

# Sustainability Knowledge Assessment at California State University, Northridge

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*Helen M. Cox,*  
*Director, Institute for Sustainability*  
*Professor, Geography*

*Kiana Lucero*  
*Research Assistant, Institute for Sustainability*



# Outline

- Context
- Sustainability at CSUN
- Assessment tool
- Results:
  - Factors affecting performance
  - Question analysis
  - Comparison to other universities
- Summary
- Next steps



# CSUN

- Founded in 1958
- Located on 356-acres in Los Angeles' San Fernando Valley



- One of the largest single-campus universities in the nation
- 38,310 enrolled in Fall 2013
- 40,131 in Fall 2014



# Student Profile



Race/Ethnicity	
Asian	11%
African American / Black	5%
Hispanic	40%
White	26%
International	9%
Other	9%

Gender	
Male	45%
Female	55%

<http://www.csun.edu/~instrsch/csunnumbersindex.html>



# Student Profile



College	
Arts, Media, & Communication	13%
Business & Economics	17%
Education	5%
Engineering & Computer Science	11%
Health & Human Development	18%
Humanities	5%
Science & Math	8%
Social & Behavioral Sciences	17%
Other	6%

Average Age	23
From California:	95%
% of Undergraduate Students Who Are Low Income Students	49%

[www.csun.edu/~instrsch/csunnumbersindex.html](http://www.csun.edu/~instrsch/csunnumbersindex.html)



# Purpose of Study

1. How much do CSUN students know about sustainability?
2. Do CSUN students in some disciplines know more than others?
3. Do students not engaged in sustainability curriculum gain knowledge in sustainability while at CSUN?
4. Are sustainability students self-selecting?
5. Does our sustainability curriculum enhance knowledge of sustainability principles?
6. Are there areas of sustainability where we need to focus/improve?
7. How does the knowledge of CSUN students compare to other universities?



# Assessment Tool

- Used assessment survey tool developed by the Ohio State University Environmental and Social Sustainability Lab, (<http://ess.osu.edu/>) created using Item Response Theory (IRT).
- 14 questions were chosen from the original set of 16 questions given to 2,000 students.
- Questions and responses from OSU students are available from: [Assessing sustainability knowledge of a student population: Developing a tool to measure knowledge in the environmental, economic and social domains](#), Adam Zwickle , Tomas M. Koontz , Kristina M. Slagle , Jeremy T. Bruskotter. International Journal of Sustainability in Higher Education 2014 15:4 , 375-389  
<http://www.emeraldinsight.com/doi/full/10.1108/IJSHE-01-2013-0008>

Zwickle et al. also presented tool at AASHE, 2013.



# Assessment Tool

- Another 4 questions were added from the combined OSU-University Of Maryland, 2013 ASK survey:  
<http://ess.osu.edu/sites/essl/files/imce/Phase%20II%20Questions%20no%20bold%20answers.pdf>
- An additional 7 questions were generated by CSUN faculty that were more specific to California.
- The entire survey was 25 questions total and took students 15 - 20 minutes to complete.





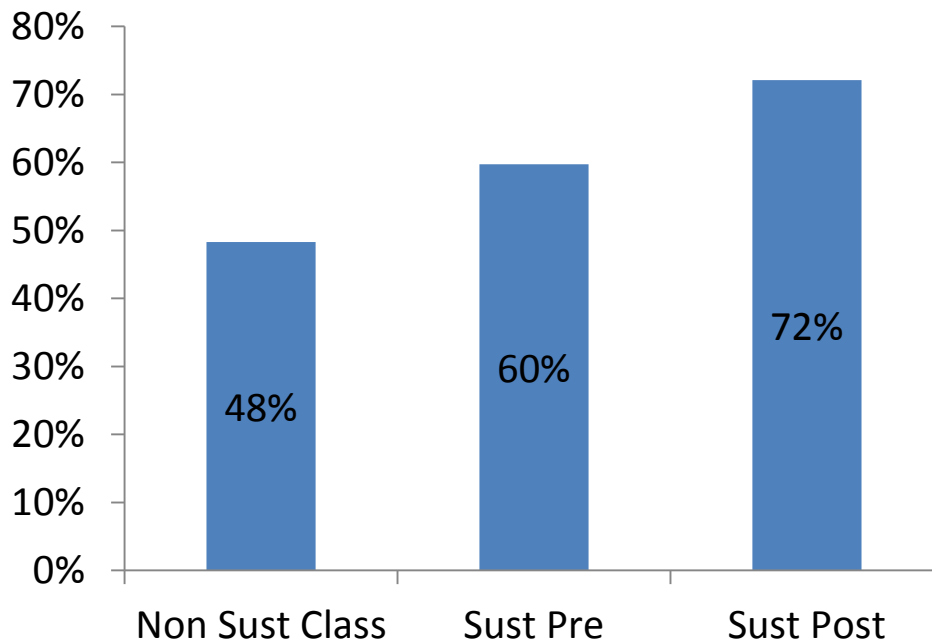
# Methodology

- Administered survey in class (using Scantron forms) to 15 general education classes and 17 sustainability classes between Fall 2013 and Spring 2015.
- 1698 students were surveyed in total. 1157 G.E. students, 541 sustainability students. 420 sustainability students completed both pre- and post- tests.
- Also recorded were:
  - Gender
  - Year in school
  - College of major
  - Number of sustainability-related courses taken



# Results: CSUN Average Scores

	Mean	N	Std. Deviation	Std. Error Mean
<b>NonSust</b>	12.06	1157.00	3.96	0.12
<b>Pre</b>	14.93	523.00	4.47	0.20
<b>Post</b>	18.02	438.00	3.88	0.19



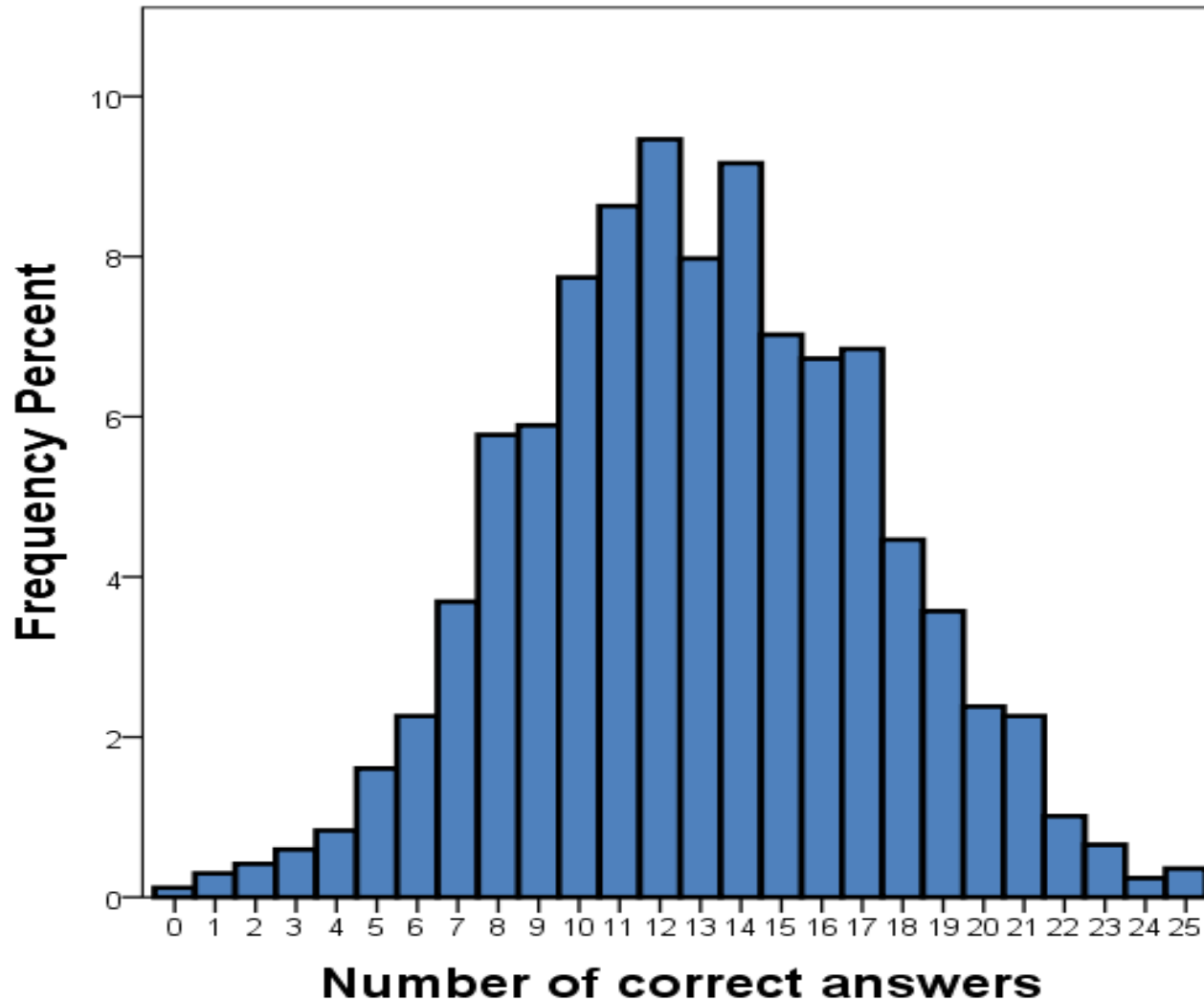
## t TEST

	t	Sig. (2-tailed)
<b>NonSust</b>	103.528	0.000
<b>Pre</b>	76.382	0.000
<b>Post</b>	97.098	0.000

- Difference is significant.
- Post-Sust students have more sustainability knowledge than Pre-Sust and Non-Sust students.



# Results: CSUN Scores



	Pre
Mean	12.95
N	1680
Std. Deviation	4.33



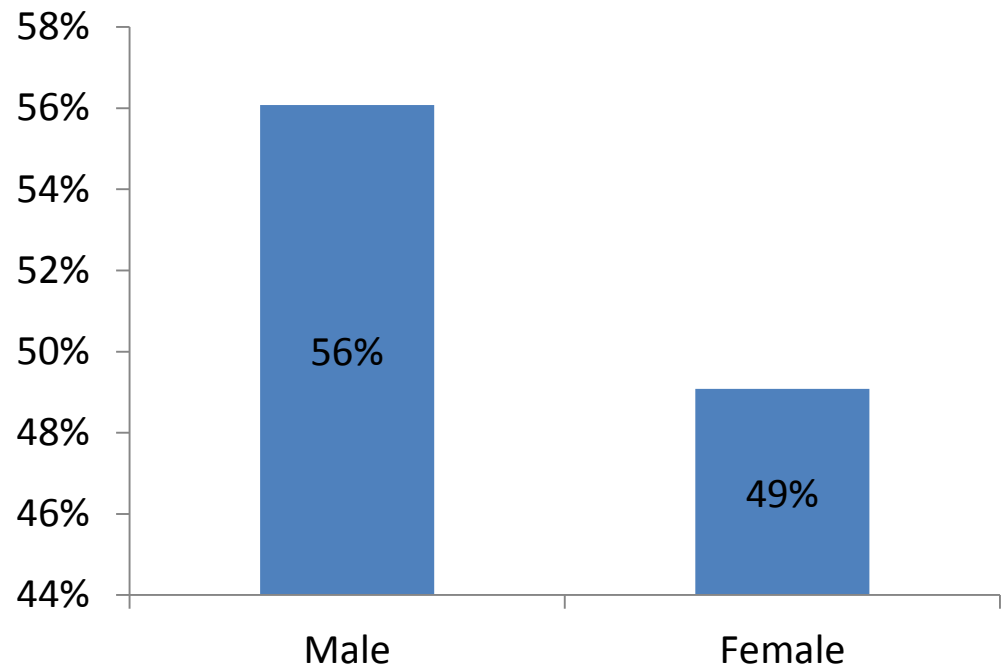
# Results: Gender

	Mean	N	Std. Deviation	Std. Error Mean
Male	14.02	739	4.34	0.16
Female	12.27	888	4.11	0.14

## ANOVA

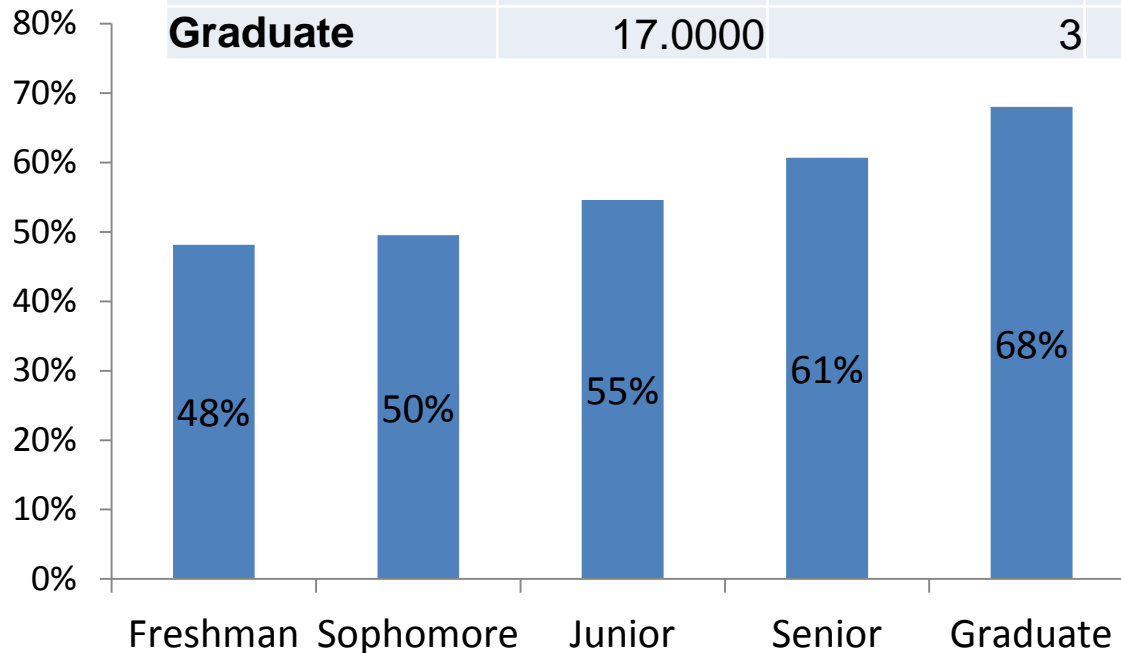
	F	Sig.
Between Groups	70.007	0.000

- Difference is significant.
- Males tend to have more knowledge about sustainability than females.



# Results: Year in school

	Mean	N	Std. Deviation	Std. Error Mean
<b>Freshman</b>	12.0396	480	3.80	0.17
<b>Sophomore</b>	12.3824	455	3.90	0.18
<b>Junior</b>	13.6469	439	4.49	0.21
<b>Senior</b>	15.1719	256	4.63	0.29
<b>Graduate</b>	17.0000	3	2.65	1.53



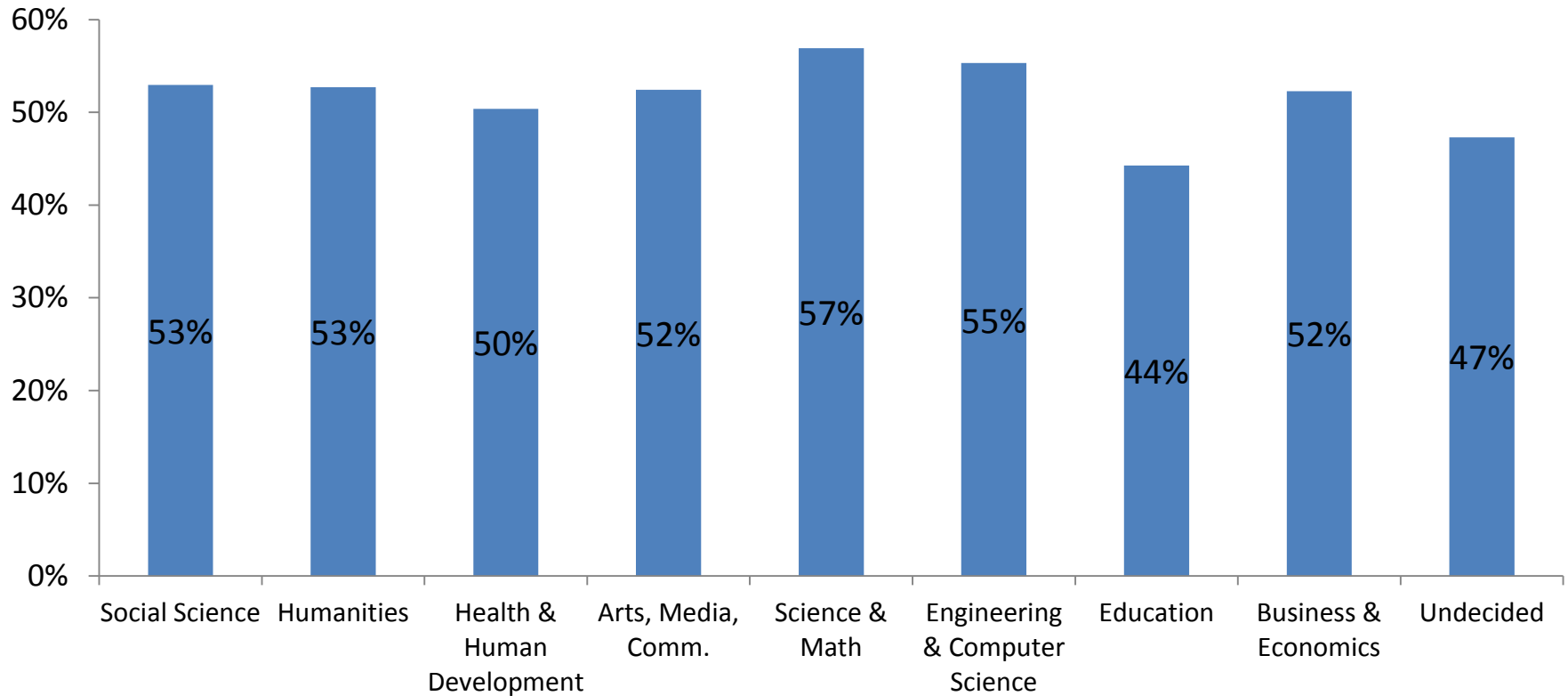
## ANOVA

	F	Sig.
<b>Between Groups</b>	29.638	0.000

- Difference is significant.
- Knowledge of sustainability increases with year in school.



# Results: Major



## ANOVA

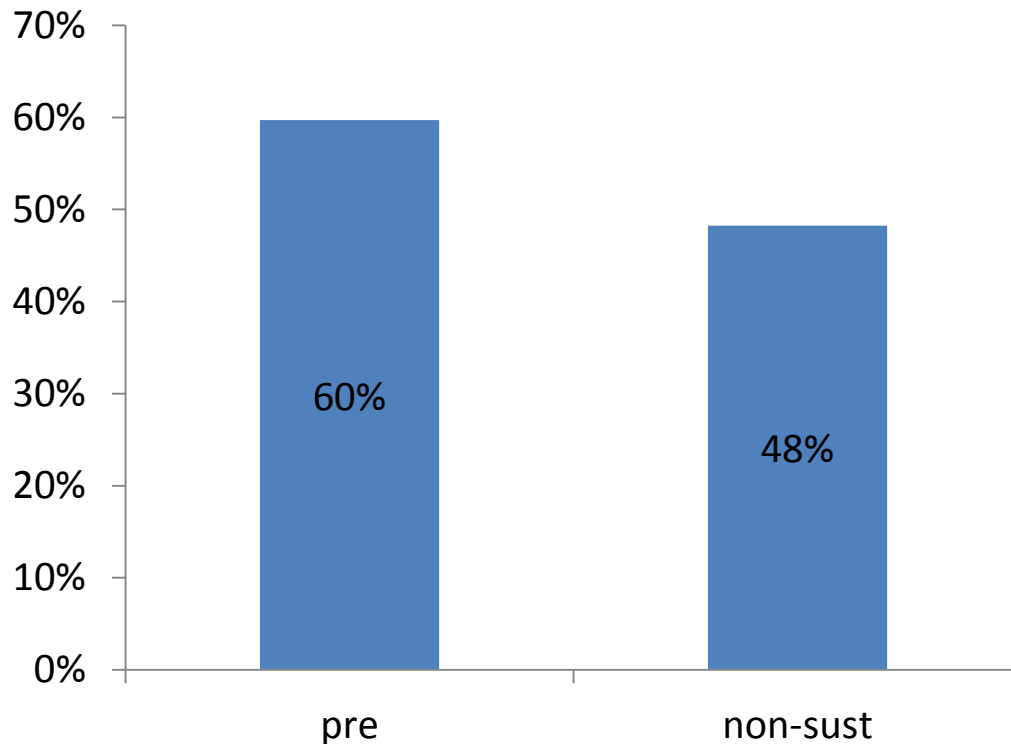
	F	Sig.
Between Groups	4.847	0.000

- Difference is significant overall
- Least knowledgeable majors: Education, and Undecided
- Most knowledgeable majors: Science & Math, Engineering & Comp. Sci.



# Results: Are sustainability students self-selecting

	Mean	N	Std. Deviation	Std. Error Mean
Pre-Sust	14.93	523.00	4.47	0.20
Non-Sust	12.06	1157.00	3.90	0.12



## t TEST

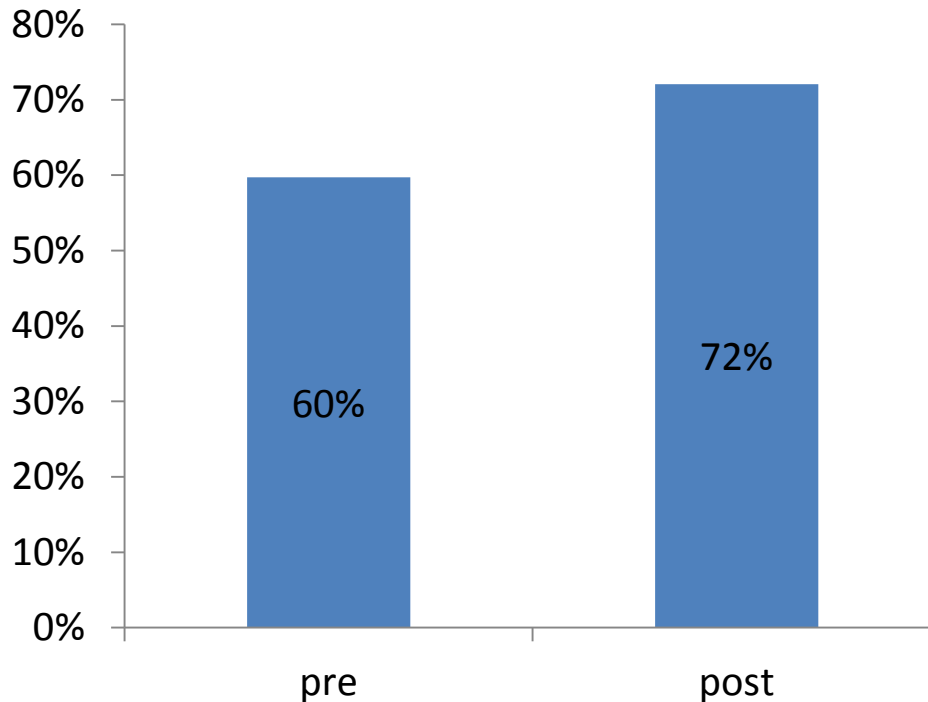
	t	Sig. (2-tailed)
Pre-Sust	76.382	0.000
Non-Sust	103.528	0.000

- Difference is significant.
- Students enrolling in a sustainability class have an average score 2.9 points (12%) higher than other students



# Results: Post vs Pre Test

	Mean	N	Std. Deviation	Std. Error Mean
<b>Pre-Sust</b>	14.93	523.00	4.47	0.20
<b>Post-Sust</b>	18.02	434.00	3.90	0.19



## t TEST

	t	Sig. (2-tailed)
<b>Pre-Sust</b>	76.382	0.000
<b>Post-Sust</b>	96.240	0.000

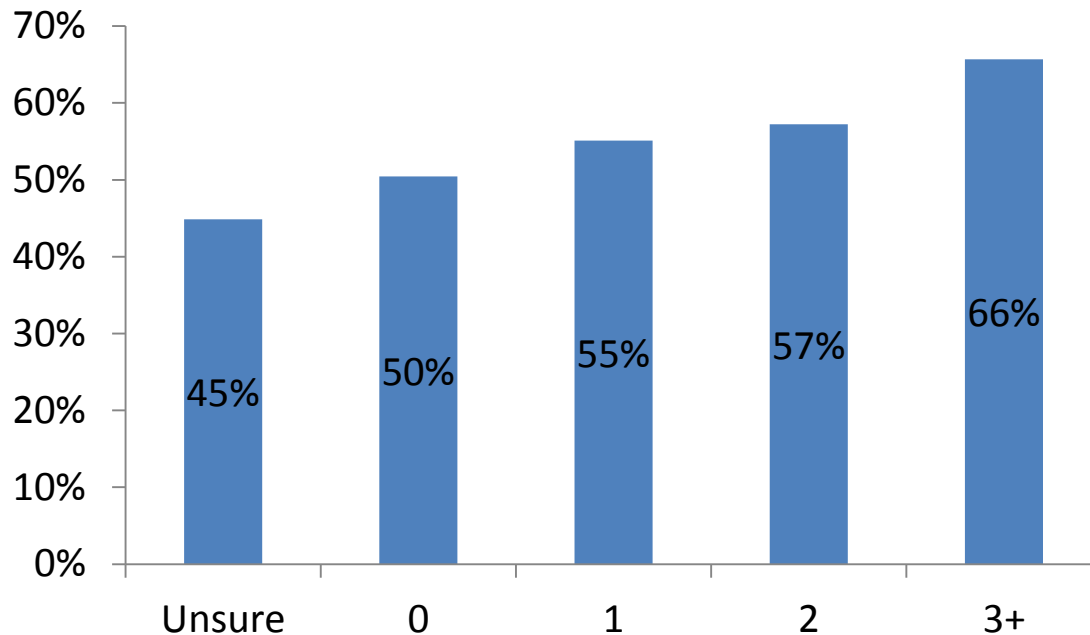
- Difference is significant.
- Post-test average is 3.09 points (12%) higher than pre-test.





# Results: Number of Sustainability Courses Taken

	Mean	N	Std. Deviation	Std. Error
Unsure	11.21	89.00	4.33	0.46
Zero	12.61	1186.00	4.03	0.12
One	13.77	211.00	4.26	0.29
Two	14.31	71.00	4.72	0.56
Three +	16.42	36.00	4.91	0.82



## ANOVA

	F	Sig.
Between Groups	16.002	0.000

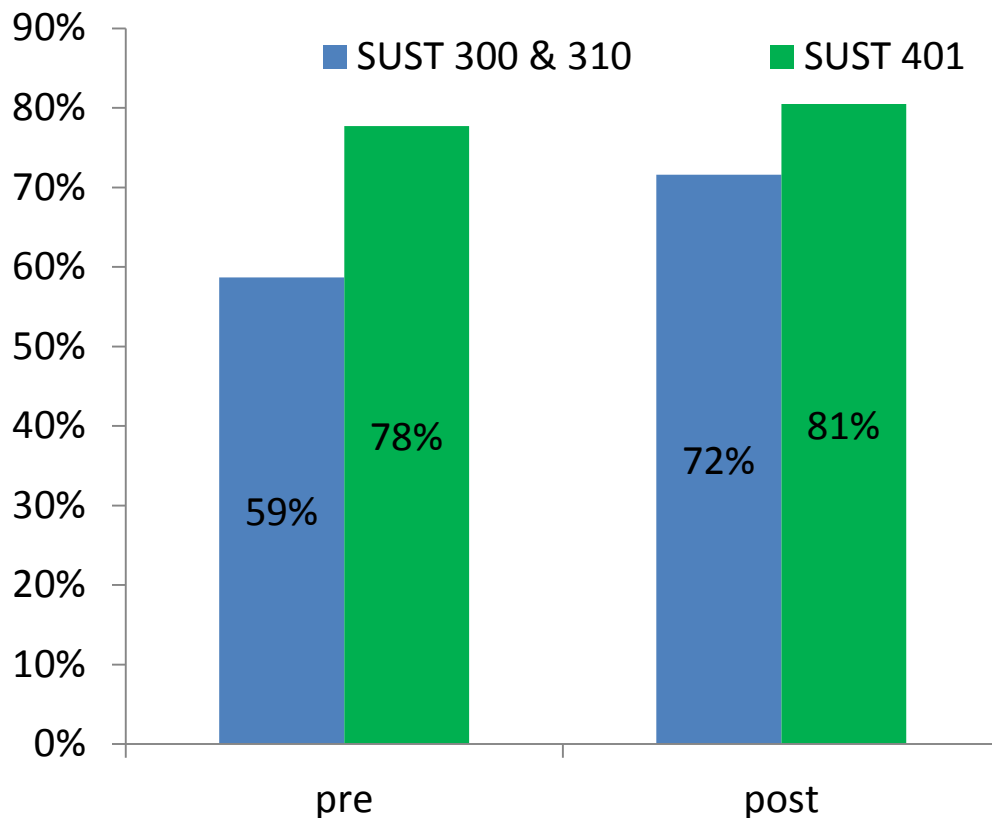
- Difference is significant.
- Knowledge of sustainability increases with amount of sustainability courses taken.



# Results: Upper vs Lower Division Sustainability Class

Pre	Mean	N
<b>SUST 300 &amp; 310</b>	14.6707	495
<b>SUST 401</b>	19.4286	28

Post	Mean	N
<b>SUST 300 &amp; 310</b>	17.90	414
<b>SUST 401</b>	20.13	24



## ANOVA

	F	Sig.
<b>Pre</b>	31.815	0.000
<b>Post</b>	7.566	0.006

- Difference is significant for both pre and post tests.
- Students in upper level sustainability classes score better than lower level classes.



# Results: CSUN Specific Questions

- 7 new questions pertained specifically to California and to topics covered in the university's sustainability program
  1. Our local water supply in Los Angeles comes primarily from \_\_\_\_\_ and will \_\_\_\_\_ as a result of climate change:
    - a. the Colorado River; increase
    - b. the Colorado River; decrease
    - c. the Sierra Mountain snowpack; increase
    - d. the Sierra Mountain snowpack; decrease**
    - e. Don't know
  2. 80% of the country's greenhouse gas emissions result from:
    - a. agriculture
    - b. energy consumption**
    - c. industrial processes
    - d. Landfills
    - e. carbonated beverages



# Results: CSUN Specific Questions

3. Which of the following devices, if left running one hour, would consume the most energy?

- a. **microwave**
- b. cell phone charger
- c. 60-watt light bulb
- d. computer
- e. refrigerator

4. Which of the following is the best explanation why oceans are becoming more acidic?

- a. The oceans are getting warmer.
- b. The pH of oceans is increasing.
- c. **More carbon dioxide is dissolving in oceans.**
- d. Marine organisms are using up all the calcium carbonate to build shells.
- e. Pollution run-off is adding chemicals to the oceans.



# Results: CSUN Specific Questions

5. LEED refers to:
- a. **standards for assessing the “greenness” of buildings**
  - b. standards for evaluating the energy efficiency of light bulbs
  - c. a framework for assessing the local economy
  - d. standards for sustainable fisheries
  - e. standards for conserving wildlife
6. What do most scientists think is causing the current warming trend?
- a. Holes in the ozone layer allow more solar radiation to reach Earth.
  - b. Warm air from the increased number of cars on the road.
  - c. **An increase in greenhouse gases.**
  - d. An increased number of greenhouses.
  - e. The carbon cycle breaking down, and heat related by natural chemical breakdown.



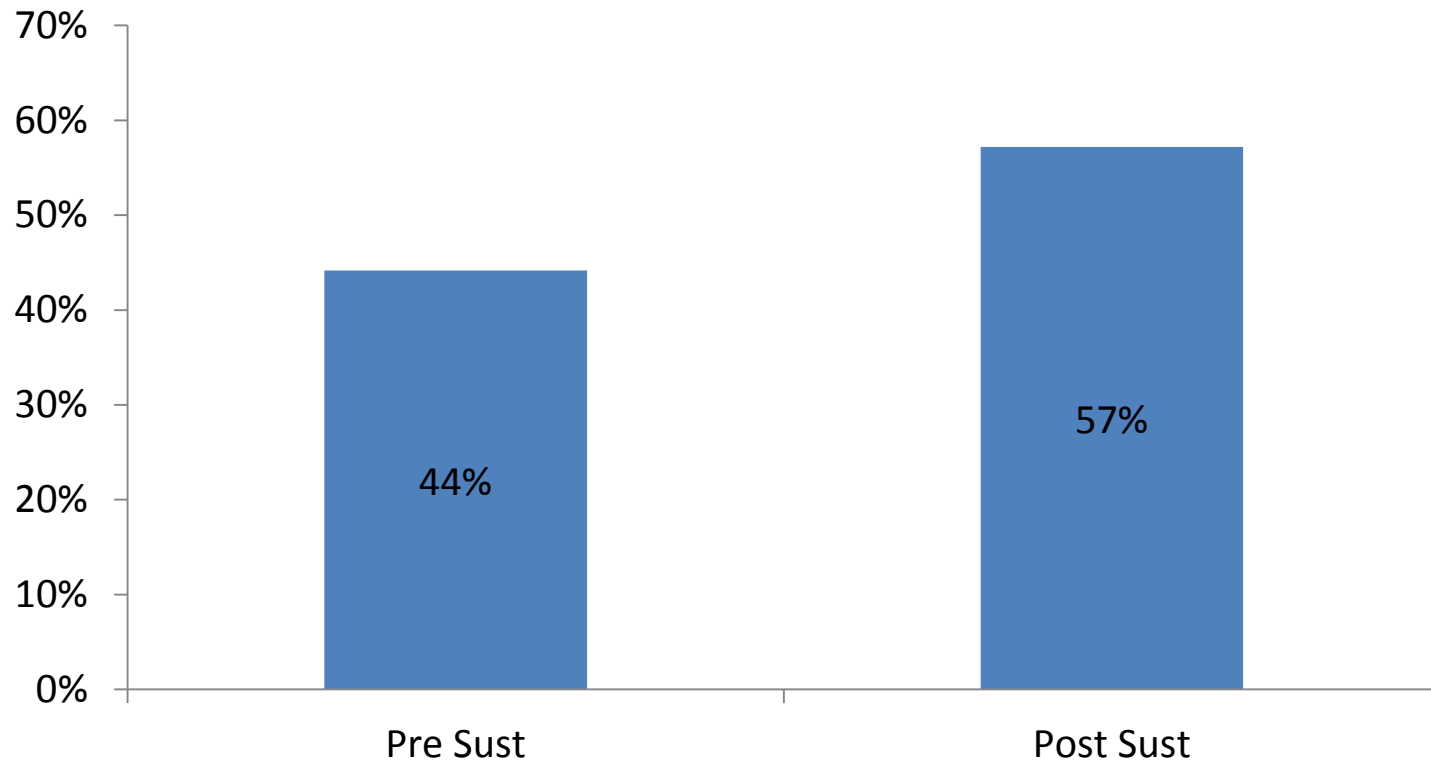
# Results: CSUN Specific Questions

7. Reducing or eliminating which of the following foods from your diet would have the biggest environmental impact?

- a. corn
- b. eggs
- c. milk
- d. beef**
- e. I Don't know



# Results: CSUN Specific Questions

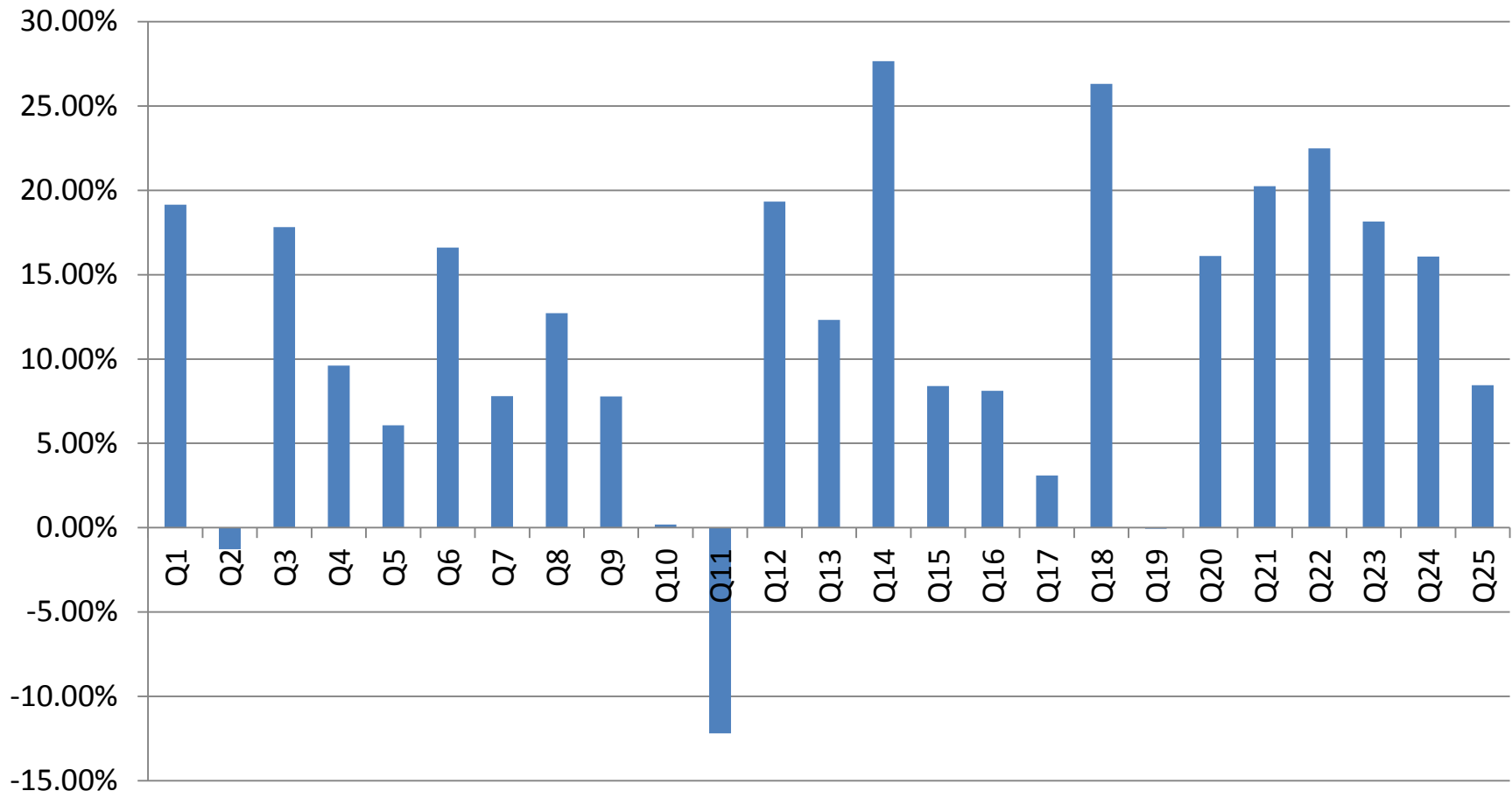


- The average score increase was 13% on these questions after taking a sustainability class



# Results: Sustainability curriculum

% Improvement: Pre to Post Sustainability Class

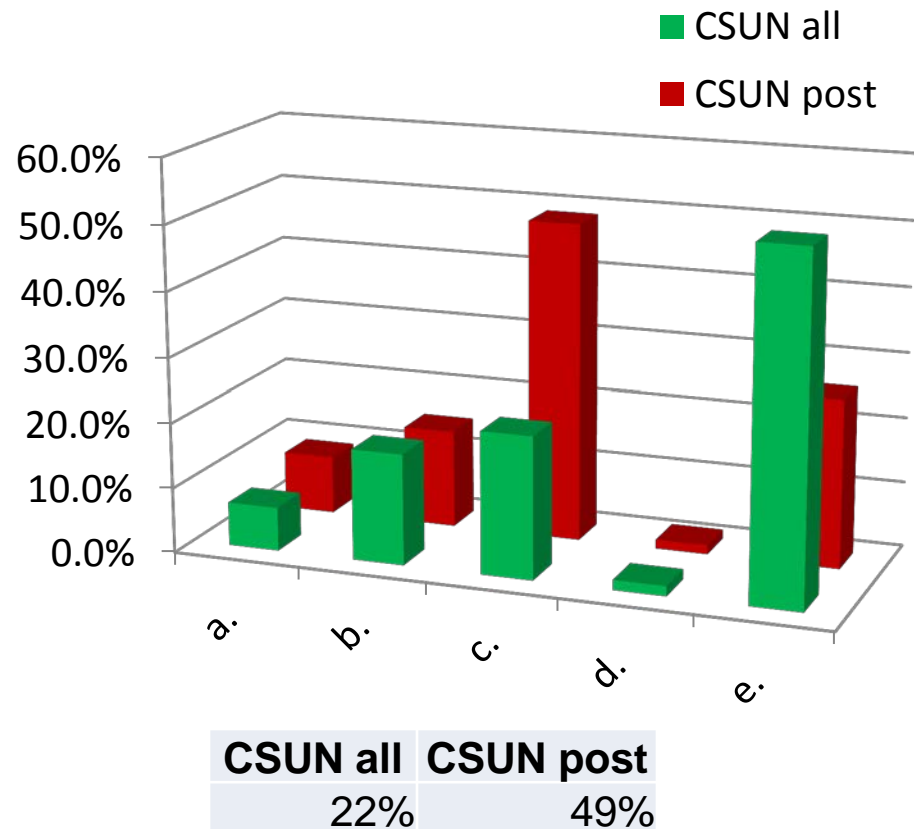




# Results: Question Analysis – Worst performance

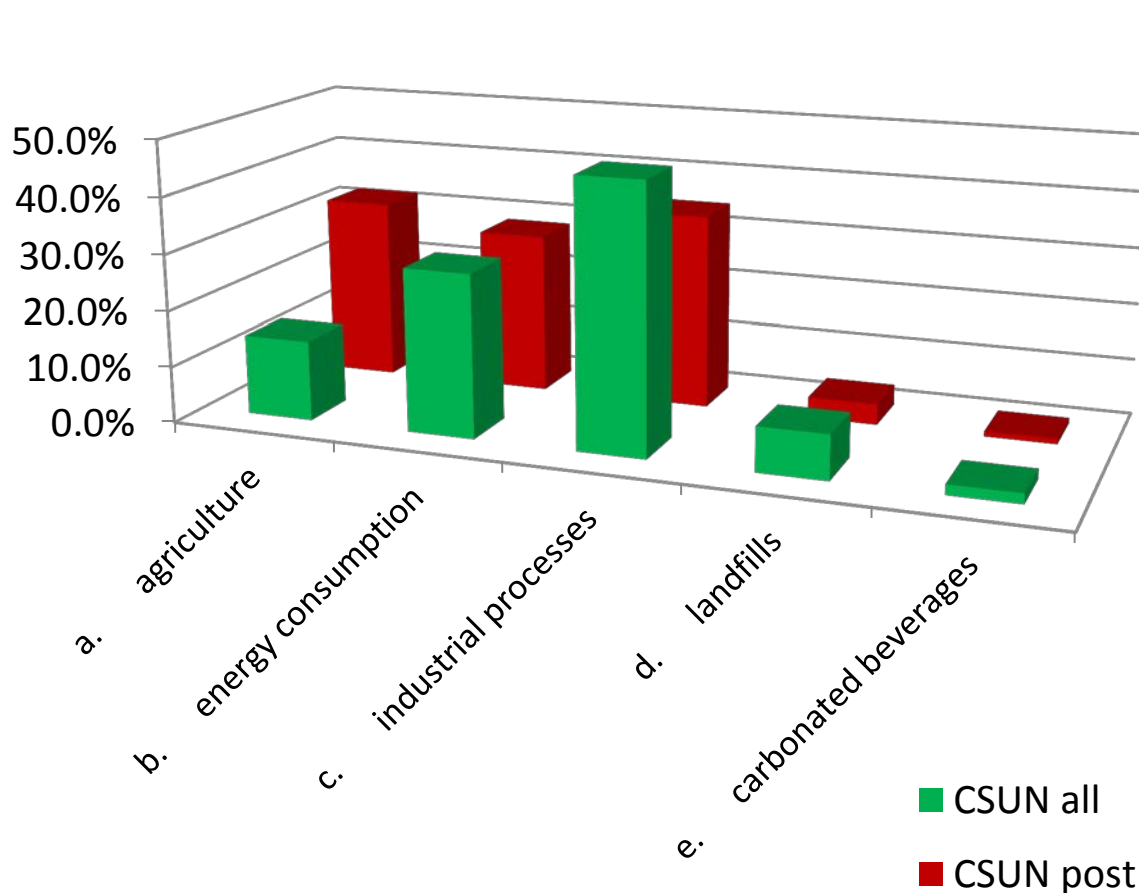
Which of the following is the best explanation why oceans are becoming more acidic?

- a. The oceans are getting warmer.
- b. The pH of oceans is increasing.
- c. **More carbon dioxide is dissolving in oceans.**
- d. Marine organisms are using up all the calcium carbonate to build shells.
- e. pollution run-off is adding chemicals to the oceans



# Results: Question Analysis – Worst performance

80% of the country's greenhouse gas emissions result from:



CSUN all	CSUN post
29%	29%

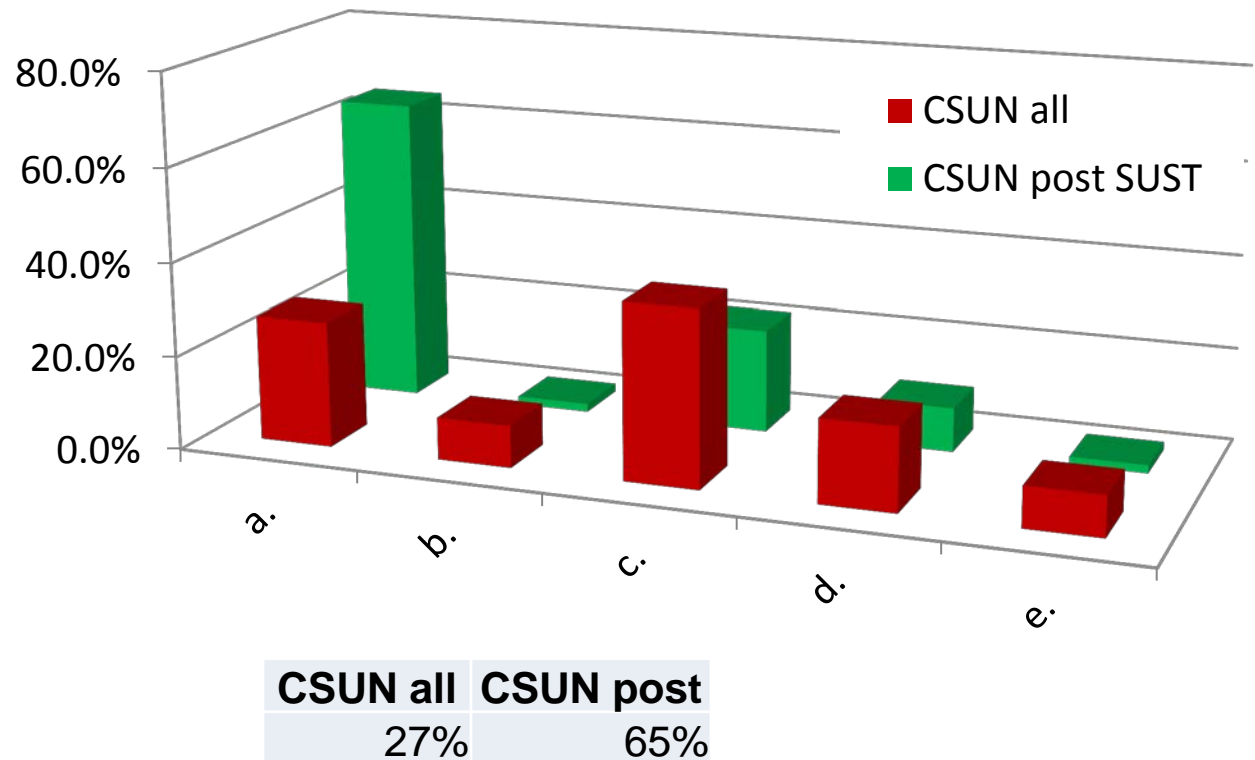
- a. Agriculture
- b. Energy consumption**
- c. Industrial processes
- d. Landfills
- e. Carbonated beverages



# Results: Question Analysis – Worst performance

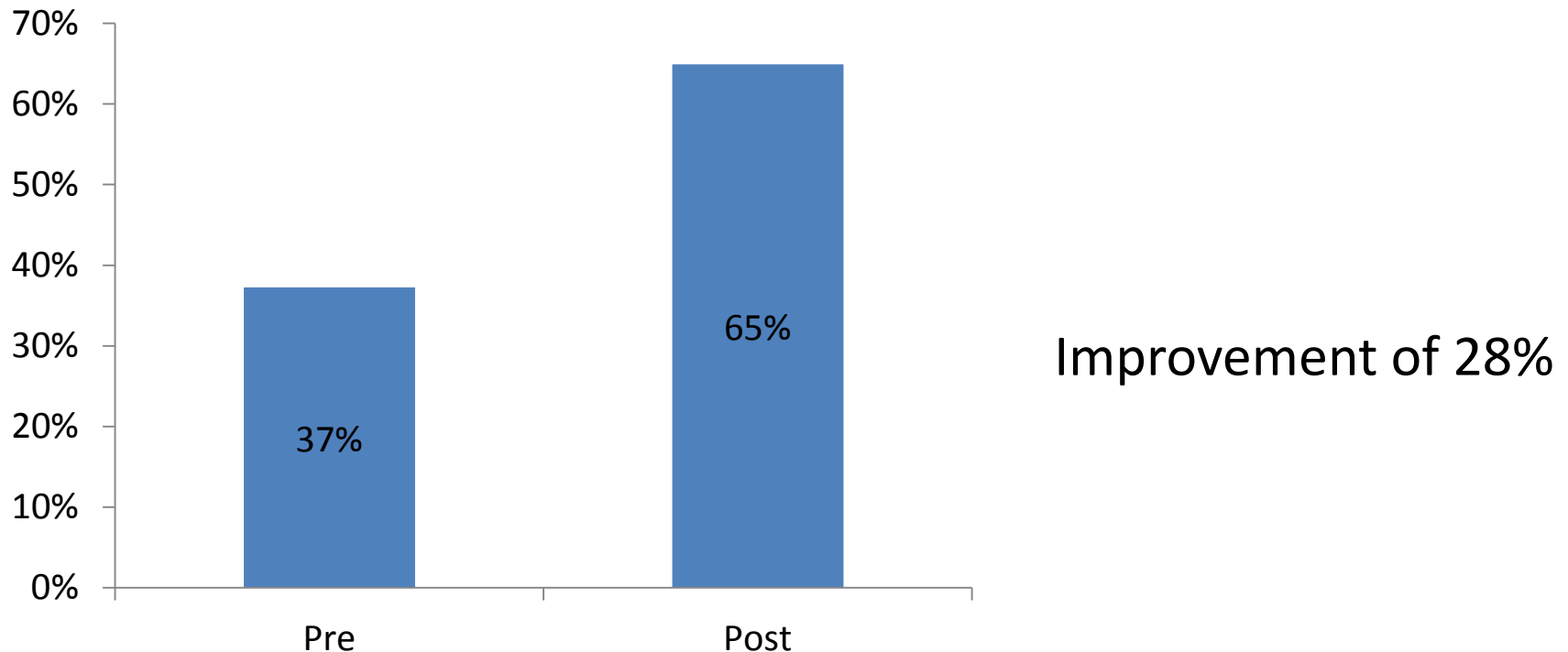
Which of the following is a leading cause of the depletion of fish stocks in the Atlantic Ocean?

- a. Fishermen seeking to maximize their catch
- b. Reduced fish fertility due to genetic hybridization
- c. Ocean pollution
- d. Global climate change
- e. Don't know



# Results: Question Analysis – Most Improved

Which of the following is a leading cause of the depletion of fish stocks in the Atlantic Ocean?

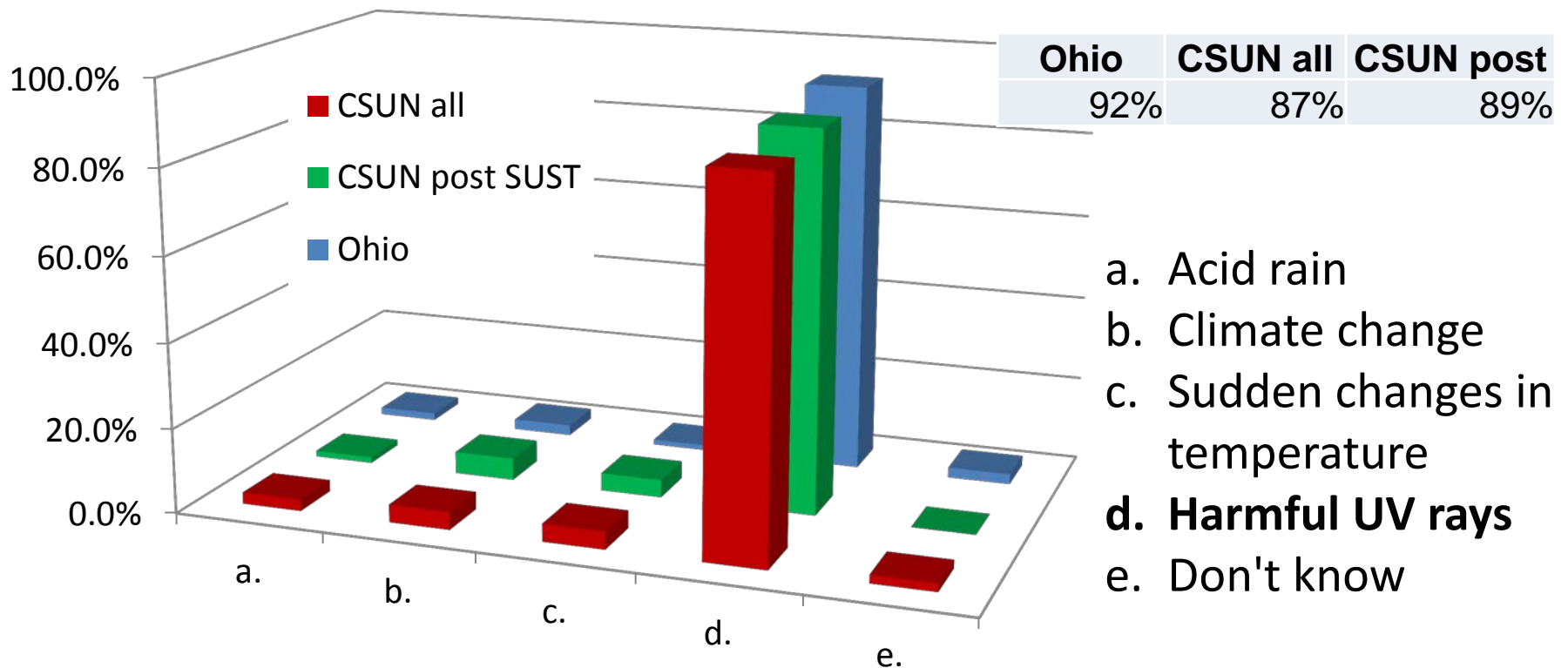


**a. Fishermen seeking to maximize their catch**



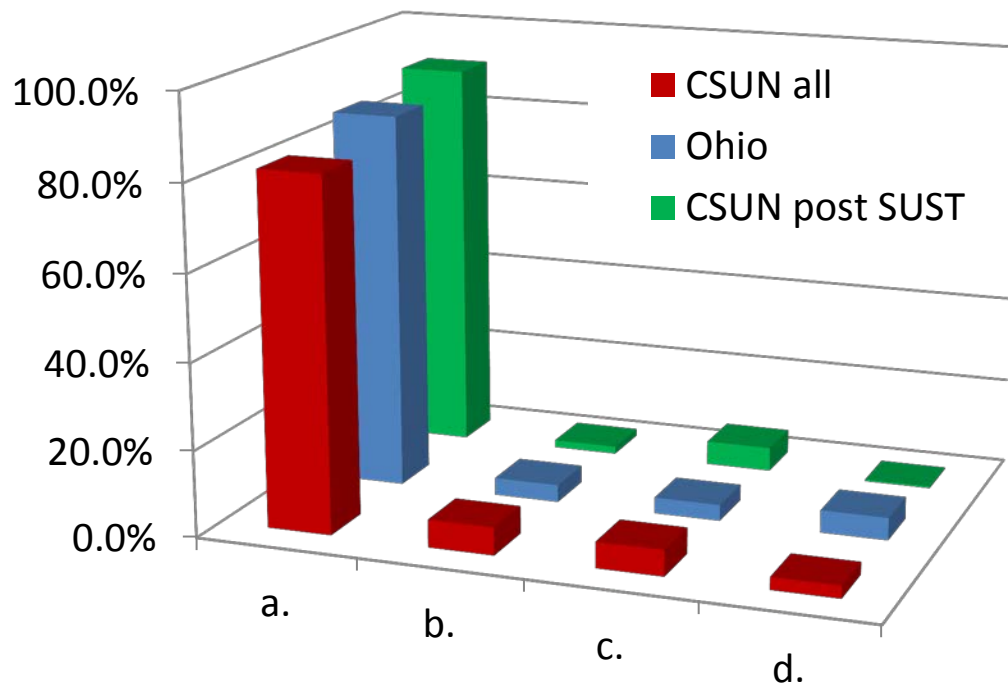
# Results: Question Analysis – Best performance

Ozone forms a protective layer in the earth's upper atmosphere.  
What does ozone protect us from?



# Results: Question Analysis – Best performance

Over the past 3 decades, what has happened to the difference between the wealth of the richest and poorest Americans?



Ohio	CSUN all	CSUN post
87%	82%	91%

- a. The difference has increased
- b. The difference has stayed about the same
- c. The difference has decreased
- d. Don't know



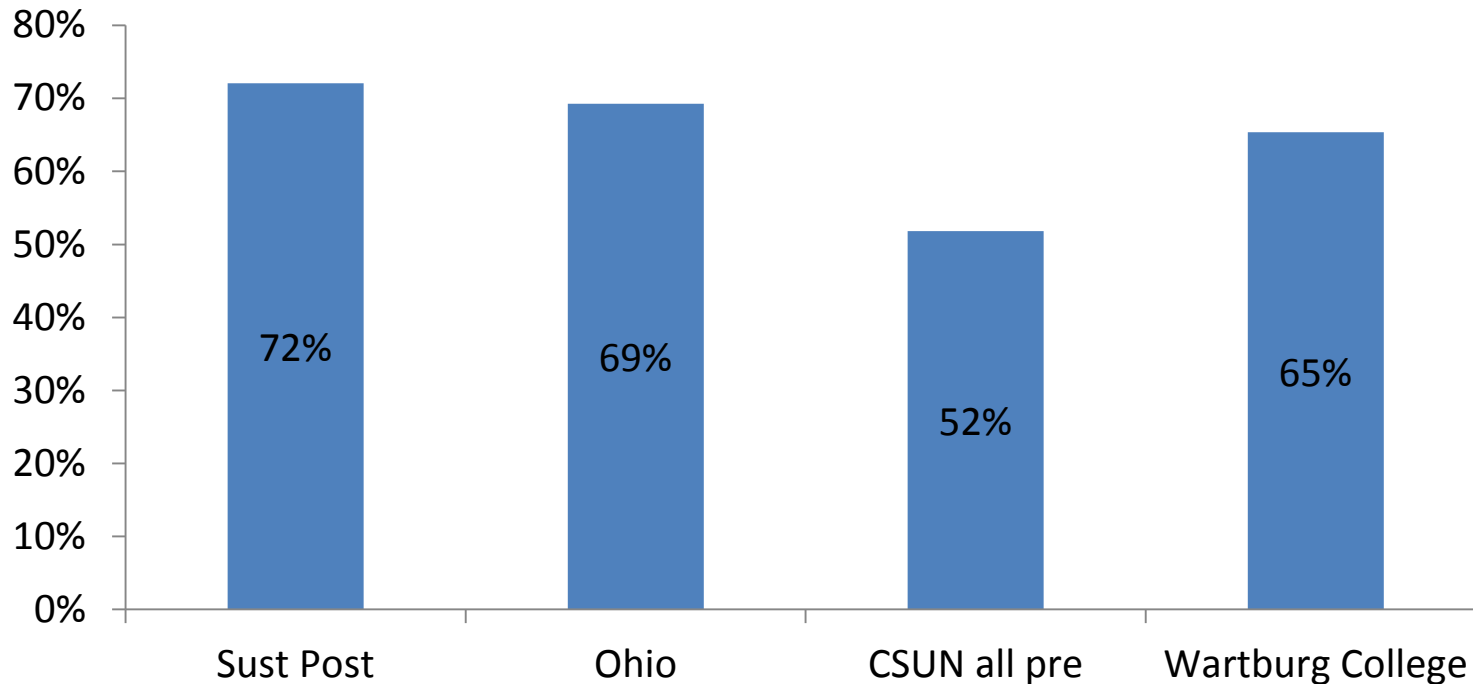
# Results: Are there areas of sustainability where we need to focus/improve?

What our sustainability students didn't improve on:

- 80% of the country's greenhouse gas emissions result from: **energy consumption**
- Ozone protects us from? **Harmful UV rays**
- The most significant driver in the loss of species and ecosystems around the world is: **Conversion of natural spaces into human developments (farmland, cities, etc.)**



# Results: How does CSUN compare?



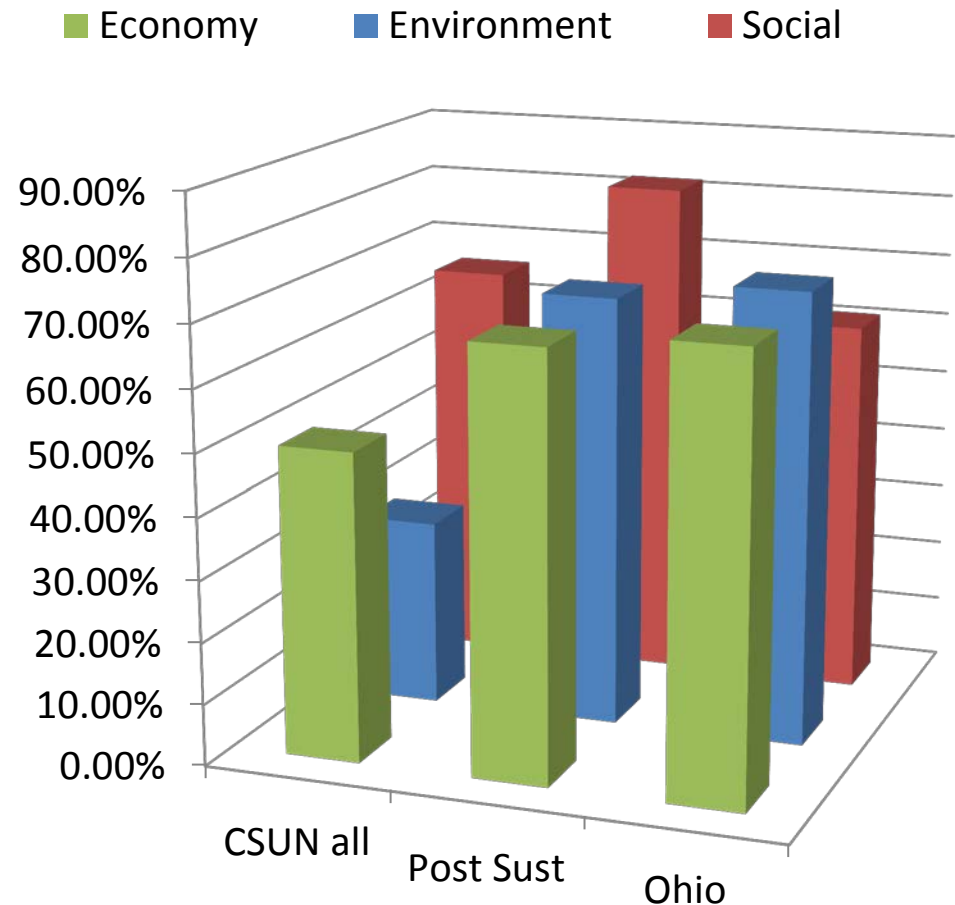
- A general CSUN student has less sustainability knowledge than a student at Ohio State or Wartburg College
- Students that have completed a sustainability course at CSUN score higher than other student groups





# Results: How does CSUN compare?

- Questions grouped into social, environmental, and economic categories
- Ohio students scored best in environmental (73%) and economic (71%) categories
- Overall CSUN students had worst knowledge on the environment before taking a SUST class. After a class they scored highest in social (82%) vs Ohio students (61%). In the other categories their knowledge was similar.



# Results: How does CSUN compare?

Some questions were used by other universities to assess student sustainability knowledge. Our results on these questions are compared to those of other universities who posted test results on STARS.

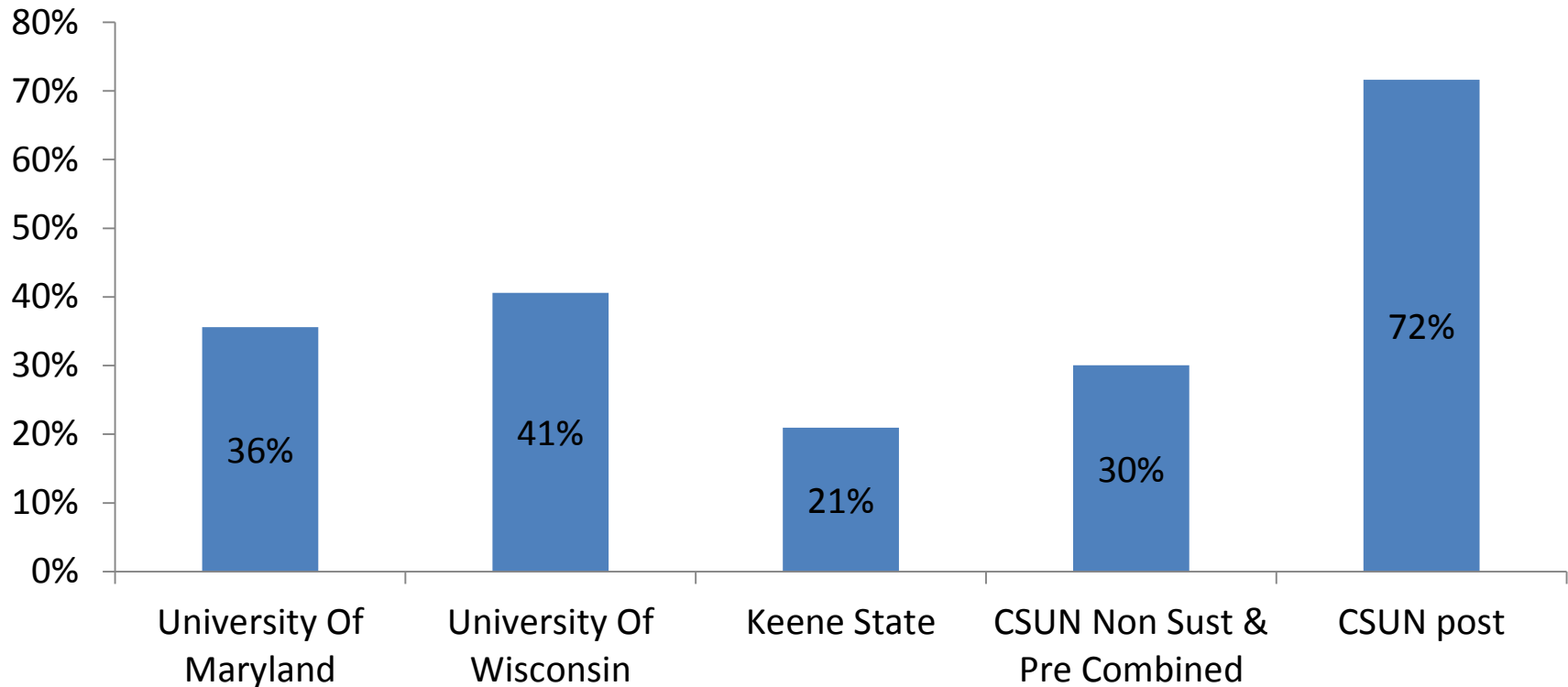
e.g. Q. Put the following list in order of the activities with the largest environmental impact to those with the smallest environmental impact:

1. Keeping a cell phone charger plugged into an electrical outlet for 12 hours
2. Producing one McDonald's quarter-pound hamburger
3. Producing one McDonald's chicken sandwich
4. Flying in a commercial airplane from Washington DC to China

**Answer: 4, 2, 3, 1**



# Results: How does CSUN compare?



Pre-SUST students have a similar understanding to other comparable populations. After a SUST course, CSUN students have a better understanding than other populations.



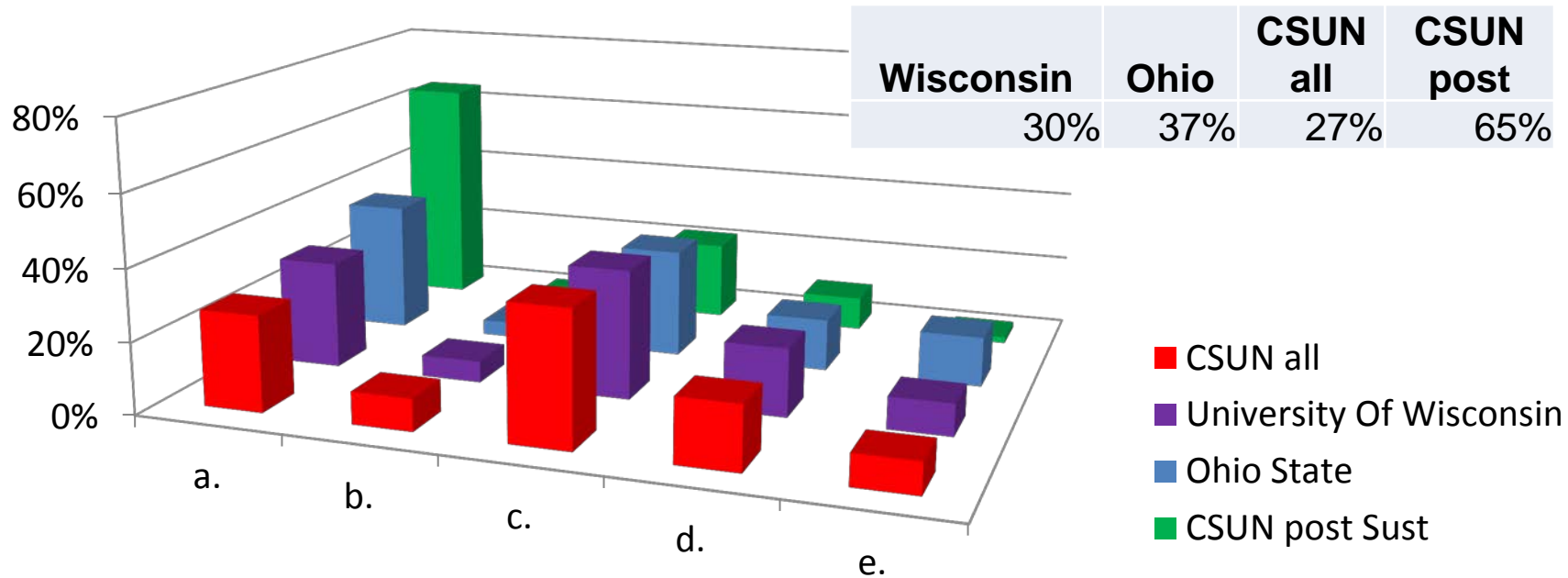
# Results: How does CSUN compare?

e.g. Q. Which of the following is a leading cause of the depletion of fish stocks in the Atlantic Ocean?

- a. **Fishermen seeking to maximize their catch**
- b. Reduced fish fertility due to genetic hybridization
- c. Ocean pollution
- d. Global climate change
- e. Don't know



# Results: How does CSUN compare?



CSUN students scored weaker than the other schools pre-SUST courses but significantly higher than other student populations after taking a course.

Most students who answered wrongly, thought that the correct answer was ocean pollution.



# Results: How does CSUN compare?

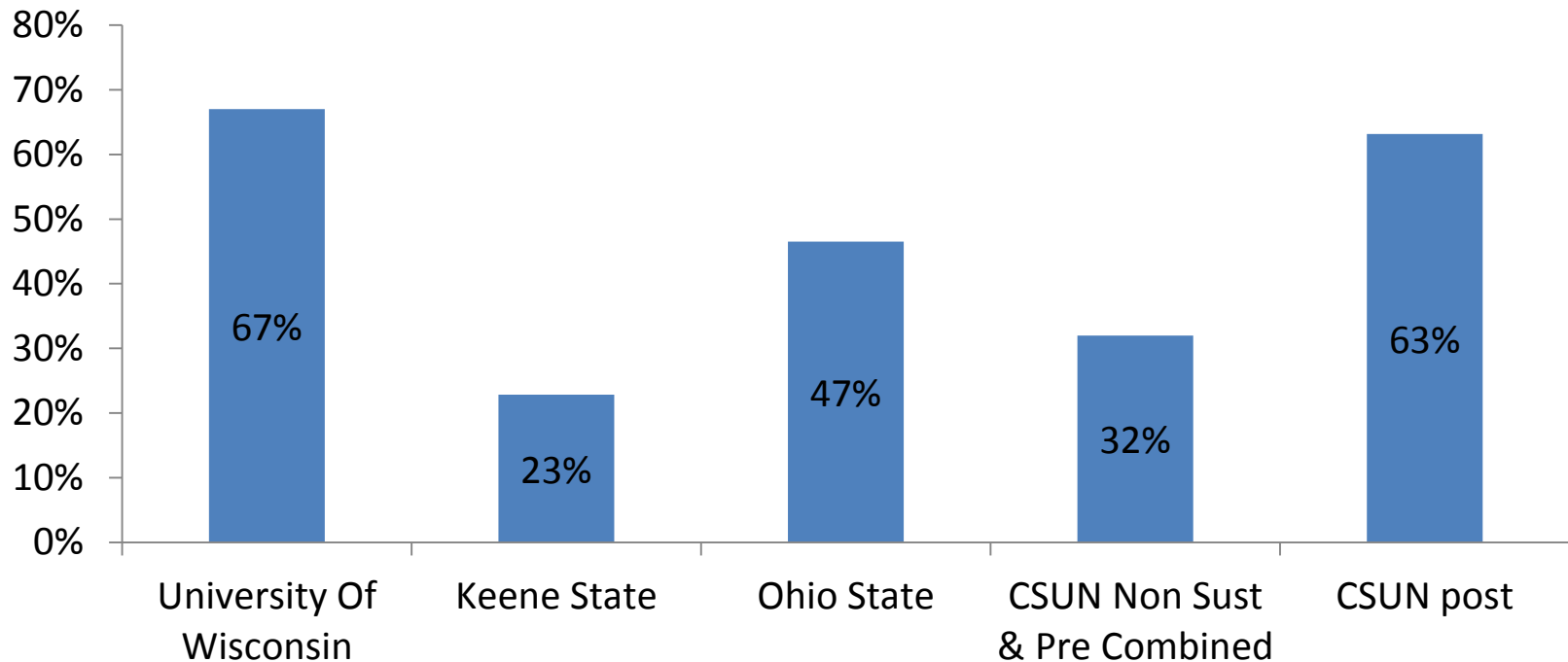
e.g. What is the most common cause of pollution of streams and rivers?

- a. Dumping of garbage by cities
- b. Surface water run off from yards, city streets, paved lots, and farm fields**
- c. Litter near streams and rivers
- d. Waste dumped by factories
- e. Don't know



# Results: How does CSUN compare?

What is the most common cause of pollution of streams and rivers?



- University of Wisconsin scored higher than all other schools, even post-SUST CSUN students.



# Summary

## Highly significant:

- Males tend to have more knowledge about sustainability than females.
- Knowledge of sustainability increases with year in school.
- Students enrolling in a sustainability class have more sustainability knowledge than other students
- Post-test average is 12% higher than pre-test

## Mildly significant:

- Some differences in knowledge amongst majors:
  - Least knowledgeable majors: Education, Undecided
  - Most knowledgeable majors: Science & Math, Engineering & Computer Science





# Summary

- CSUN students have weaker sustainability knowledge than those at other universities, particularly when it comes to environmental issues, but the knowledge gap is overcome with a sustainability course.
- Some knowledge gaps and confusion over issues. (Issues discussed at length in class tend to get chosen as the answer in a question, even if not correct.)
- Encourage more students to enroll (stop just preaching to the choir)



# Acknowledgments

The Institute would like to thank the following professors for taking time out of their classes to allow students to participate in our survey:

Julie Laity  
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Mario Giraldo  
Mechelle Best  
Abhishek Tiwari  
Erica Wohldmann  
Loraine Lundquist  
Dev Vrat



For in the end, we will conserve only what we love.

We will love only what we understand.

We will understand only what  
we are taught.

-Baba Díoum

**Thank You! Questions?**

[helen.m.cox@csun.edu](mailto:helen.m.cox@csun.edu)  
[sustainability@csun.edu](mailto:sustainability@csun.edu)

