percentage of students answering "Yes" to each prompt. (N = 692.) Prompts are tagged with an identification number that matches its order on the OLL survey (see Appendix).

Faculty Survey

The next step in this study was to create another survey to distribute to the STEM faculty at PSU to gather their perspectives on the results of the OLL activities (Figure M1), detailing the students' lived experiences. We used the online platform, *Qualtrics*, to disseminate and collect survey data. The question items ranged from the closed-ended to the more open-ended ones. For closed-ended questions, we were interested in learning about the demographics of our STEM teaching populations at PSU and included the following items:

a) In which department(s) do you teach courses at PSU/
b) For how many years have you taught courses at PSU (in any capacity/position)?
c) What is your current position at PSU?
d) In total, approximately how many students do you teach at PSU in an average year?
e) Which population(s) of students do you teach at PSU?
f) I most closely identify as [gender]
g) Do you identify as a person who is marginalized in higher education due to being a PEER (Person Excluded due to Ethnicity or Race) and/or another social identity factor?

Along with the demographic questions, we included a 10 point slider with a question: "To what extent does the information presented [in Figure M1] surprise you?"

For our open-ended questions, we were interested in directly learning about the facultys' perceived values and applications for a belonging intervention exercise upon seeing the results of the OLL project. We asked:

1. How might there be value in engaging university students in an activity that focuses on their life experiences [...]?
2. How might you incorporate the results of this activity - depicted [in Figure M1] - into your teaching practices at PSU?

The full comprehensive survey can be found in the Appendix under the title Qualtrics Faculty Survey.

Survey Distribution

The Portland State University IRB (Protocol # 227603-18) approved this research. PI Shortlidge recruited participants from a list of faculty who taught in PSU's STEM departments. They were given a period of one week to open and respond to the survey, with participation being purely

optional. After a week, a secondary follow-up email was sent to encourage participation for those who may have forgotten or disregarded the email during the first wave. By the end of the distribution period, we collected 146 responses, although only 93 were complete responses. The remainder were incomplete (leaving the majority of questions blank) and therefore discarded from the study sample.

Faculty Survey Data Analysis

Data were analyzed in a few ways. Using inductive coding techniques, two researchers iteratively and independently developed codes to apply to faculty responses using the inductive coding process[10], we then met to discuss and revise our codebook and come to agreement on the revised codebook. We then coded responses independently using the revised codebook and calculated interrater reliability (IRR) until we were at least 80% agreement in codes applied. Once we reached 80% coding agreement or above, we finished coding responses separately. We organized each faculty participant into three response categories: 1/ their demographic traits and respective surprise slider value, 2/ Their perceived values of using a belonging intervention exercise, and 3/ an application in their own classroom. Using the first category, we can get a sense of the faculty's opinion on the exercise. With the latter two, we can directly answer the question F1 and F2 and answer the research question.

Results

Result a) How surprised were faculty in learning about students' lived experiences?

For the first category, we first counted the number of respondents that picked a certain slider value, and then divided it by the total n = 92 to generate a frequency percentage for our distribution chart. The result is a bimodal curve, with local maximum at values 2 and 8.

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[10]Strauss, Anselm. "Grounded Theory in Practice." Edited by Juliet Corbins. Google Books. SAGE Publications, n.d.

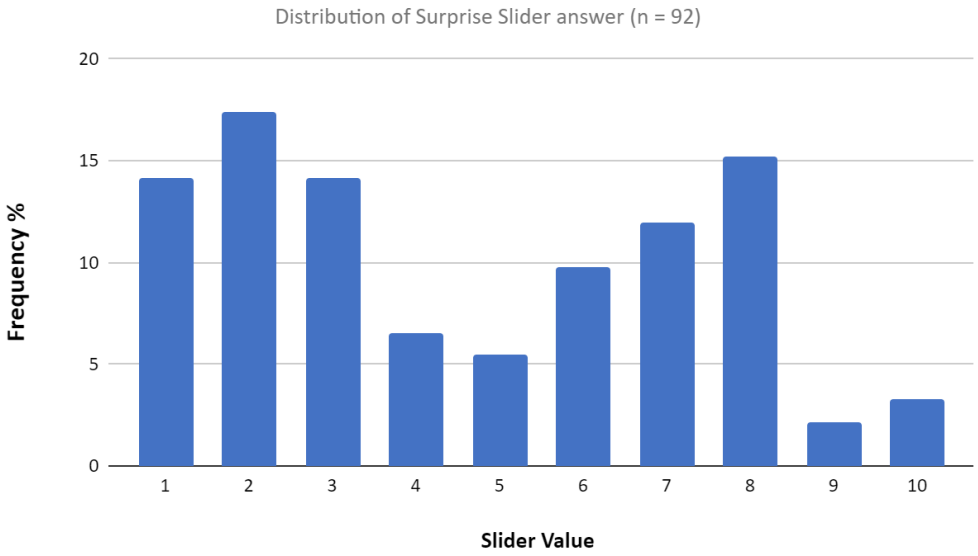

Figure R1: Distribution of faculty's surprise slider answer, N = 92. Answering the question a) How surprised are STEM faculty by the results of a belonging intervention focused on students' lived experiences?

Building upon this bimodal distribution, we further simplified the surprise slider distribution into two discrete categories, labeled "Surprised" or "Unsurprised". The "Unsurprised" category contains responses that selected 1-5 as their slider value, and the "Surprised" category contains responses that selected 6-10 as their slider value. This allows us to assign specific demographic groups two variables - their count of surprise versus unsurprised responses. It is of worth noting for Table R3 below is that even though the initial question for demographics was targeted at departments, the resultant spread was too thin and thus chose to categorize them into the College (e.g Biology and Chemistry belonging to the College of the Liberal Arts and Sciences) to which they belong to in order to achieve a higher n per group.

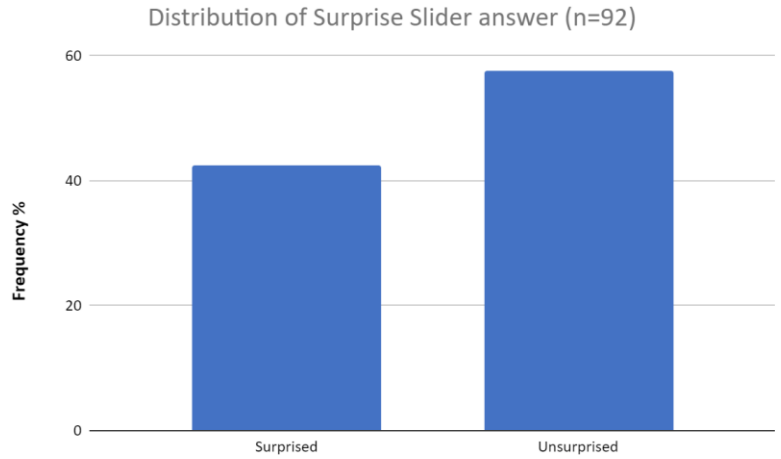

Figure R2: Condensed bimodal distribution of Surprised versus Unsurprised receptions to the exercise. The Surprised category had a frequency of 42.39% and Unsurprised category had a frequency of 57.61% (p-value of approximately 0.073.)

Demographic Categories	Unsurprised	Surprised
College		
College of the Liberal Arts and Sciences (n=60)	35	25
Maseeh College of Engineering (n=18)	10	8
School of Public Health (n=2)	0	2
Toulan School of Urban Studies and Planning (n=5)	4	1
College of Education (n=1)	1	0
College of the Arts (n=4)	2	2
Current Position		
Adjunct Instructor (n=23)	13	10
Administration (n=2)	1	1
Graduate Student (n=10)	6	4
Instructional Professional (n=2)	1	1
Non-tenure track research faculty (n=3)	2	1
Non-tenure track teaching faculty (n=12)	9	3
Tenured faculty (n=34)	15	19
Tenure-track faculty (n=5)	2	3
Other (n=3)	3	0
Years at PSU		
<1 year (n=9)	5	4
1-3 years (n=12)	8	4

3-6 years (n=22)	12	10
6-10 years (n=14)	8	6
>10 years (n=34)	18	16
Not Stated (n=1)	1	0
Numbers of Students Taught		
25 or fewer (n=8)	4	4
25-50 (n=13)	10	3
50-100 (n=30)	11	19
100-300 (n=35)	23	12
300-500 (n=6)	6	0
>500 (n=1)	0	1
Student Population Taught		
Undergraduate only (n=35)	19	16
Graduate only (n=5)	2	3
Undergraduate and Graduate (n=53)	32	21
Persons excluded due to ethnicity or race (PEER)		
No (n=66)	38	28
Maybe (n=14)	8	6
Yes (n=11)	7	4

Table R3: Comprehensive demographic groups and their respective sliders count on the bimodal distribution of "Unsurprised" (1-5) versus "Surprised" (6-10).

Result b) To what extent do faculty see value in a belonging intervention?

Through iterative coding, we identified four emergent themes pertaining to "the value of an activity that focus on students' lived experiences":1/ highlighting shared experiences between students (shared experience), 2/ promoting diversity mindfulness (diversity mindset), 3/ promoting belonging outreach (belonging outreach), and 4/ personalizing the educational process (personalized education). We further tag our derived codes into three sub-codes: student-centric values, faculty-centric values, and bothc values. In addition to these four themes, we have a separate code titled "Indifferent" that describes a response containing none of the aforementioned codes.

For each response, up to four codes from the rubric may be applied simultaneously, and each of them is only counted once. A response that highlights the importance of "shared experience"

between students in three different sentences will only have the first instance count, to further elaborate.

The code “shared experience” describes the ability to see common grounds between students, faculties or both. Student-centric tag for this code refers to the interrelatedness between students, while the faculty-centric tag for this code stresses the importance of building a strong faculty-student connection.

The code “diversity mindset” describes the ability to tolerate and accept differences in experiences between students, quite contrary to the “shared experience” code that highlights common grounds. Student-centric tag for this code highlights self-reflection between students on how their privileges, disadvantages, and or conditions might present themselves and affect others. On the other hand, faculty-centric tag stresses the instructors’ ability to be cognizant of their students’ lives experiences.

The code “Belonging outreach” is the tangible counterpart to the “diversity mindset” code. Whereas the latter stresses a mindfulness attitude toward social identities, the former puts emphasis on promoting belonging support for students through activities and exercises similar to the OLL project. Student-centric tag for this code promotes belonging intervention exercises as means to break down barriers and support students. Faculty-centric tag likewise perceives the exercise as valuable in identifying supports for the faculties. For this code, all responses were either student-centric or both.

The code “Personalized Education'' refers to the thoughts that personal life affects learning. Student-centric tag for this code puts students’ lived experiences as key attributes of their learning success. On the other hand, faculty-centric responses agree that learning about students’ lived experience helps instructors make better informed decisions in their instructional practices.

All exemplary statements to represent each code along with their respective -centric tags are listed below in Table V1.

Theme	**Representative Quotes**	**Sub-code**
Indifferent	“I think the main purpose of education is to get outside	None

	and beyond oneself, so I have ambivalent feelings about pedagogy that places too much emphasis on one's own lived experience."	
Shared Experience	"The value helps students realize that **they are not the only ones with these types of experiences**."	Student-centric
	"It is always **useful to know what you share in common with your audience**… it helps to reduce the perceived differences students may have…"	Faculty-centric
	"It is **important for people in general (not just students) to understand that others have had similar experiences** as they have had. It makes us feel part of the community."	Both
Diversity Mindset	"Allow students to **gauge the range of experiences of their peers."**	Student-centric
	"The value may be in **opening the instructor's minds to what their students go through."**	Faculty-centric
	"Given that PSU attracts non-traditional students, **getting a sense of the lived experiences of students in our classroom seems like a good idea, both for other students and for the instructor."**	Both
Belonging Outreach	"Sense of belonging amongst students, opening dialogue, **acknowledging importance of seeking and asking for support and help,** understanding extent of challenges that must be addressed personally and societally."	Student-centric
	I think there are attempts at engaging with students on life experiences, just more focus on that now. Activities show the trends, but being able to understand and relate would require, say, **a workshop, for example. Or, weekly meetings where students can engage with one another, and possible faculty, about life experiences or what life is at the time."**	Both
Personalized Education	"Knowing that students **need not be pressured by others might help students engage.**"	Student-centric

	"It could be useful to **tie in-class learning to students' experience to make a connection."**	Faculty-centric
	"**I love how this brings in paradigm / experience into focus. Even if the class curriculum is not related to these topics, I believe it's important to recognize that we are unique, and bring our life experience to the classroom.** This seems like a good recognition of this fact."	Both

Table V1: Representative quotes of all emergent themes along with the respective -centric tag. Highlighted texts indicate the most indicative sentence of the themes inducted.

After tallying up the themes from all 92 responses, the below table V2 and figure V3 represents the total count as well as distribution of the -centric tag for each code.

Main themes	**Count**	**Student centric**	**Faculty centric**	**Both**
Shared experience	38	31	2	5
Diversity Mindset	35	16	5	14
Belonging Outreach	19	10	0	9
Personalized Education	24	10	5	9
Indifferent	9			

Table V2: Recurring values reported by faculties, and their respective count and the audience-centric tag division.

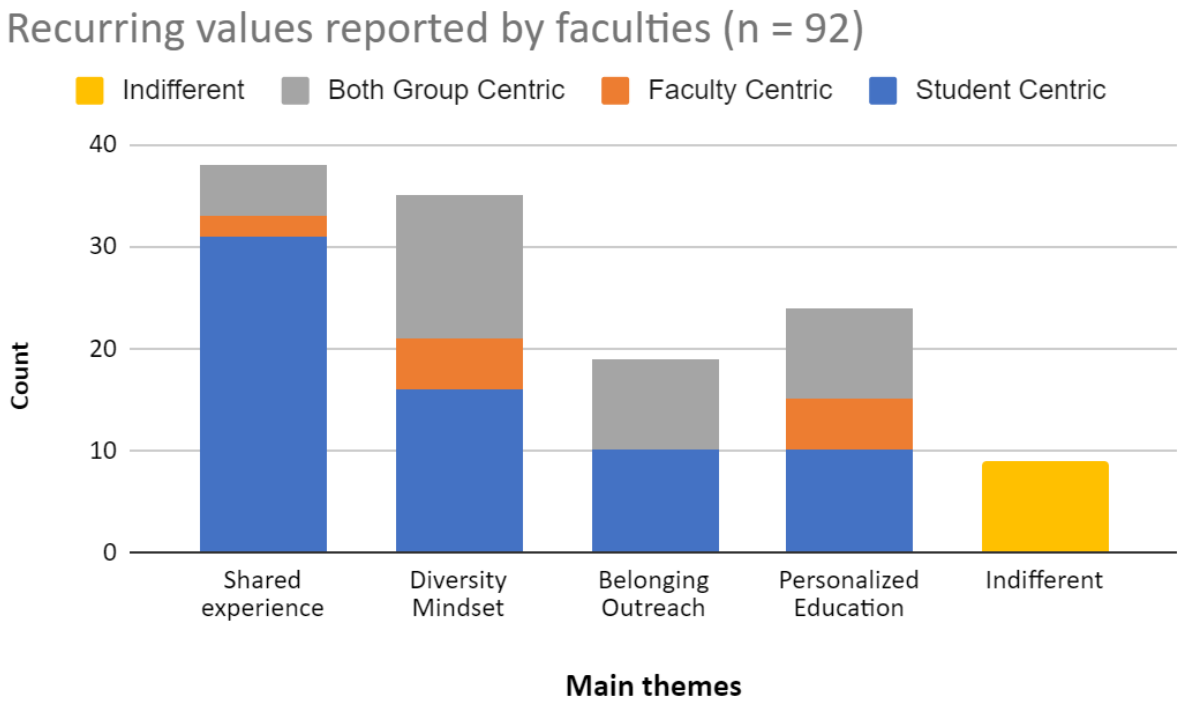

Figure V3: Stacked bar graphic for Table V2. "Belonging Outreach" code had zero faculty-centric responses. The -centric tag is not applicable to the "Indifferent" code.

Result c) How might faculty incorporate the results of a social belonging intervention into their own teaching practices?

We repeated the three rounds of the inductive coding process as described for the previous question. The four emergent percieved applications for the OLL activity are as follows: intervention exercises can be applied in a classroom 1/ to build faculty-student relationships (faculty-student relationship), 2/as is for building students' belonging (intervention exercises) 3/ to adjust courses to accommodate life experiences (course adjustments), and 4/as teaching materials (teaching materials). Codes are applied once per response. Unlike the previous question however, we elected not to assign student or faculty-centric tags.

The following table A1 lists and describes the four codes that were used to assign to all instructors' responses, along with exemplary statements.

Theme	Theme Description	Representative Quotes
Indifferent	The faculty in question does not perceive any practical applications to be used in their own classroom.	"**I probably wouldn't, in any substantive way.** I am already aware of most of these issues, and try to take them into account in my teaching…"
Faculty-student relationship	The instructors perceive intervention exercises as excellent ways to build rapport with their students.	**"As I engage with students, I need to have an open mind and heart.** I would have answered yes to about 80% of the questions. Faculty and students may not be so far apart.
Intervention exercises	The instructors will use the exercise as is in their classroom.	**"Could be an exercise** the first week of classes, so everyone is aware of the diversity we bring into the classroom."
Course adjustments	The instructors perceive intervention exercises as ways to better learn students' circumstances and adjust course expectations accordingly.	**"Adapt lectures and curriculum as possible to accommodate** knowledge of student life experiences."
Teaching materials	The instructors plan to incorporate the results or methods of the exercise as concepts to be delivered in the classrooms.	**"In teaching statistics, this could be useful in hypothesis tests about proportions.** I might take a survey of students based on one of the questions and test the hypothesis that our class has the same proportion of respondents who said yes when compared to the general population."

Table A1: Brief explanation of each code and their respective exemplary quotes.

After tallying up the themes from all 92 responses, the below table A2 and figure A3 represents the total count as well as distribution of the -centric tag for each code.

Main themes	**Count**
Faculty-Student Relationship	27
Intervention Exercises	20

Course Adjustments	26
Teaching Materials	12
Indifferent	21

Table A2: Recurring applications in the classroom reported by faculties, and their respective count and the audience-centric tag division.

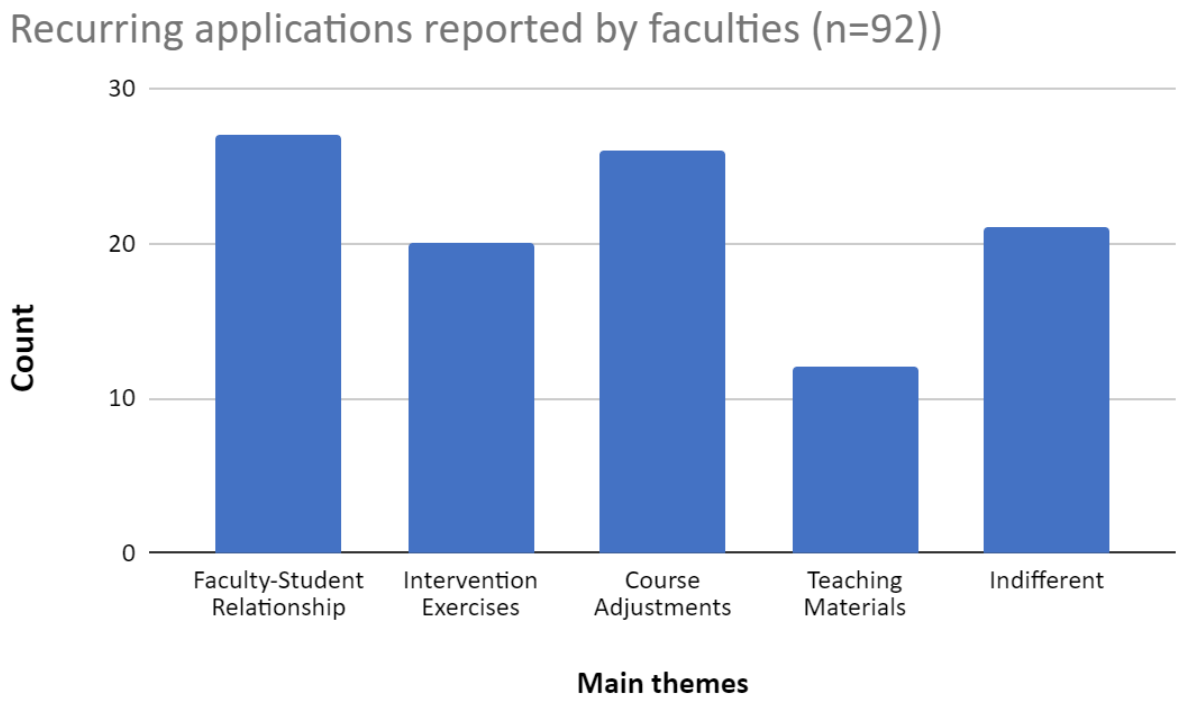

Figure A3: Bar graphic for Table A2.

Discussion

Discussion a) How surprised were faculty in learning about students' lived experiences?

The initial distribution in Figure R1 demonstrating a bimodal distribution shows a polarity in faculty reactions to the exercise, with each half being either surprised or unsurprised upon learning about students' lived experience. To further consolidate this, Figure R2 section had a p-value of 0.073, indicating a null hypothesis that there isn't a clear direction in faculty receptions. Table R3 comprehensively listing the demographic groups and their respective count of "Unsurprised" versus "Surprised" also failed to achieve a significant p-value below 0.05. This means that in

addition to there not being a comprehensive direction, we also cannot detect a significant difference for faculty listed in specific demographic groups.

Thus to answer this question, faculty is either surprised or unsurprised by knowledge of students' lived experience through a social belonging intervention, and it is not related whatsoever to their professional background in college (e.g student populations, years of experience, teaching departments). This means that more likely, their receptions will be wholly dependent on their own personal experiences and awareness of social experiences.

To further study this connection, perhaps it would then be of interest to investigate their own lived experiences instead and see how the surprise slider value that they have selected in their response.

Discussion b) To what extent do faculty see value in a belonging intervention?

Of the 93 faculty that had a complete response, 83 perceived value in the intervention exercise. According to Figure V3, we can see that faculty mostly reported "shared experiences" and "diversity mindset" as the value to be expected from a belonging intervention exercise. Of the "shared experience" code alone, over 75% report it as beneficial to the students. The two codes "diversity mindset" and "belonging outreach" have a bimodal distribution of either being beneficial to the students or both the students and the instructors, with the latter having no response catering toward a faculty-centric outreach program. This is to be expected: a belonging exercise like this is aimed at students. The code "personalized education" has an even spread of benefits for all category groups. The code "Indifferent" has a count of 9, comprising less than 10% of the total n.

Thus to answer the question, a significant majority of faculty saw values in the exercise, and up to four of the aforementioned emergent themes have been reported per response. In using an exercise like this, students and faculty get to pool in their experiences, develop a keen diversity mindset, promote belonging as a social outreach, and personalize the educational process. This supports our initial thoughts that faculty see academic and social value in using social belonging to promote inclusive teachings.

Discussion c) How might faculty incorporate the results of a social belonging intervention into their own teaching practices?

Of the 93 faculty that had a complete response, 71 saw an application for the belonging intervention exercise in their own classroom. The most frequent application was to improve faculty-student relationship as well as adjusting course load to be more accommodating, followed by using the intervention exercise as is, then as a teaching material. The code "Indifferent" for this question has a count of 21, comprising approximately 23% of the total n. This in comparison to the "Indifferent" percentage of the previous question (less than 10%) indicates a discrepancy in faculty perceptions between seeing values, and then finding an application in their own classrooms.

Thus to answer the question, a significant majority of faculty reported that they could see an application for an exercise like the OLL in their own classroom, and up to four of these applications have been reported per response. In using an exercise like this, faculty can get to learn their students better and adjust their course accordingly to accommodate real life scenarios. Furthermore, an exercise like the OLL still has value as an "icebreaker" as is, and can be further used as miscellaneous teaching materials in certain departments to tie in concepts.

An interesting point of note is the clear difference between Question b)'s percentage of "Indifferent" responses aversus Question c)'s. Whereas over 90% of the faculty sees value in a social belonging exercise, only around 77% would consider applying in their own classroom. In many of the responses for Question c), there was mention of classroom time limitations, institutional restrictions, as well as insufficient faculty training in inclusive teaching practices. These are some of the possible reasons explaining the discrepancy. And thus, while we set out to study the benefits of this exercise as perceived by faculty members, we too must be aware of the barriers that must be considered for practical implementation.

Limitations

The results of both surveys were all self-reported data - students and faculty had complete freedom in assessing their responses without the researchers' interference.[11] We were aware of running into response bias. [12] The first of which is the social desirability bias - wherein surveys that tackle private or sensitive topics, inherently causes the participants to sugarcoat their self-assessment in ways that would be socially acceptable. While the two surveys were conducted entirely anonymously to mitigate the fear of exposure, they still couldn't control for the individual's

[11] Jupp, Victor, ed. "Self-Report Study." Sage Research Methods. SAGE Publications, 2006.
[12] Rosenman, Robert, Vidhura Tennekoon, and Laura G Hill. "Measuring Bias in Self-Reported Data." International journal of behavioral & healthcare research. U.S. National Library of Medicine, October 2011.

misunderstanding of the prompts. This ties into the second bias, which is the recall bias, wherein students' ability to assess their experiences largely depends on their ability to remember past events.[13]

On the other hand, we were able to collect a much wider range of data over multiple classroom groups, for over three years for the students; and over 100 faculty in a span of two weeks for the faculties. This in turn negates both biases as we have a larger pool to validate the data through cross-examination. For instance, we compare the prompt results of each classroom group with each other, and if a certain prompt has a similar percentage of students answering "Yes" over three year and across seven different classrooms, then we can be more certain that the self-reported answers were truthful and accurate. This validation was checked for all prompts, and for each classroom group, and the pattern of "Yes" percentage holds true for most questions.

Conclusion

Through the demographic and the surprise slider data, we found out there were no prevailing perceptions toward using a belonging intervention exercise in the classroom. Receptions were mixed, with instructors being either surprised or unsurprised by the range of experiences that their students go through. In the qualitative section where we explored the values and applications of a belonging exercise in the classroom, we reported up to four recurring themes for each category. The overall responsive N for each group (n=83 for values in intervention and n=71 for applications in classroom) suggested more faculties found values and applications than compared to those who do not.

Social belonging is important because it appeals to the human's needs for relatedness. Likewise, students seek validations and inclusion because they want to feel like they are being validated by a relationship that is greater than themselves. Belongingness is one of the key human motivations that allows them to pursue group memberships as well as vocational opportunities. In the case of students, it motivates them to pursue academic excellence. Even though we know using student-centric teaching models has provided much learning benefit, faculty often relies on hard lectures in

[13]Althubaiti, Alaa. "Information Bias in Health Research: Definition, Pitfalls, and Adjustment Methods." Journal of multidisciplinary healthcare. Dove Medical Press, May 4, 2016.

STEM courses regardless. Through the result of this research, we aim to bring a bit more humanity in disciplines that often deal with hard facts and numbers.

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Appendix

OLL Survey

The below survey is a comprehensive list of prompts that students in a classroom group were asked to fill out Yes or No to each time the exercise was conducted. The identification number of each question (e.g Number 1 for “I played sports in high school”) mathes the identification number for the prompt report in FIgure M1 in the Materials and Methods Section.

Our Lives Lived

Instructions: **Please do not write your name on this paper.**
Respond to each of the following statements by writing "Y" for yes, or "N" for no in the blank provided.

To maintain confidentiality, we will collect the papers from the room, mix them, and randomly hand one back to each individual who filled one out. You will then have someone else's paper. Each statement will be read aloud, and you will be asked to ***respond to the statement as a representative of the individual whose anonymous answers are in your hand.***
**Please note some items may be sensitive, you are not required to participate if you choose not to.*

I...

1) ___ played sports in high school
2) ___ have traveled to a country that speaks a language other than English
3) ___ got picked on in school
4) ___ am the first person in my family to go to college
5) ___ was a leader in high school
6) ___ got suspended from school
7) ___ was rejected from a college I wanted to attend
8) ___ have grandparents or parents that were born outside of the United States
9) ___ have/had a problem with food or an eating disorder
10) ___ have a learning challenge
11) ___ have a step-parent
12) ___ take medication on a daily basis for health reasons
13) ___ have broken someone's heart
14) ___ have caught myself judging someone before I even met them
15) ___ have dated someone outside of my race
16) ___ have raised and/or killed animals for my/my family's consumption
17) ___ have a friend, family member, or I have been sexually assaulted or raped
18) ___ have experienced privileges that people of other races don't
19) ___ have been followed around a store when I shopped
20) ___ have been the target of a racist comment
21) ___ abandoned my faith at some point in my life
22) ___ know the meaning of an upside-down pink triangle
23) ___ have had someone close to me die
24) ___ love someone who has been or is in jail
25) ___ have been to a gay bar
26) ___ have been asked to answer for my entire race, as if I was the "expert"
27) ___ have a friend, family member, or I have attempted suicide
28) ___ have someone that I love affected by alcoholism
29) ___ am close to someone who is homosexual
30) ___ have a friend, family member, or I was abused as a child
31) ___ feel comfortable walking down the street holding hands with my partner
32) ___ have been on welfare or social services
33) ___ depend on financial aid to attend college
34) ___ am close to someone who immigrated to the United States

Credit: Shortlidge, E.E.; eshortlidge@pdx.edu Portland State University, 2019.
Modified from: Beyond P.C.: Let's Understand Each Other; WACUHO Feb. 2004 ~ Timi C. Tullis I.

Figure Ax1: Comprehensive Our Lives Lived survey

Faculty Survey

The following compilation of images are each page of the faculty survey, exported using Qualtrics' built in features.

Consent

Consent to Participate in Research

Project Title: **The Lived Experiences of Portland State University STEM Students**

Population: STEM Instructors at PSU

Researcher: Erin Shortlidge, Stan Nguyen - Portland State University

Researcher Contact: eshortlidge@pdx.edu; 503-725-9305

You are being asked to take part in a research study. The box below shows the main facts you need to know about this research for you to think about when making a decision about if you want to join in. Carefully look over the information in this form and ask questions about anything you do not understand before you make your decision.

Key Information for You to Consider

- **Voluntary Consent**. You are being asked to volunteer for a research study. It is up to you whether you choose to involve yourself or not. There is no penalty if you choose not to join in or decide to stop.
- **Purpose**. The reasons for doing this research are to better understand the PSU student population and share your perceptions of the data.
- **Duration.** It is expected that your part will last approximately 10 minutes
- **Procedures and Activities.** You will be asked to open a survey, read the consent form, look at data from PSU students and provide your thoughts on the data.
- **Risks.** Some of the possible risks or discomforts of taking part in this study include potentially triggering information about PSU students' lived experiences.
- **Benefits**. Some of the benefits that you may expect include having a better understanding of PSU students, and contributing to research on instructors' perceptions.
- Participation is voluntary and the only alternative is to not participate

What happens to the information collected?

Information collected from you for this research will be used in aggregate for an Honor's thesis project and will potentially be used for education research purposes (peer review).

How will I and my information be protected?

We will take measures to protect your privacy by not collecting identifying information about you. Despite taking steps to protect your privacy, we can never fully guarantee that your privacy will be protected.

What if I want to stop being in this research?

You do not have to take part in this study, but if you do, you may stop at any time. You have the right to choose not to join in any study activity or completely stop your participation at any point without penalty or loss of benefits you would otherwise get. Your decision whether or not to take part in research will not affect your relationship with the researchers or Portland State University.

Will it cost me money to take part in this research?

There is no cost to taking part in this research, beyond your time.

Will I be paid for taking part in this research?

There is no compensation being offered for your participation.

Who can answer my questions about this research?

If you have questions or concerns, contact the research team at: Erin Shortlidge; eshortlidge@pdx.edu

Who can I speak to about my rights as a research participant?

The Portland State University Institutional Review Board ("IRB") is overseeing this research (#227603-18). The

IRB is a group of people who review research studies to make sure the rights and welfare of the people who take part in research are protected. The Office of Research Integrity is the office at Portland State University that supports the IRB. If you have questions about your rights, or wish to speak with someone other than the research team, you may contact:

Office of Research Integrity
PO Box 751
Portland, OR 97207-0751
Phone: (503) 725-5484
Toll Free: 1 (877) 480-4400
Email: psuirb@pdx.edu

I have had the chance to read and think about the information in this form. I understand that I can ask additional questions anytime while I take part in the research.

- ○ I agree to take part in this study
- ○ I do not agree to take part in this study

OLL

Please Read:

The below graphic is the result of an activity completed by just under 700 STEM students at PSU.

The activity was done anonymously by students during a variety of STEM courses and trainings (pre-pandemic). The majority of responses were collected from STEM undergraduates, and approximately 20% from STEM graduate students.

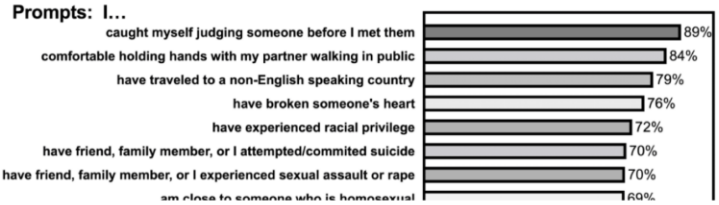
How the activity works:

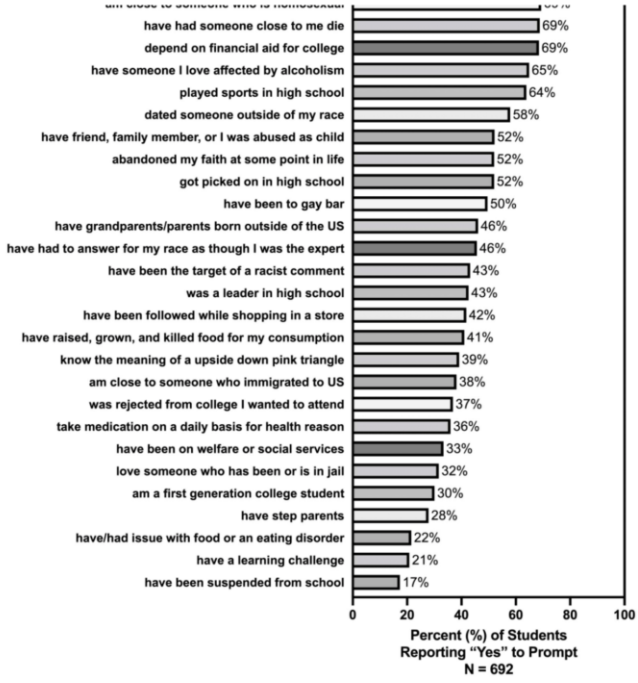
- Students are provided a paper handout that includes instructions and 34 statement prompts.
- Students are instructed to not put their name on the sheet, but to answer 'yes' or 'no' to each statement as it relates to thier experiences.
- Students are advised at the beginning of the activity that it could elicit uncomfortable or triggering responses for some, and that they are welcome to

abstain from participating at no consequence. (The vast majority, if not all students participated each time the activity was done.)

- After students fill out the worksheets we collect them, shuffle, and randomly redistribute them.
- The statements are read outloud, participating students raise thier hands for the anonymous student whose paper they hold when the student's response to the statement is 'yes'.

The graphic below shows the percent of students who responded "yes" to each statement. Please read through the statements and the results before answering the questions that follow.





To what extent does the information presented above surprise you? Please drag the slider to best represent your perspective.

0 = These data do not surprise me at all **10 = These data completely surprise me**

0 5 10

Using only **one or a few words,** please describe your *reaction* to the information presented in the above graphic.

How might there be value in engaging university students in an activity that focuses on their life experiences, such as the one illustrated above?

How might you incorporate the results of this activity (depicted in the above graphic) into your teaching practices at PSU?

Demogs

In which department(s) do you teach courses at PSU?

- [ ] Anthropology

- [ ] Architecture
- [ ] Biology
- [ ] Chemistry
- [ ] Civil Engineering
- [ ] Computer Engeineering
- [ ] Computer Science
- [ ] Curriculum and Instruction
- [ ] Economics
- [ ] Education
- [ ] Electrical Engineering
- [ ] Environmental Engineering
- [ ] Environmental Science and Management
- [ ] General Science
- [ ] Geography
- [ ] Geology
- [ ] Honors
- [ ] Mathematics
- [ ] Mechanical Engineering
- [ ] Physics
- [ ] Psychology
- [ ] Public Health

- [ ] Sociology
- [ ] Statistics
- [ ] Systems Science
- [ ] University Studies
- [ ] Urban Planning
- [ ] Women and Gender Studies
- [ ] Other

For how many years have you taught courses at PSU (in any capacity/position)?

What is your current position at PSU?

- ○ Administration
- ○ Adjunct instructor
- ○ Graduate student

I most closely identify as

- ○ Man
- ○ Woman
- ○ Gender variant/non-binary
- ○ [ ] Other (please specify)
- ○ Prefer to not answer

Do you identify as a person who is marginalized in higher education due to being a PEER (Person Excluded due to Ethnicity or Race) and/or another social identity factor?

There is space to elaborate on your response if you so choose.

- ○ Instructional professional
- ○ Non-tenure track research faculty
- ○ Non-tenure track teaching faculty
- ○ Staff
- ○ Tenure-track faculty
- ○ Tenured faculty
- ○ [ ] Other

In total, approximately how many students do you teach at PSU in an average year?

[ ]

Which population(s) of students do you teach at PSU?

- ○ Undergraduate only
- ○ Graduate only
- ○ Undergraduate and graduate students

- ○ Yes
- ○ No
- ○ Maybe/Unsure
- ○ Prefer to not answer

If you have any additional comments, please feel free to share them here:

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