

# Using education to fight climate change

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STAFF WRITER & SCIENCE & TECH EDITOR

Facing the threat of a climate change emergency, the world is creating climate action plans to invest resources into green technology to reduce humanity's carbon footprint. But a team of researchers at San Jose State is concerned that one crucial aspect is overlooked in the fight against climate change: education.

"Humans are absent from almost all climate action plans," said Eugene Cordero, a meteorology and climate science professor. "For me, the most compelling piece to our work is that we're able to quantify, alongside these other solutions, the role education plays."

In a new research paper co-authored by Cordero, meteorology and climate science lecturer Diana Centeno and communication studies department chair and professor Anne Marie Todd, they explain that climate change-related education can have a long-term impact in reducing students' carbon footprints.

The paper, "The role of climate change education on individual lifetime carbon emissions," focused on the year-long Global Climate Change class first offered by SJSU in Fall 2007.

"A majority of course graduates reported pro-environmental decisions (i.e., type of car to buy, food choices) that they attributed at least in part to experiences gained in the course," the paper states. "Furthermore, our carbon footprint analysis suggests that for the average course graduate, these decisions reduced their individual carbon emissions by 2.86 tons of [carbon dioxide] per year."

In comparison to other technologies over the next 30 years, the team found that education was more effective than investing in electric vehicles, offshore wind farms and even afforestation. Only installing rooftop solar was expected to reduce student carbon emissions more than education.

"We were surprised and pleased to find that students found this learning experience to be unique, and of course, the research showed that many years later it still seemed to have a lasting impact," Cordero said.

Cordero said that he wasn't aware of any similar research that demonstrated the effectiveness of education in combating climate change, describing the paper as the "first of its kind."

"This is the first time anyone has quantified the carbon-emission reduction impact of high-quality environmental education,"

Cordero said. "We hope that this research will encourage policymakers to recognize education as one of the most effective tools we have to achieve our carbon emission reduction goals."

He and Todd designed the Global Climate Change class 13 years ago as a cross-departmental collaboration, listed across five different departments. While most faculty hope their courses are successful in educating students, Cordero said this one was unique in that they were able to demonstrate the impact with data.

Centeno, also a 2014 meteorology master's alumna, explained that the goal of the class was ambitious.

"Behavioral changes is one of the most challenging fields, because you have to basically do what we did: track the students through time and that is very complex when you are doing research studies because you need to track them," Centeno said. "It's not just one year or two years, you want to track them for a few years on."

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**Eugene Cordero**  
meteorology and climate science professor

She said that in the fight against climate change a single person's actions will have an effect in the long run.

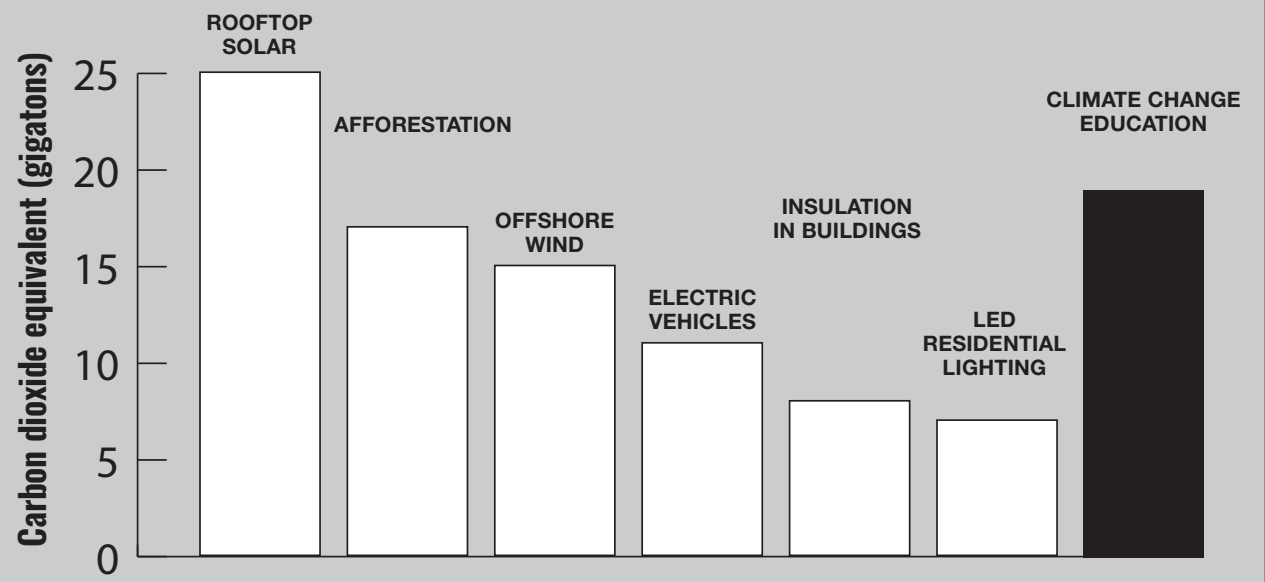
"It does matter what the individual does; it's like a ripple effect," Centeno said. "Once one person does it, people around that person may change some of their behavior and little by little it starts increasing in amount and magnitude."

One former student the paper highlighted is Elaine Alatorre, a 2012 communication studies and English alumna. She said over the phone that she took the class in 2010 because it was the quickest way to fulfill her upper division requirements at the time, but now considers it to be one of the best decisions of her life.

Alatorre said she noticed waste in her job as a manager at Walmart and spoke with her upper management to reduce the excess merchandise that was being thrown away. She pitched her proposal as cost-saving for the business even though her primary motivation was to help the environment.

## Expected carbon reduction by 2050

Research by a team of SJSU faculty members showed that climate change education could reduce carbon dioxide emissions by 18.8 gigatons over a 30-year span.



SOURCE: THE ROLE OF CLIMATE CHANGE EDUCATION ON INDIVIDUAL LIFETIME CARBON EMISSIONS. INFOGRAPHIC BY MARCI SUELA

Soon after, she was able to help launch a program to reduce waste at all Walmarts across the Bay Area.

"It's important for people to realize that everybody can have an impact," Alatorre said. She added that she believed the course should be a requirement for everyone, as it's relevant for students regardless of their major.

For Cordero and Centeno, educating college students is just the first step. They are currently working on a project to educate middle school students: Green Ninja.

Cordero founded the program at SJSU in 2010 and then spun it out of the university as a certified benefit corporation in 2016. Like the college course, Green Ninja is a multi-department collaboration that involves students and faculty members across physics, meteorology, radio, TV, film, theater arts, education and animation and illustration.

"It revolved around children and the idea of the Green Ninja is something that is creative, it's fun and it makes you look at things differently," film and theater lecturer Juan Serna said.

Utilizing a series of YouTube videos that entertain a younger audience while encouraging healthy and positive messages, the program made its way into classrooms.

"The videos are designed to teach middle school students respect and empathy for the environment and the world and nature," associate design professor David Chai said. "To educate them so that they will hopefully be the generation to help save the planet."

Chai serves as the artistic director and editor for Green Ninja videos.

Along with the online videos, Cordero said the program is now approved to sell science curriculum in the state of California.

"Our research has shown that one week of climate change education is not going

to do it," Cordero said. "We want three years: the whole middle school."

The education curriculum based on the program's research was implemented in line with the Next Generation Science Standards for educating middle school students on climate change.

The Green Ninja character communicates the ideas of healthy eating, waste management and recycling. Those ideas are then put into practice with games and by providing real-world examples so that students can apply what they learned to their daily lives.

The program is being piloted in 22 school districts across the state, with six to eight other districts using it as well, Cordero said.

By applying real-time data on climate change, as well as developing data literacy and computational thinking skills, students can also prepare themselves for their future careers. There are currently plans for a seventh annual Green Ninja Film Festival to be held in May where students can showcase their own environmental videos.

"It feels good to be a part of something that can make a big difference in something as serious as climate change," Chai said. "And in doing it, we have a lot of making these videos and these animations."

Cordero said he plans on conducting research on the effect the Green Ninja program has on middle schoolers. In addition to studying the students,

Cordero said they will also study the teachers as well. Unlike the SJSU class where the researchers were familiar with the professors and lecturers teaching the course, the middle school program is taught by a wide range of teachers.

The program and the materials that can be found easily on the Green Ninja website continue to evolve. Cordero, Centeno and Todd's research paper can be read online for free.

"While it is difficult to change the minds of others, we have had some success," Cordero said. "We are just starting."

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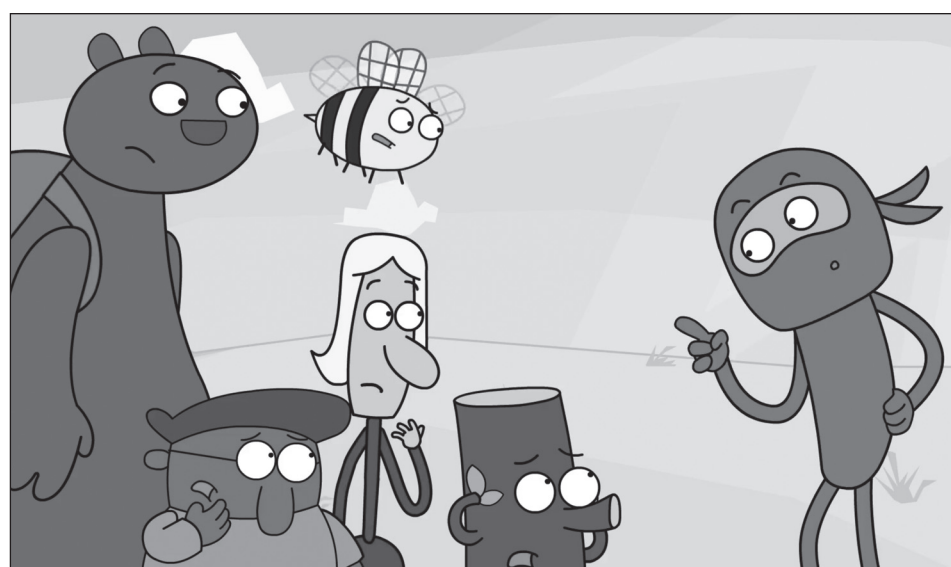


PHOTO COURTESY OF GREEN NINJA

The Green Ninja (right) educates a group of students and animals about the water cycle in an animated video posted on the organization's YouTube channel.

## Global Spartan Month

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