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STUDENT SUSTAINABILITY SURVEY

Informational Whitepaper

January 2023

By

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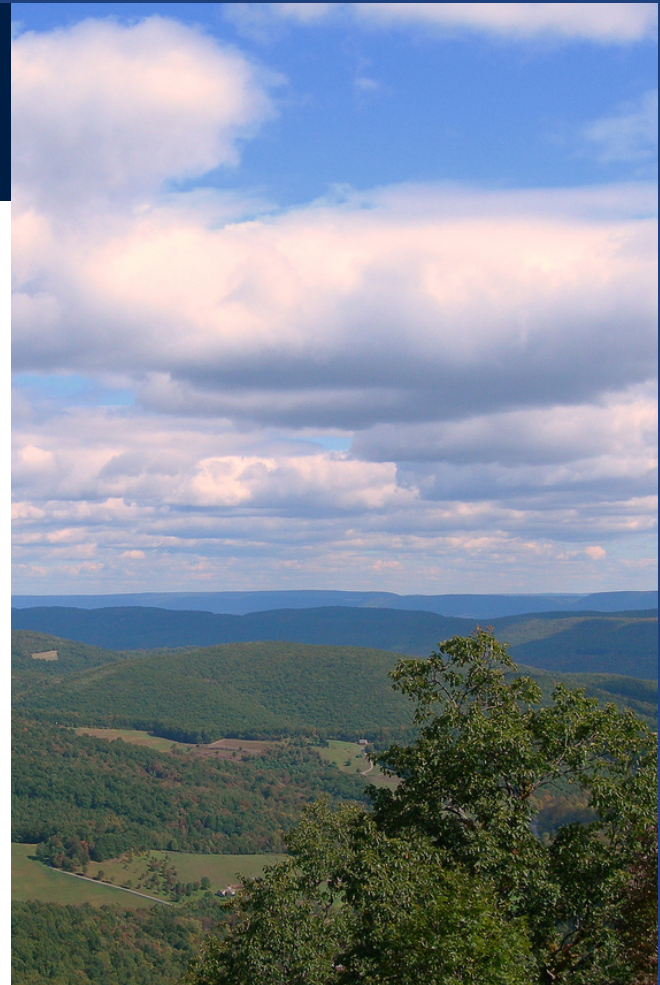Dr. Julie Stanton,
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Krista Bailey

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ACKNOWLEDGMENTS

At the time of this publication, I am a fourth-year undergraduate student about to graduate in May 2023. I had hardly imagined I would be writing this a year ago, when this process first started. It was the unwavering and persistent support from my faculty and staff mentors that made this possible, and their uplifting encouragement that made me believe in myself.

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My internship director, thank you for investing your time every week to meet with me, and picking me up when I doubt myself. You have been my #1 supporter through this all.

Dr. Julie Stanton

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Dr. Janet Swim

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To the **University Park Undergraduate Association** and the **Sustainability Institute**, thank you for providing the resources and guidance to make this survey possible.

EXECUTIVE SUMMARY

A recent effort to understand students' current knowledge and beliefs about sustainability was initiated by Penn State's Faculty Senate and University Park Undergraduate Association (UPUA) and continued by a team of students, staff, and faculty throughout the fall semester of 2022. The survey is composed of 38 questions gauging sustainability knowledge, beliefs, and behaviors. Students were recruited via campus-wide advertisement and several large-instruction business classes (final N = 1315). Responses patterns are the same from the two sources.

 Participants answered fifteen True/False statements and indicated whether they were certain or guessed at their answers. On average, participants correctly answered 72% of the fifteen questions, but they were only certain and correct on 32% of the questions. Students performed best on waste-related questions (49% certain and correct), worst on climate change-related questions (18%), and in between on ecosystem services (39%), environmental justice (34%), and systems-thinking (31%) questions. There was a slight tendency for those who have been at Penn State longer to score better on these questions (r = .13, p < .001)

Using the Six Americas Super Short Survey (SASSY) – a nationally recognized assessment of climate change beliefs that allowed us to compare student responses to national averages – over three-quarters of students are either concerned 44%) or alarmed (34%), with students being more concerned and less dismissive and doubtful then the rest of the country. Stronger beliefs were unrelated to knowledge and semester standing.

Students responded favorably to the Carbon Emissions Reduction Task Force and Waste Stream Task Force report. They expressed strong support for climate change initiatives (e.g., 71% agreeing that Penn State's President needs to make climate action a top priority and consistently communicate this as a priority, 75% wanting the campus to reduce emissions by 100% by 2035). They even more strongly support recycling initiatives (e.g., 92% wanting better recycling systems on campus). Students want more out of their courses: 74% agree there should be more sustainability-related courses and 86% agree that Penn State should encourage more climate-smart courses and curriculum. While assessment of their current coursework was somewhat encouraging, only 65% believed their coursework transformed the way they thought about sustainability and 68% felt their courses prepared them for the challenge of climate change. There is a slight tendency for those who supported these efforts to score well on the sustainability knowledge test and to have been at Penn State longer (r's ranging from .05 to .21, average = .14)

The survey results provide insight into student sustainability interests and should be used as a catalyst for the prioritization of sustainability in Penn State's curriculum, operations, outreach, and culture. Based on the survey findings, the authors suggest three key recommendations:

1) Develop an annual, university-wide Sustainability Literacy Assessment
2) Engage students in sustainability in classrooms
3) Support an integrated approach to sustainability education in the curriculum (sustainable learning outcomes, sustainability designation, university requirement, etc).

INTRODUCTION

Penn State has developed robust sustainability education in programs, majors, and courses across the Commonwealth. Interested faculty have been leaders in this space, and worked with staff offices such as the Penn State Sustainability Institute to tailor courses and create degree programs that teach sustainability in its various disciplines and forms.

The Sustainability Institute has long looked at the merits of institutionalizing sustainability in the academic curriculum. Several milestones that have been identified in this endeavor include the development of sustainable learning outcomes, a sustainability course designation, a sustainability university requirement, and a sustainability literacy assessment.

Recent efforts by the University Park Undergraduate Association sparked a collaboration with the Sustainability Institute and partnering faculty to understand the four outlined milestones through a student sustainability survey. The survey questions below guided the following methodology, discussion, and recommendations included in this whitepaper:

1 WHAT SUSTAINABILITY KNOWLEDGE DO PENN STATE STUDENTS CURRENTLY HAVE?

2 WHAT BELIEFS ABOUT SUSTAINABILITY DO PENN STATE STUDENTS CURRENTLY HAVE?

3 IS THERE AN ASSOCIATION BETWEEN KNOWLEDGE AND BELIEFS, AND IF SO, WHAT IS IT?

INSTITUTIONAL CONTEXT

Penn State's Sustainability Literacy Assessment descends from a set of actions centered in the Sustainability Institute's Academic Programs. It begins with the development of a sustainability meta-competencies framework.

Shortly after Penn State formed its Sustainability Institute (SI), its first Director, Dr. Denice Wardrop, tasked its academic staff with researching and formulating a framework for sustainability competencies that could be used in curricular design. Wardrop believed that Penn State should provide an explicit and implicit curriculum teaching the knowledge, skills, abilities, and behaviors that foster more sustainable individuals, organizations, cultures, and economies that support the web of life. Audiences could include students, staff, faculty, and the public. A group of researchers, led by then SI staff Dr. Susannah Barsom and Rural Sociology doctoral student Elyzabeth Engle, conducted a literature review of relevant research and corporate gray literature and a case study using sustainability expert informant interviews from Penn State and beyond. The resulting framework includes systems thinking, temporal thinking, interpersonal literacy, ethical literacy and imagination/creativity. The study was published as a white paper in 2016 and then in peer-reviewed literature in 2017.

In 2018 a Sustainability Survey was developed by a committee staffed by Penn State Student Affairs Research and Assessment (SARA) office, the Sustainability Institute, and other offices of Student Affairs. The survey covered several areas, including literacy, opinions regarding the United Nations Sustainable Development Goals, and knowledge of sustainability programs and practices at Penn State.

The literacy portion of the survey, which consisted of 12 questions, was drawn directly from the work of Zwickle and Jones (2018), with permission. The survey was administered in Fall 2018 by Student Affairs Research and Assessment staff. A total of 1,228 students (undergraduate and graduate) completed the survey, a 13.64% response rate. Demographics of respondents were compared to those of the overall student body. Staff at the Sustainability Institute found the survey results interesting, but did not believe they provided sufficient insight into sustainability literacy, beliefs, and actions that could guide university-wide curricular development for sustainability.

Today, after five-plus years of use of the meta-competencies framework, the SI and partners in academic units, academically-related administrative offices, and the Faculty Senate face the challenge of deeper institutionalization. Based on conversations across the entire Commonwealth system with faculty, staff, and students at nearly every level of the organization, we see a desire to develop an attribute in LionPath for sustainability. This attribute will require a set of learning outcomes that the Faculty Senate approves. That process requires staffing, further research, reporting, and the small-p "political" work for passage. For the Senate to pass the attribute and its concomitant learning outcomes, we have taken the parallel action to develop a sustainability literacy assessment to reliably and validly test sustainability knowledge, beliefs, and actions. From this point, this paper focuses on the Sustainability Literacy Assessment.

TIMELINE

 Interest in a university-wide survey has been ongoing for years; however, this iteration of a sustainability assessment began in January of 2022. The former president of Penn State's University Park Undergraduate Association (UPUA), Erin Boas, worked with former Faculty Senate Chair, Bonj Szczygiel, to obtain a university license to the Sulitest in order to measure student sustainability literacy. The terms for both positions came to an end before the Sulitest could be disseminated. The new administration of the UPUA tasked their Department of Environmental Sustainability (DoES), headed by Isabella Briseño, to continue this work and establish a marketing campaign to encourage broad-based participation.

After meeting with several members of the Sustainability Institute as well as faculty members with expertise in this area, concerns over the Sulitest's length, effectiveness in measuring sustainability literacy, and usefulness towards addressing the milestones outlined above prompted a discussion of the merits of seeking alternatives. This, in combination with technical difficulties transferring the ownership role of Sulitest to the DoES as well as the expiration of the university's license with the Sulitest, resulted in the formation of an informal working group consisting of UPUA Executive Director of Sustainability Bella Briseño, Liberal Arts faculty Mark Sentesy and Janet Swim, Earth and Mineral Science faculty Brandi Robinson, Brandywine faculty Julie Stanton, and Sustainability Institute staff Krista Bailey, Peter Buck, Doug Goodstein, and Meghan Hoskins.

 The group volunteered considerable time and effort throughout the summer to distill existing assessment frameworks and generate an original survey that would capture a snapshot of students' knowledge and attitudes towards various sustainability topics. Specifically, the original survey incorporated components of the Assessment of Sustainability Knowledge (ASK), Awaken State survey, and Yale's SASSY scale, and utilized the expertise of Dr. Julie Stanton, marketing researcher, and Dr. Janet Swim, behavioral psychologist. In early August, the group produced their final draft of the Student Sustainability Survey, a 38-question survey (including demographic questions) that includes cognitive, affective, and behavioral components to gauge overall sustainability knowledge and beliefs.

The Student Sustainability Survey was piloted the week of August 15, 2022 in Penn State's HUB-Robeson Center. Random participants were asked to provide live feedback in order to improve the survey, and received a $5 giftcard to the Penn State Bookstore in return. Participants' personal information was not collected, and their answers were not recorded.

The survey was officially launched on August 22nd during the University's Welcome Week, and the UPUA sponsored a $50 Amazon giftcard raffle to encourage participation. Initially, the survey's integrity was compromised by bots, resulting in new security measures being put in place and the group decided to wipe the initial results to relaunch the survey with a clean slate. The survey was relaunched in September and remained open until November 18th. Participation was again encouraged by the UPUA's sponsorship of a $150 Amazon giftcard raffle.

PARTICIPANTS

Dissemination included a variety of strategies, including tabling in the HUB-Robeson Center, promotional flyers in over 15 high-traffic buildings, social media posts, a promotional article by Onward State, and instructor referral. Over the course of three months, the survey received 1,315 total responses (N=1315).

Of all the dissemination strategies, instructor referral was the most effective, as 1,234 respondents indicated they accessed the survey through this method. The Sustainability Institute's faculty affiliates were contacted and asked to share the survey with their classes, and thirteen responded affirmatively. Instructors of large-group classes were also contacted. In particular, Smeal faculty Ron Johnson graciously offered extra credit to students in sections of his BA 342 and MGMT 301 classes who completed the survey. A copy of the original survey was made to collect participant information to award extra credit. As a result, 1,119 responses (N=1119) were collected from his classes alone (see Table 1 below).

## Table 1. Frequency of Survey Recruitment Methods

	Frequency	Percentage
Volunteer Distribution	196	14.9%
Johnson's Distribution	1,119	85.1%
TOTAL	**1,315**	**100%**

The two copies were merged in SPSS to analyze the results in aggregate, but separate statistical tests were completed to compare the two distributions for any statistically significant results (see Section IV).

The survey collected demographic information as a standard procedure, and analyzed the frequency of gender, race/ethnicity, academic college, and semester standing for the sake of comparison. The survey tilted slightly towards males (58%) than females (41%) or non-binary/third gender identifying individuals (0.50%). Survey participants were predominantly white (83%), resulting in a low diversity of respondents. Although we pursued dissemination methods that cast a wide net into the general student population, we cannot ascertain from our data collection methods why we received such low participation from individuals across races/ethnicities.

Academically, 55% of students had a semester standing of 5 semesters or more (assigned label "UpperClass"), and 44.5% had a semester standing of 4 semesters or less. 71% of students (N=933) were in Smeal College of Business, largely due to the participation of business professor Ron Johnson's students. Low representation from most other academic colleges impeded cross-college study. See *Limitations* section for further detail.

Statistical tests controlling for Johnson's student sample were run to evaluate the extent of a sample skew. Although there were some nuances, it was not enough to skew the survey results and response patterns are the same across the two samples. See *Appendix* for detailed analysis of Johnson's sample.

PARTICIPANTS BY GENDER

PARTICIPANTS BY RACE
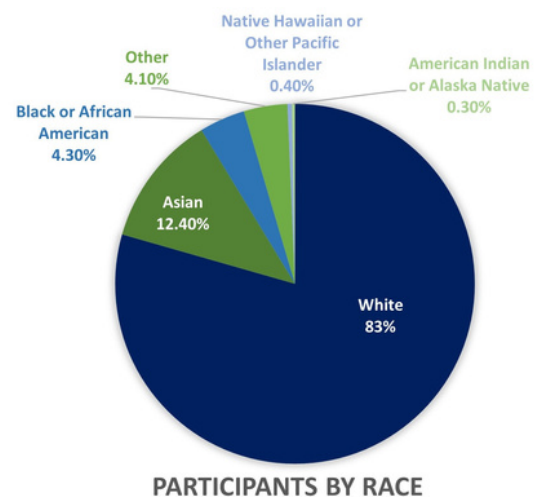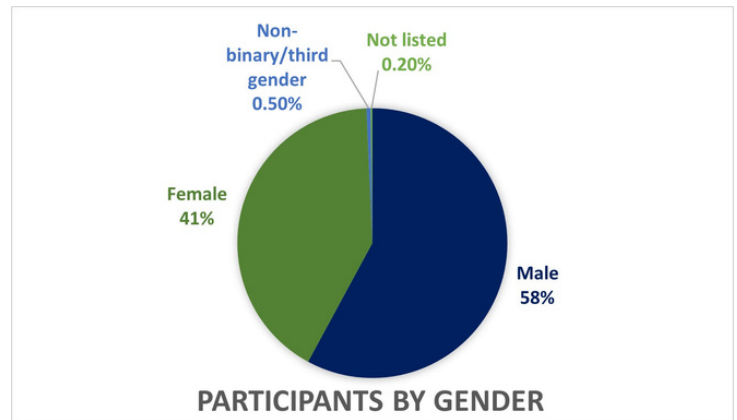
ARE YOU HISPANIC/LATINO/SPANISH ORIGIN?
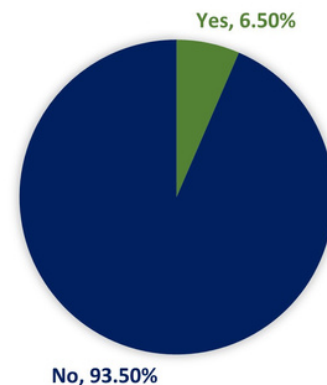
SURVEY INSTRUMENT

The survey instrument was divided into four sections that assessed sustainability competencies through socio-demographic, cognitive, affective, and behavioral questions (Waltner et al., 2019) and attempted to capture a snapshot of student knowledge and beliefs about sustainability through an expanded version of True/False knowledge questions about fifteen different areas of sustainability, the four Six Americas Super Short Survey (SASSY!) questions, agreement statements pulled from the Waste Stream Task Force recommendations and Carbon Emissions Reduction Task Force recommendations, the Awaken State survey, and Penn State-approved demographic questions. A copy of the survey can be found in the appendix.

Dr. Julie Stanton and Dr. Janet Swim led data analysis of the Student Sustainability Survey results. Their analyses were run separately using different variable coding for the knowledge section, but their results are reported jointly due to their consonant, instead of dissonant, conclusions.

The fifteen knowledge questions were structured in the same format as below:
- Residents of Pennsylvania will experience increased frequency and intensity of flooding events as a result of climate change.
  - I'm certain this statement is true.
  - I think this statement is true but I'm uncertain.
  - I think this statement is false but I'm uncertain.
  - I'm certain this statement is false.

Including the certainty measure in assessing the respondent's correctness allows for a more accurate "knowledge" calculation. If a respondent gets a question right "with certainty," it can more accurately be considered knowledge; otherwise, it can be considered guesswork. Analysis takes this into consideration to compare not only a dichotomous correctness measure, but the subset of correct responses answered with certainty.

The agreement section of the survey begins with four questions copied from Yale's Six Americas Super Short Survey, an "audience segmentation tool" to delineate how people view global warming (Yale SASSY). In our survey, we replaced the term "global warming" with "climate change", but it otherwise mirrors the original model. Their model asks participants how important climate change is to them personally, how worried they are, how much they think it will harm them personally, and how much they think it with harm future generations of people. Based on the data we collected and uploaded to their SASSY Group Tool, we were able to distinguish audience segments for our pool of participants, and compare them against national estimates. Agreement statements were posed using a five-point Likert scale, ranging from "Strongly Agree" to "Strongly Disagree." Likert scales are so commonly used in consumer research that respondents are rather comfortable with them and expend less of a cognitive load in the effort to respond. Twelve out of the 38 questions were formatted in this matter, with the exception of the four SASSY questions.

RESULTS

Knowledge was most precisely defined in this survey by the level of certainty and correctness respondents demonstrated by their answer choices. Table 3 sorts the fifteen questions, abbreviated according to their subject area, by "percent certain and correct" and divides it according to the five categories the question falls under (Table 2). The question about the definition of environmental justice recorded the lowest percent (8%), whereas the question about the general definition of sustainability recorded the highest percent (56%).

Table 2. Categorical Analysis

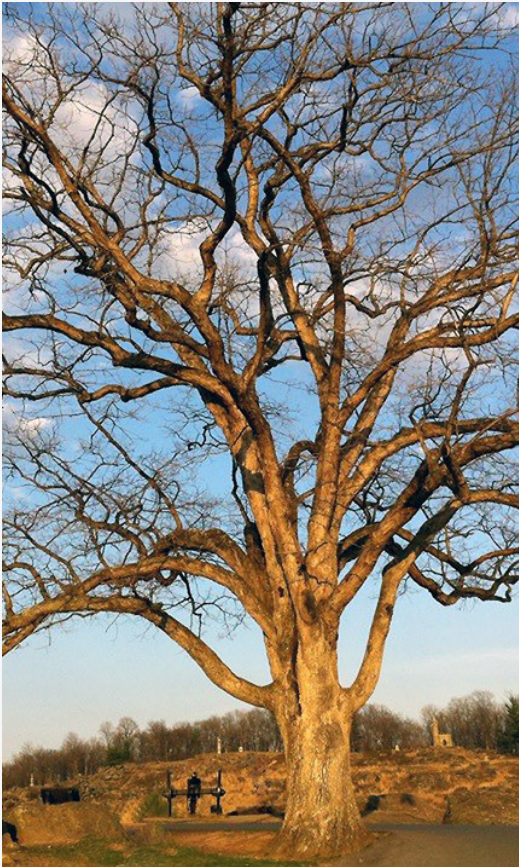| Category	Percent Correct	Percent Certain and Correct	Percent Certain
Climate Change	59%	18%	26%
Systems Thinking	66%	31%	38%
Environmental Justice	74%	34%	38%
Ecosystem Services	84%	39%	41%
Waste	75%	49%	59%

On a categorical basis, students performed best on waste-related questions (49% certain and correct), worst on climate change-related questions (18%), and in between on ecosystem services (39%), environmental justice (34%), and systems-thinking (31%) questions. The Percent Certain metric provides a contrast to the Percent Certain and Correct that implicitly records the level of certainty and incorrectness for each category. The largest difference is seen in the waste category, indicating 10% of responses were certain yet incorrect (59% - 49%). Following this, 8% of climate change responses were certain yet incorrect, as well as 7% of systems thinking responses, 4% of environmental justice responses, and 2% of ecosystem services responses.

Table 3. Question-by-question Analysis

Item	Percent correct	Percent Certain and Correct	Percent Certain
Environmental Justice definition	37%	8%	16%
Public transportation - Health and EJ	85%	39%	42%
Malnutrition prevalence	88%	39%	41%
Landfill location EJ	86%	49%	53%
PA effects climate change	66%	16%	20%
US GHG Emissions	66%	17%	24%
Climate change cause	46%	20%	34%
Food waste	78%	44%	49%
Ecological footprint	71%	54%	69%
Water pollution source/system	56%	13%	19%
Current economic systems	61%	24%	33%
General sustainability defintion	80%	56%	61%
Plant-based diet	72%	27%	33%
Biodiversity	86%	34%	36%
Impact of trees on urban environment	95%	55%	55%

KNOWLEDGE SUMMARY

Average "scores" across the student sample

Percent Correct

72%
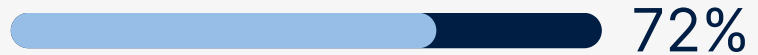
Metric: Participants answered 72% correctly on average

Percent Certain

39%

Metric: Participants answered 39% with certainty on average

Percent Certain and Correct

32%

Metric: Participants answered 32% correctly, and with certainty, on average

On average, participants correctly answered **72%** of the fifteen questions, but they were only certain and correct on **32%** of the questions. When interpreting results, the level of certainty indicates how confident participants were in their answer choices. Across items, participants were certain on **39%** of the questions, independent of whether they got it correct or incorrect.

RESULTS

The SASSY Group Tool identified over three-quarters of our student sample as either concerned or alarmed about climate change, with slightly more being concerned than alarmed. While virtually the same percentage of students are alarmed as those in the US population, far more students are considered concerned than the national sample and far fewer students are dismissive and doubtful than the national sample.

Audience Segmentation

444	578	216	9	59	9
ALARMED	**CONCERNED**	**CAUTIOUS**	**DISENGAGED**	**DOUBTFUL**	**DISMISSIVE**

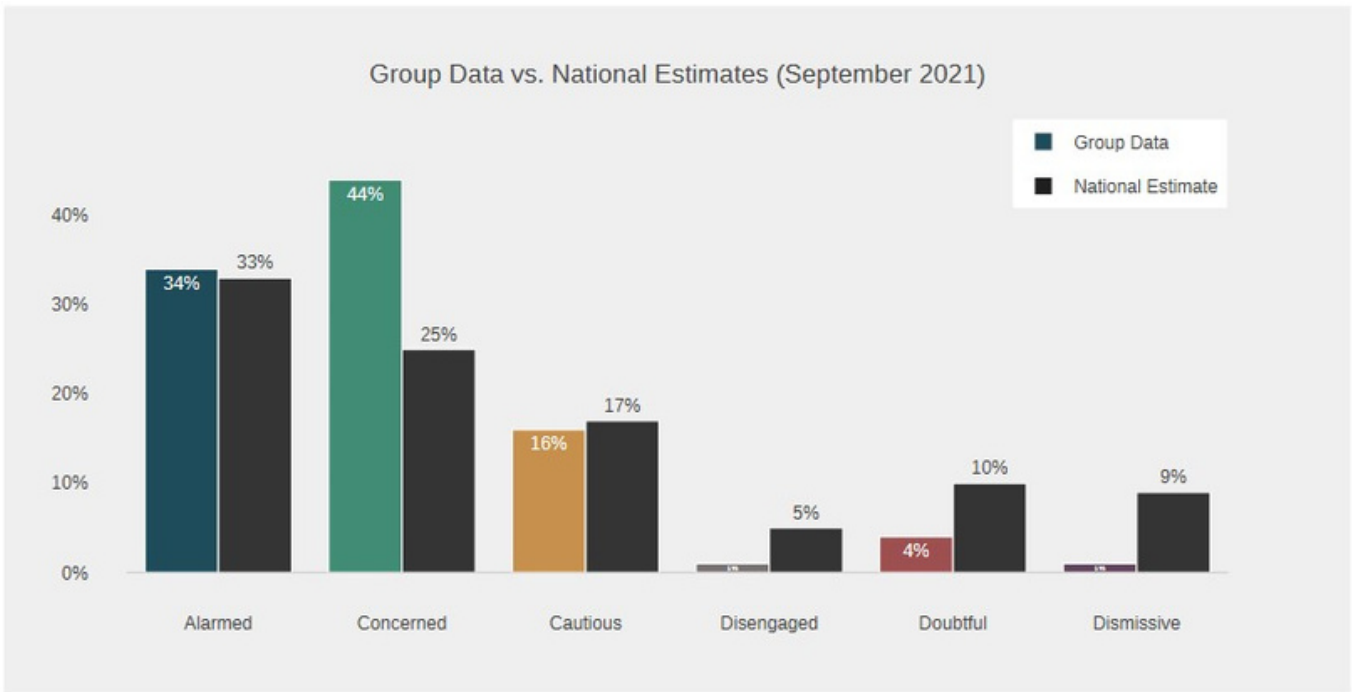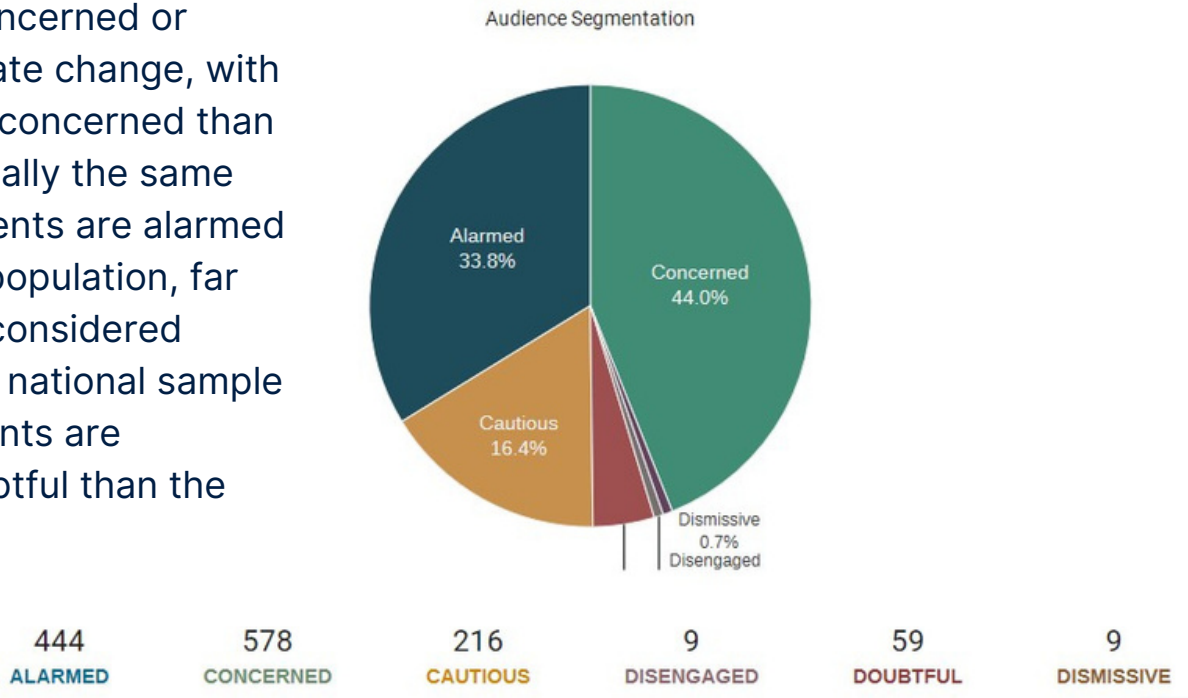Group Data vs. National Estimates (September 2021)

Figure 4 and 5. SASSY Group Tool comparisons

For statements regarding Penn State's future direction, on average, students did not disagree with any of the statements provided. Agreement is the sum of Strongly Agree and Agree. Some statements were more favorable than others, namely statements regarding Penn State's integrated recycling system that promotes moving away from single-use plastics (91.7%), recycling educational outreach (88.8%) and sustainable investing (87.5%). The least favorable statement among the Carbon Emissions Reductions Task Force and Waste Stream Task Force statements was that students believe their Penn State education will prepare them to take on the challenge of climate change (67.8%).

Further, sustainability education statements had the lowest cumulative percent agreement, on average, between the three categories. Comparing individual statements, students overwhelmingly agreed that students in their college should learn more about sustainability (80.6%. Otherwise, 75.9% agreed more sustainability topics should be infused into existing courses, and 74.2% agreed that more courses should be offered that focus on sustainability.

Figure 6. Comparisons for carbon emission-oriented and waste-oriented statements.
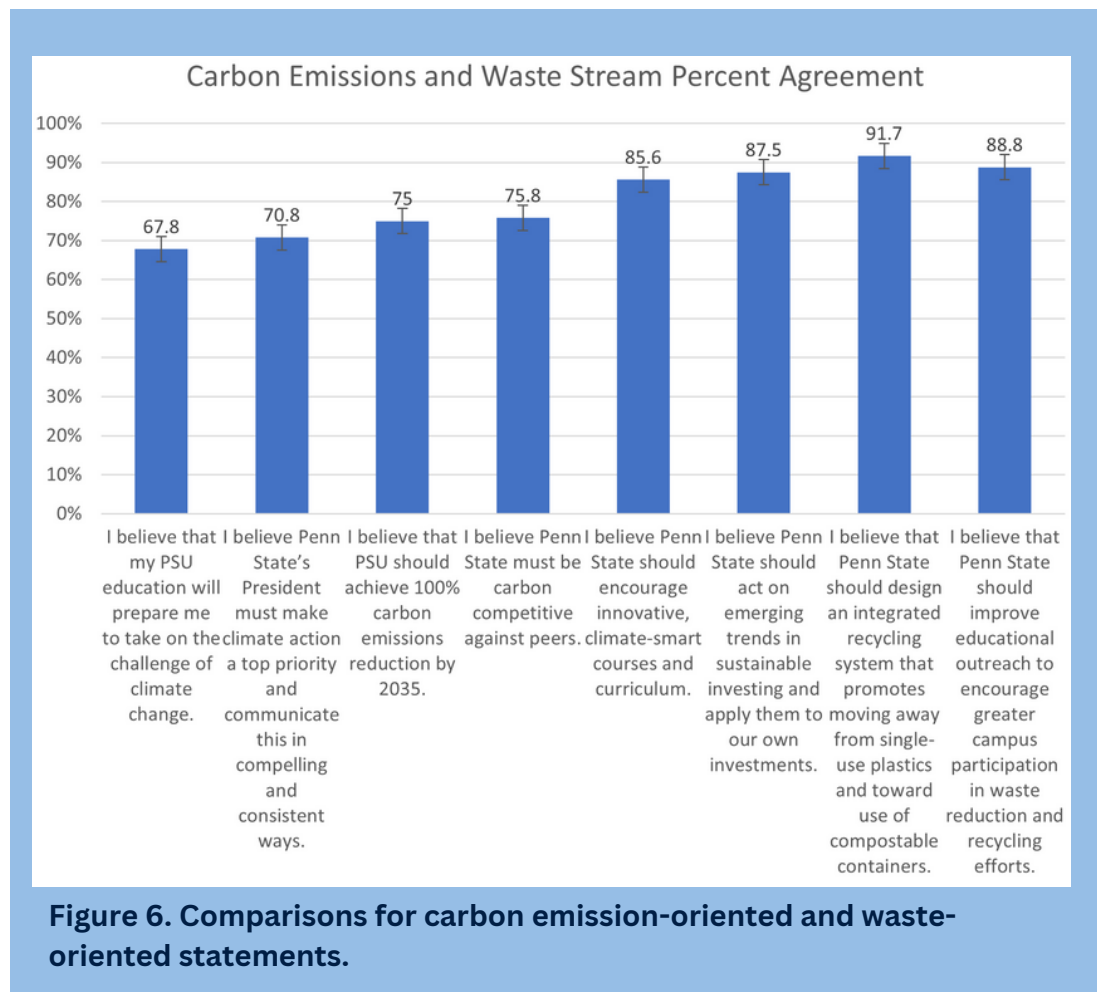
The least favorable education statement asked students whether they agreed that the courses they have already taken at Penn State have transformed how they think about sustainability (65.1%). This is reminiscent of a pattern, considering the least favorable statement from the CERTF recommendation concerned how current courses prepare students for climate change (67.8%).

In a paired samples t-test, there is no statistically significant difference between the statements I believe that my PSU education will prepare me to take on the challenge of climate change and The courses I have taken at PSU have transformed the way I think about sustainability. As of now, students do not have a framework to attribute their knowledge to.
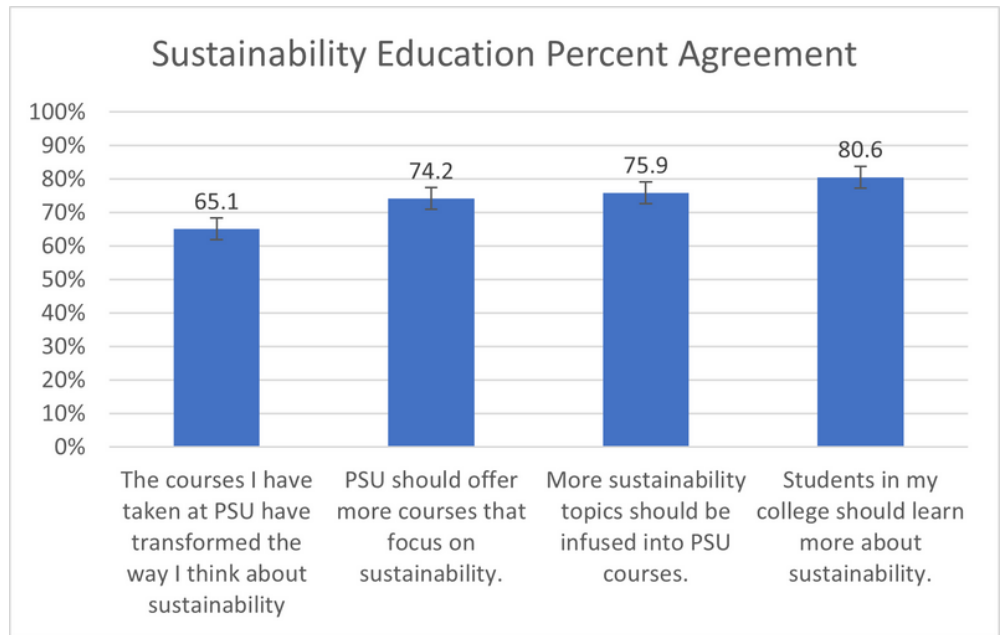
Figure 7. Agreement comparisons for education-oriented statements.

The survey concluded with a multiple-select question regarding sustainability-related activities students partake in outside of their classes. Interestingly, the highest participation was students educating themselves about sustainability topics (68%), followed most closely by encouraging others to engage in sustainability-related activities (37%).

Figure 8. Participation in sustainability-oriented activities

BELIEFS SUMMARY

Average percent agreement across three categories
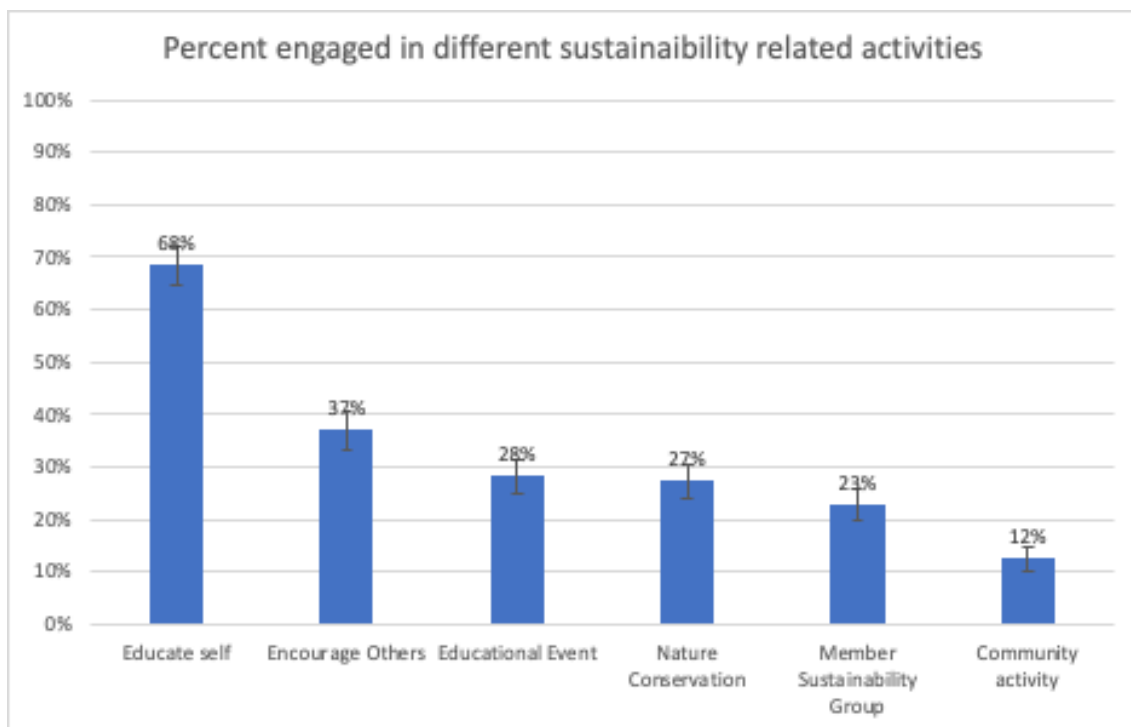

Waste Stream

90%
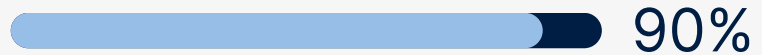
Metric: Average percent agreement across all waste statements

Carbon Emissions Reduction

77%
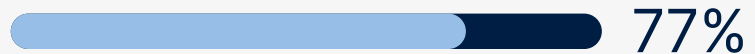
Metric: Average percent agreement across all carbon emissions reduction statements

Sustainability Education

74%
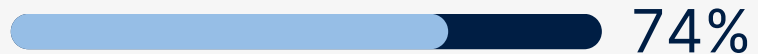
Metric: Average percent agreement across all sustainability education statements

Percent agreement averages the percentage of participants who answered "Strongly Agree" and "Agree" to each statement, and for each category, further averages the statements within each category. For sustainability education, this meant four statements; for carbon emissions reduction, this meant six statements; for waste stream, this meant two statements.

RESULTS

People who **knew more** about sustainability also were **more supportive** of sustainability education.

The correlations are statistically significant yet slight, and preliminarily suggest that the higher students score on the knowledge section, the more likely they are to agree with the statements in the beliefs section. The strongest correlations are associated with statements regarding sustainable investing, an integrated recycling system, and integration of climate-smart courses (See Table). Two correlations are not statistically significant and therefore are considered exceptions, those being "I believe that my PSU education will prepare me to take on the challenge of climate change" and "The courses I have taken at PSU have transformed the way I think about sustainability."

Climate change beliefs (i.e., Six Americas categories) were unrelated to how well participants did on the knowledge test or how certain they were on the test.

Statement	Correlation
I believe Penn State should act on emerging trends in sustainable investing and apply them to our own investments.	-3.19*
I believe Penn State should encourage innovative, climate-smart courses and curriculum.	-3.10*
I believe that Penn State should design an integrated recycling system that promotes moving away from single-use plastics and toward use of compostable containers.	-3.08*
I believe Penn State's President must make climate action a top priority and communicate this in compelling and consistent ways.	-2.67*
I believe that Penn State should improve educational outreach to encourage greater campus participation in waste reduction and recycling efforts.	-2.67*
I believe Penn State must be carbon competitive against peers.	-2.53*
More sustainability topics should be infused into PSU courses.	-2.42*
Students in my college should learn more about sustainability.	-2.14*
I believe that PSU should achieve 100% carbon emissions reduction by 2035.	-2.10*
PSU should offer more courses that focus on sustainability.	-1.95*
I believe that my PSU education will prepare me to take on the challenge of climate change.	-0.43
The courses I have taken at PSU have transformed the way I think about sustainability.	-0.36

LIMITATIONS

The results of this survey effort have provided an initial insight into the knowledge and beliefs of Penn State students, as well as the association between the two as a metric for the efficacy of Penn State's current formalized sustainability education. However, limited conclusions can be drawn from these results due to several inhibiting factors.

While the survey may contribute to the body of knowledge existing on sustainability competencies and assessment, the lack of an established framework means sustainability meta-competencies cannot be linked to the survey results without further academic research. Similarly, the lack of an established framework of university-wide sustainable learning outcomes (SLOs) means student performance cannot be linked to existing curriculum. In the future, SLOs provide a metric to assess the efficacy of individual classes and the collective curriculum in teaching students a set framework of sustainability topics. This is a future goal for university groups to undertake and set into motion prior, or in concurrence with, a university-wide assessment.

On that note, the nature of the survey as a grassroots, largely student-run, effort meant survey dissemination and diverse participation were challenges. We were unable to promote the survey on the five university list-servs we contacted because the survey was deemed a student effort. This made it difficult to get the word out to a larger sample of students,

and a lack of participation across academic colleges. The dissemination strategies relied on instructor referral because of the voluntary, yet impactful method of obtaining a wide sample of students. This resulted in a potential skew towards the Smeal College of Business, which was resolved by performing statistical tests but framed the survey as a Smeal case study instead of a representative sample. Due to some colleges having as few as four participants out of 1,315, we could not analyze the sample by college.

The differences associated with Johnson's sample and the original sample cannot be explained without further investigation. A variety of factors may cause these differences, such as the curriculum and/or community culture, but there is no current, well-established phenomenon to cite.

Since the effort was a University Park Undergraduate Association initiative, and the capacity of the survey team was limited, the survey only applies to University Park students. In future iterations, it is imperative that Commonwealth Campuses not only participate, but help plan the survey and orchestrate its dissemination.

Lastly, although the survey development was intentional and strategic, the questions are original for the most part, and therefore pose a question of whether student performance reflected the possession/lack of knowledge or the question design itself.

RECOMMENDATIONS

Ask #1 ——— Develop an annual, university-wide Sustainability Literacy Assessment

Ask #2 ——— Engage students in sustainability in classrooms

Ask #3 ——— Support an integrated approach to sustainability education in the curriculum (sustainable learning outcomes, sustainability designation, university requirement, etc).

Survey results provided an initial insight into the knowledge and beliefs of Penn State students and the efficacy of Penn State's current formalized sustainability education. Students agree that sustainability improvements in carbon neutrality, waste reduction, and education are essential for Penn State to consider moving forward. Students are not confident or often correct on sustainability knowledge questions, which implies a gap in the current curriculum that can be improved through strategic sustainability curricular advancements.

Future university-wide survey efforts are needed to investigate these preliminary findings and overcome the limitations of this initial effort, revising some questions and obtaining a more representative sample. At the very least, the survey results provide insight into student sustainability interests and a catalyst for the prioritization of sustainability in Penn State's curriculum, operations, outreach, and culture. Financial and personnel resources are needed to extend and continue this survey effort so that such goals can be met. This may include engaging individual colleges in internal analyses and collaborative assessment of findings across the university system, such that curricular and operational goals can reflect the identified priorities.

APPENDIX

I. Statistical Tests for Johnson and Volunteer sample

i) Those in Johnson's classes tended to be more Alarmed and Concerned and less Cautious, Disengaged, Doubtful, and Dismissive).

	Alarmed	Concerned	Cautious	Disengaged, Doubtful, Dismissive
Volunteer Count	56	81	43	16
Volunteer Percent	28.6%	41.3%	21.9%	8.2%
Johnson's Count	388	497	173	61
Johnson's Percent	34.7%	44.4%	15.5%	5.5%

ii) Students in Johnson's classes scored less on average than the rest of the sample across the three categories, despite these students being on campus for slightly more semesters then the rest of the sample (Semester standing: Johnson's class M=4.20, SE = .049; rest of sample, M = 3.78, SE = .12)

	Percent correct	Percent certain and correct	Percent certain
Volunteer Sample	79%	45%	50%
Johnson Sample	70%	31%	37%

APPENDIX

iii) Students in Johnson's classes were less likely to engage in sustainability activities.

Percent sustainability Activities

Bar chart comparing Volunteer sample (blue) and Johnson's sample (orange):
- Educate self: 76% / 61%
- Encourage Others: 42% / 32%
- Educational Event: 34% / 23%
- Nature Conservation: 34% / 20%
- Member Sustainability Group: 27% / 18%
- Community activity: 15% / 10%
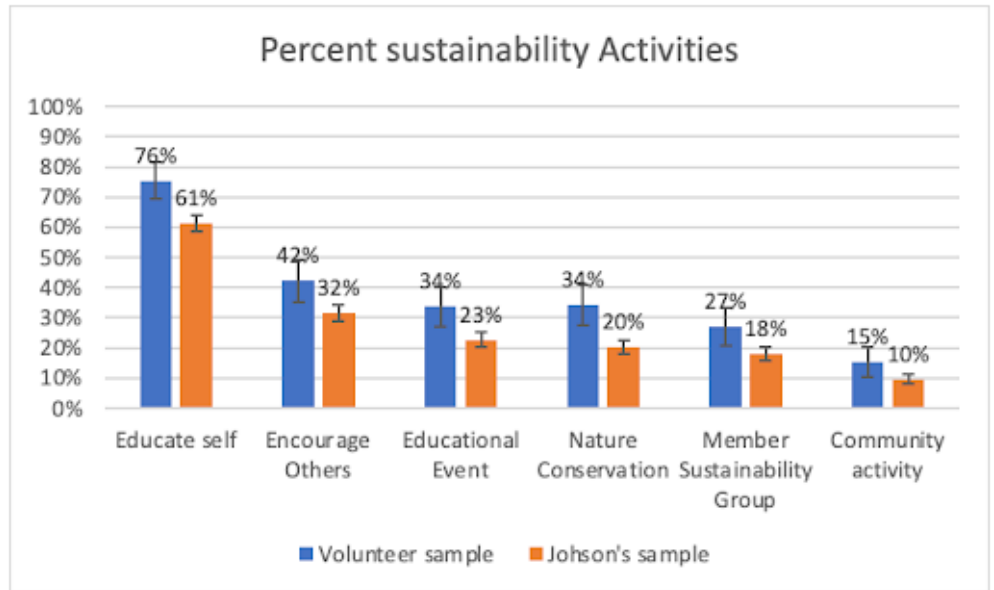
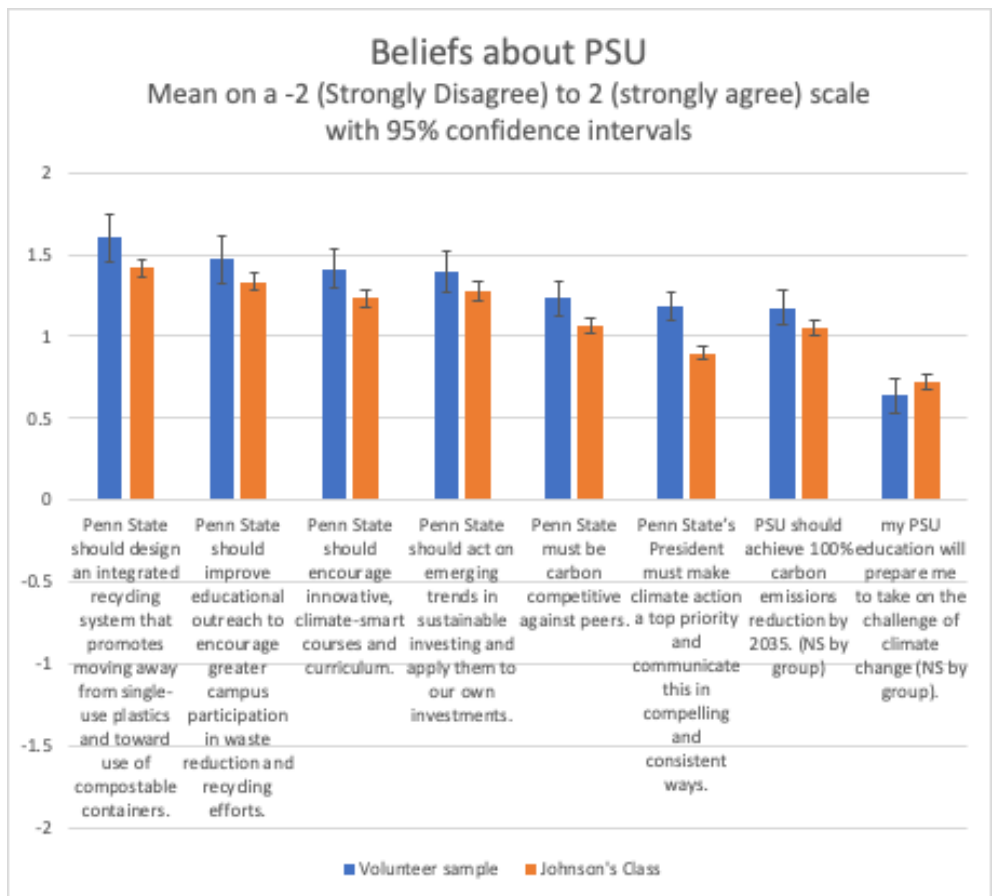iv) Johnson's distribution agrees less strongly with belief statements. However, these differences were not statistically significant.

Beliefs about PSU
Mean on a -2 (Strongly Disagree) to 2 (strongly agree) scale with 95% confidence intervals

Bar chart comparing Volunteer sample (blue) and Johnson's Class (orange) across belief statements:
- Penn State should design an integrated recycling system that promotes moving away from single-use plastics and toward use of compostable containers.
- Penn State should improve educational outreach to encourage greater campus participation in waste reduction and recycling efforts.
- Penn State should encourage innovative, climate-smart courses and curriculum.
- Penn State should act on emerging trends in sustainable investing and apply them to our own investments.
- Penn State must be carbon competitive against peers.
- Penn State's President must make climate action a top priority and communicate this in compelling and consistent ways.
- PSU should achieve 100% carbon emissions reduction by 2035. (NS by group)
- my PSU education will prepare me to take on the challenge of climate change (NS by group).

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RESOURCES

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