Retelling Climate Change Stories Enhances its Science Communication With Students in California

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Introduction/Need for Idea or Innovation

Effective climate science communication is critical for students who are the next generation agricultural leaders. In California, these students are witnessing the impact that agricultural production has had on their environment, as well as the adverse environmental impact on agriculture (Pathak et al., 2018). Given the ongoing debate about climate perceptions, information controls, and skepticism (Cheng & Gonzalez, 2021; Kelly et al., 2022), climate science communication is vital for students to understand how to validate climate information and manage its related disorders (van der Linden et al., 2017; Wardle & Derakhshan, 2017). Wardle and Derakhshan illustrated the information disorders using a Venn diagram, as an intersection between false and harmful information. False information is mis-information with aspects of false connection and misleading content, while harmful information is mal-information with aspects of leaks, harassment, and hate speech. The intersection of false and harmful information creates dis-information, with its contents denoted as falsified, fraudulent, manipulated, and fabricated. Given the current age of media (social) technology, students need to gain knowledge on information validation to build their skills and abilities to respond appropriately to highly contested debates, such as climate change. Several studies have urged universities to be "a part of" not "apart" of the students' discussions around climate science communication and discussions to support their simultaneous understanding of climate science and agriculture science and their interactions (Reimers, 2020; Stein, 2024). In response, the University of California academics and educators developed a climate–agricultural educational program to provide students with service-learning opportunities in climate–agriculture interactions.

How the Idea Works/Methodology/Program Phases/Steps

The climate–agriculture educational program in California uses a team-based approach to re-represent climate change stories as one of its educational approaches. The goal is to facilitate problem solving and critical thinking of the fundamentals of climate science communication to enhance their communication skills. This approach is embedded in a broader education project in the spring semesters workshops, focusing on climate adaptation education for students. Students team up on the first day of the workshop depending on their area of research for their project. A guide to project research is provided, and a rubric is based on the Yale Program on Climate Change Communication guidelines (YPCCC, 2026). Most of the original stories are adopted from the Yale Climate Connections (YCC) website. The first three steps in the guide require students to find a project team, choose a story from YCC, and retell their chosen story. Along with the three steps, the guide spells out other steps that require students to summarize their story; describe their thoughts and feelings about the story; describe thoughts and feelings they want to generate; choose the format to retell the story; explain the choice of format; identify other effective ways to tell the story; and explain why they chose the story. While guiding students, we adopted eight key communication clues from Rare (Rakhimov et al., 2022). Rakhimov et al. urges students to make their climate communication projects personal, accessible, empowering, doable, collective, normal, trustworthy, and for everyone. YPCCC provides a detailed rubric to evaluate the students' projects based on the content, evidence, creativity, and effort, among others, which students employed in retelling their chosen stories.

Results to date/Implications

Students (n=61) were assessed to determine their knowledge change in climate science communications on a five-point scale ranging from no knowledge to superior knowledge in the three cohorts of 2024, 2025, and 2026 of the program implementation. Overall, results show a 1.36-point change (27.2% knowledge gain), from 2.79±1.292 before to 4.15±0.792 after participating in the program. Also, on a five-point scale, students indicated a 4.28±0.756 level of usefulness of climate science communication to their understanding of the climate–agricultural interactions. On a five-point scale with team/project-based learning approaches, a 4.52±0.770 level of satisfaction was self-reported. An average of 04 students formed a team and presented 16 projects on Tule fog, radiating fog, Zoo, sea seals, coral reefs, wildfires, floods, seaweed, diabetes, ocean

acidification, resilience, potato breeding, west nile virus, online shopping on fossil fuels, and recycling. Although most adopted stories from YCC were represented in audios and blogs, students retold those stories in a blend of methods, such as brochures, PowerPoint slides, photo collages, skits, animated GIFs, Kahoot quizzes, infographics, short video clips, news hooks, and posters. These approaches demonstrate creativity in transforming audio stories into formats that appeal to several groups of audiences, vital for conveying climate science information. This study shows a greater impact experiential, problem, project, and team-based learning have on students' mastery of concepts (Ikendi et al., 2023; Ingles & Retallick, 2025).

In a synopsis of some projects, **Team Ocean,** in their project were concerned with how human activities increase CO_2 in the atmosphere. The team reviewed Ricart et al. (2021) and found that fortunately the ocean absorbs much of this CO_2, but there are other harmful effects, specifically that this CO_2 creates carbonic acid, which destroys ocean ecosystems. As a remedy, they say seagrasses help fight ocean acidification by neutralizing carbonic acid. Team Ocean retold the story through **infographics,** captivating the attention of the audience. **Team Goat,** in retelling their story using **slides**, started with a **hook:** Did you know that goats can help reduce fire intensity? And used an example from Southern California, where their original articles show goats prepare for the fire season by eating (Madson, 2021). They argued that goats munch on the stuff other animals cannot touch, from dry grasses to thorny brambles and even invasive plants like black mustard and are still able to get all the nutrients out. In their summary, they said, "Next time you spot a herd of goats munching down on the brush, remember they are not just adorable—they are wildfire fighters" **Team Goat**.

Team Sandhill Cranes identified the issue that rice farmers flood fields where cranes roost. However, Zeleke (2021), in the original article, said, "up to 11,000 cranes had been seen roosting this year, most likely due to the drought." The Cranes team felt it was concerning due to the drought; farmers were cultivating less rice the previous season, which forced cranes into fewer fields. In their critical analysis, the team feels farmers and environmentalists must cooperate to meet agricultural demands and save critical habitat for these incredible birds. The team retold their story using **slides** for easy collaboration, visual presentation, and accessibility from any device, a user-friendly interface, and ability to easily incorporate multimedia.

Future Plans/Advice to Others

Team projects helped students learn the dynamics of climate science communication by retelling climate change stories with guidelines and most stories adopted from Yale Climate Connections. Students identified climate-related problems affecting their communities and found related presentations about those problems and also used the YPCCC (2026) guidelines in re-representing the same stories in other methods. The approach adopted in the students' project reflects learner–centered theories of thinking (Schunk, 2020) and both team-based learning (Sibley & Ostafichuk, 2023) and problem-based learning (Anggraeni et al., 2023). These learning methods help learners improve comprehension, develop problem-solving skills, improve confidence, and promote long-term memory. We appeal to educators to adopt these learner-centered approaches to enhance students' comprehension and mastery of concepts. As this is a one-week spring project, students move forward to a competitive two-month summer program, which uses project-based supervised learning experiences to support students' interest in learning a specific climate–agriculture problem identified in the spring programs (Ikendi et al., 2026). By creating multiple educational opportunities for students to take in-depth educational training, this study program reveals how to enhance students' scientific understanding of the climate–agricultural interaction and discover actionable scientific solutions relevant to supporting and advising stakeholders in their agricultural operations.

Cost/Resources Needed

Retelling climate change stories was a component of a larger educational project. In the main project, costs were billed on the grant budget and involved: hiring buses for the field tours, meals, including breakfast and lunch provided by the university cafeteria. For the infrastructure needed, we used university lectures and computer laboratories, and Extension farms, and research centers. Collaborators and place-based experts in climate and agricultural sciences were sourced within the University of California system.

References

Anggraeni, D. M., Prahani, B. K., Suprapto, N., Shofiyah, N., & Jatmiko, B. (2023). Systematic review of problem-based learning research in fostering critical thinking skills. *Thinking Skills and Creativity*, *49*, 101334. https://doi.org/10.1016/j.tsc.2023.101334

Cheng, H., & Gonzalez, J. R. (2021). Trust and the media: Perceptions of climate change news sources among US college students. *Postdigital Science and Education*, *3*, 910–933. https://doi.org/10.1007/s42438-020-00163-y

Ikendi, S., Rios, K. D., Jha, P. K., & Pathak, T. (2026, May 18–21). *Fostering deep learning of climate–agriculture nexus through supervised student experiences in California* (Poster Proceedings). American Association for Agriculture Education National Conference, St. Petersburg, FL.

Ikendi, S., Retallick, M., Nonnecke, G. R., & Kugonza, D. R. (2023). Influence of school garden learning approach on academic development of global service-learners. *Journal of Agricultural Education*, *64*(4), 159–179. https://doi.org/10.5032/jae.v64i4.167

Ingles, D. M., & Retallick, M. S. (2025). Reflective practice in an experiential learning program: an exploratory content analysis of reflective writing in experiential learning portfolios. *Journal of Agricultural Education*, *66*(2), Article 1. https://doi.org/10.5032/jae.v66i2.3029

Kelly, R., Elsler, L. G., Polejack, A., van der Linden, S., Tönnesson, K., Schoedinger, S. E., ... & Wisz, M. S. (2022). Empowering young people with climate and ocean science: Five strategies for adults to consider. *One Earth*, *5*(8), 861–874. https://doi.org/10.1016/j.oneear.2022.07.007

Madson, D. (2021, July 1). *Goats help Southern California prepare for fire season by doing what they do best*. Yale Climate Connections. https://rb.gy/xzs934

Pathak, T. B., Maskey, M. L., Dahlberg, J. A., Kearns, F., Bali, K. M., & Zaccaria, D. (2018). Climate change trends and impacts on California agriculture: A detailed review. *Agronomy, 8*(3), 25. https://doi.org/10.3390/agronomy8030025

Rakhimov, R., Schauer, B., & Thulin, E. (2022, July 8). *Eight principles for effective and inviting climate communication*. Rare. https://shorturl.at/Dmg7D

Reimers, F. M. (Eds.) (2020). *Education and climate change: The role of universities*. Springer.

Ricart, A. M., Ward, M., Hill, T. M., Sanford, E., Kroeker, K. J., Takeshita, Y., ... & Gaylord, B. (2021). Coast-wide evidence of low pH amelioration by seagrass ecosystems. *Global Change Biology*, *27*(11), 2580−2591. https://doi.org/10.1111/gcb.15594

Schunk, D. (2020). *Learning theories: An educational perspective*. Pearson.

Sibley, J., & Ostafichuk, P. (2023). *Getting started with team-based learning*. Taylor & Francis.

Stein, S. (2024). Making space for critical climate education. *About Campus, 29*(5), 4−13. https://doi.org/10.1177/10864822241284622

van der Linden, S., Leiserowitz, A., Rosenthal, S., & Maibach, E. (2017). Inoculating the public against misinformation about climate change. *Global Challenges*, *1*(2), 1600008. https://doi.org/10.1002/gch2.201600008

Wardle, C., & Derakhshan, H. (2017). *Information disorder: Toward an interdisciplinary framework for research and policymaking*. Council of Europe.

Yale Program on Climate Change Communication (2026). *Re-representing a climate change story*. Yale School of the Environment. https://shorturl.at/yQZQj

Zeleke, D. (2021, June 16). *Sandhill Crane*. The Nature Conservancy. https://shorturl.at/rkQ35