

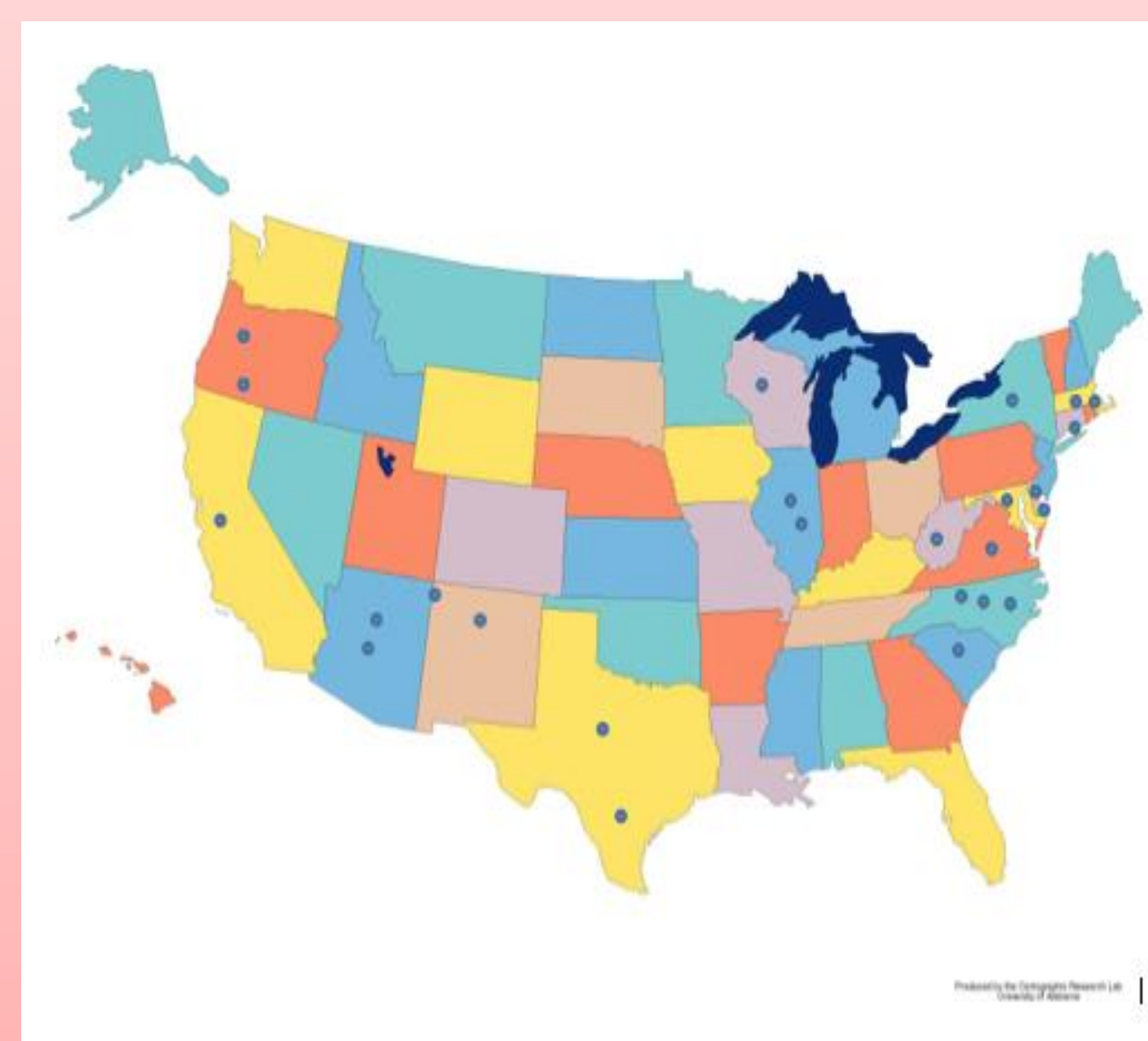
# Renewable Energy and Climate Change Education

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## Introduction

**Purpose and Approach:** To identify barriers to incorporating climate change (CC) education into high school and community college courses, 24 national educators were interviewed. During each 30-minute recording, instructors described experiences with:

- What courses are taught
- How much in depth of CC coverage
- What was the motivation to include CC
- Opportunities for CC education in the future
- Ultimate barriers to incorporating CC
- How CC is discussed and/or considered
- How CC can be a dimension in design of engineered systems and/or solar, wind, and buildings technician training



Blue dots represent workplaces of SEET workshop participants.

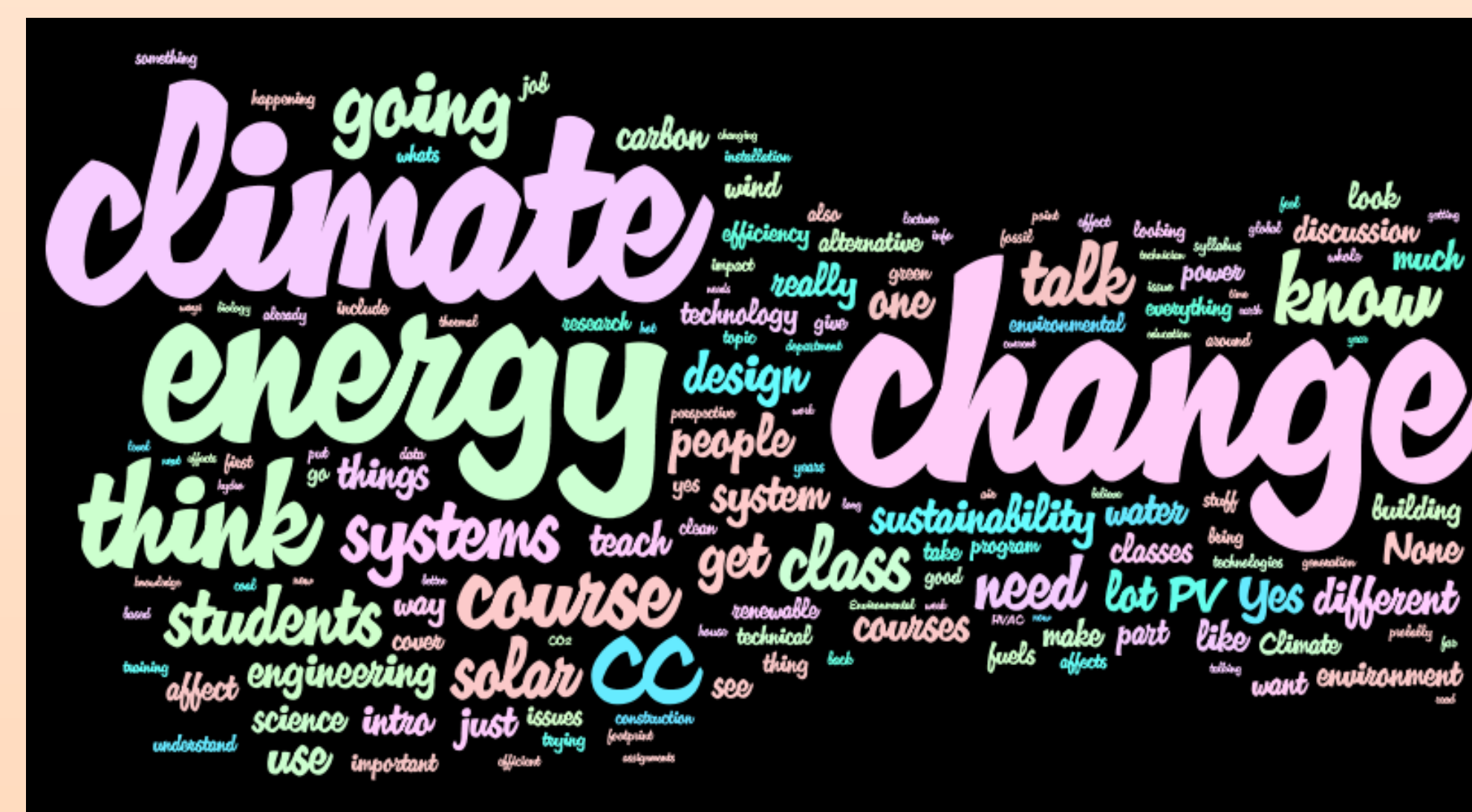
### About the 24 Participants

- Experts involved in energy/renewable energy
- Preparing new energy workforce
- Teaching/directing programs
- Technician training of students seeking 2 and 4-year degrees
- Managing energy companies

## Results

### Barriers to incorporating CC

- Primary barrier to incorporating CC is public opinion/political issues among administration, students, or larger companies. Some see CC education as complicated and controversial as evolution.
- Another barrier is the limited time in the classroom to go over new material.
- At the same time, over two years of data, CC education is becoming more expected in classrooms.



Wordle – a collage of words said most during the process of interviewing the participants.

### How CC is taught

- CC is a reason for turning to renewable energy systems as an alternative to fossil fuels.
- CC is the first topic that most cover, taking from 1 hour to a week.
- Some indirectly talk about CC throughout a course, focusing on the technical side of renewable energy systems as an alternative to CC.
- Instructors first lecture about scientific facts of CC and then have students to do their own research to draw their own conclusions.
- Older students have more opinions than those who have come straight out of HS.



Two SEET Participants demonstrate how to install a photovoltaic panel.

### Teaching strategies

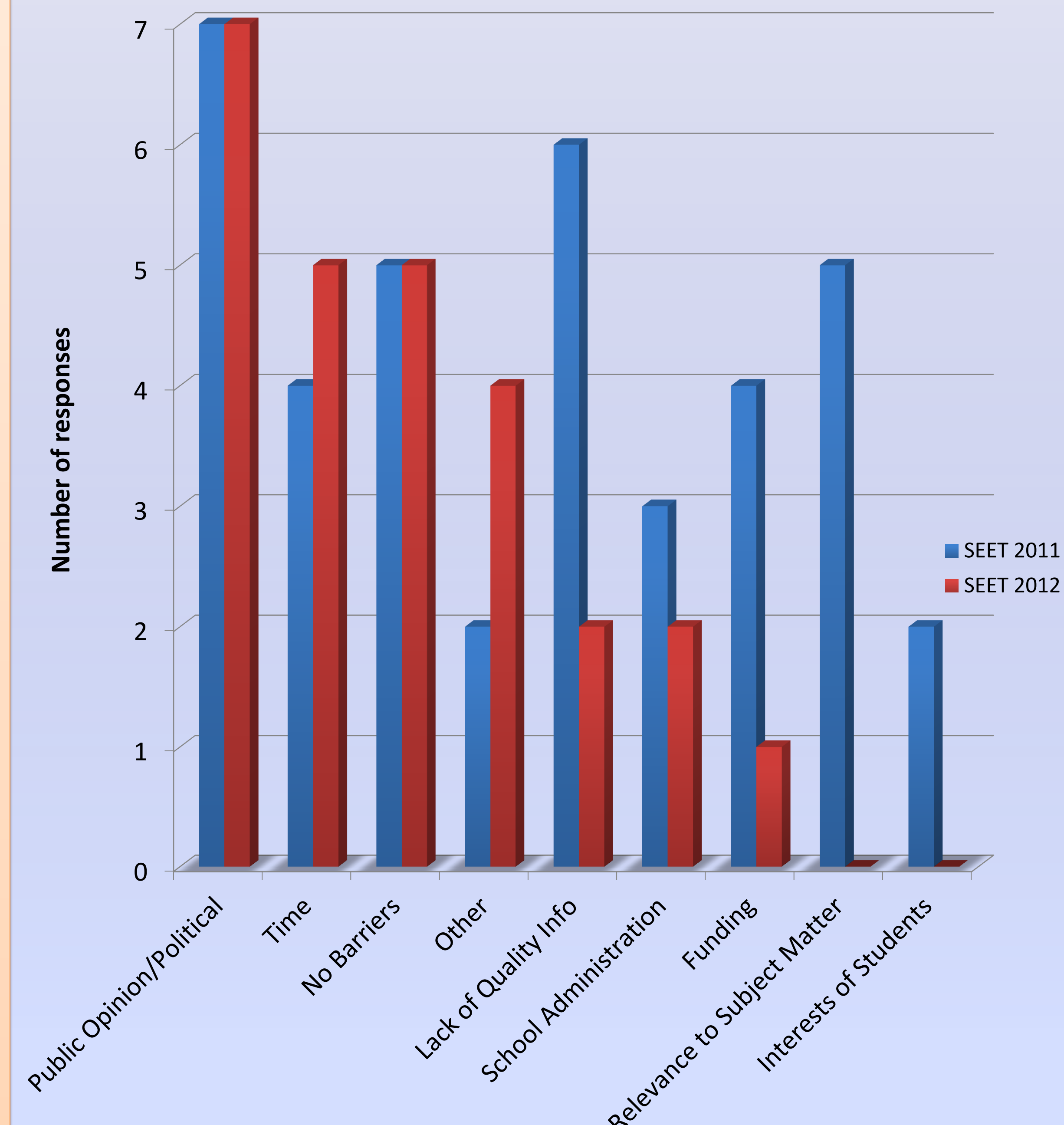
Instructors introduce CC to

- Give students scientific facts and let them draw conclusions.
- Help students understand the impacts of CC on their world.
- Hope students will choose to make a difference and be wise consumers.

### Industry / Engineered systems

- CC is important to incorporate into technical degree and 4-year programs, so that students are knowledgeable about CC when they enter the energy/renewable energy workforce.

## Barriers to Incorporating CC



The bar graph above compares results from the SEET workshop in 2011 and 2012 on barriers to incorporating CC into schools. Compared to 2011, 2012 shares 2 top barriers: public opinion/political and no barriers. Time was also commonly cited as a barrier in 2012, while in 2011, lack of quality information and relevance to subject matter were the other top barriers.

## Background Information



Scientific studies have shown that carbon dioxide levels continue to increase as population increases, reflecting the amount of fossil fuel burning. Such burning generates emissions, including carbon dioxide, which significantly increase in temperature and affects climate over time. Scientists call this climate change.

### 1. What is causing CC?

“Many independent lines of evidence show that human activity is responsible for most of the climate change in recent years, particularly the warming of the atmosphere and ocean in the last 150 years, and that these changes will continue into the future,” says nsce.com.

### 2. What effective steps can we take to delay CC?

According to CLEANet.org, “Practices and policies followed in homes, schools, businesses, and government can affect climate. Climate-related decisions made by one generation can provide opportunities as well as limit the range of possibilities open to the next generation.”

### 3. Why should I care about CC education?

“Climate information can be used to reduce vulnerabilities or enhance the resilience of communities and ecosystems affected by climate change,” states CLEANet.org.

### 4. Is CC relevant to my field of study?

As stated in nsce.org, “Climate science must be integrated as practical knowledge into society so that understanding the complex physical and biological interconnections are relevant to decision-making in social, economic, political, cultural, and educational systems.” Therefore, CC education is critical in many areas of study.

## Conclusion

In conclusion, we cannot expect CC to dissipate on its own. With the population continuously growing, we must introduce the topic of CC to students in high school and college as they will be the next generation leaders and workforce. Therefore, we must push for education on CC. To do this, it is important to identify and overcome any barriers of time and politics so that future generations will be able to act intelligently to implement renewable energy alternatives and reduce carbon emissions.

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References:  
 “Science and Technology: Climate Change.” *United States Environmental Protection Agency*. N.p., <http://www.epa.gov/gateway/science/climatechange.html> (2012).

“Teaching Climate Literacy and Energy Awareness.” *Climate Literacy and Energy Awareness Network*. N.p., <http://cleanet.org/clean/literacy/index.html> (2012).

“What Can We Do About Climate Change?.” *National Center for Science Education*. N.p., <http://ncse.com/climate/climate-change-101/what-can-we-do> (2012).