Directions

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Promising Principles to Enhance Distance Learning in Environmental Education

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THE PANDEMIC HAS INITIATED an abrupt pivot for many environmental education (EE) providers toward distance learning. Our research team responded to this pivot by conducting a systematic literature review to identify promising approaches for designing virtual field trips and online EE activities. Through an extensive search of the last decade of published research (2010-2020), we identified 32 peer-reviewed articles that empirically measured environmental literacy outcomes of online EE programs. We carefully reviewed program descriptions, study results and authors' conclusions to identify key principles that appear commonly linked to better outcomes for participants related to environmental literacy.

Several promising principles emerged for potentially enhancing the success of EE distance learning programming for students in grades K–12. We divide these principles into the following three broad categories commonly linked to better environmental literacy outcomes for participants:

- Participant engagement (how to engage participants in online settings)
    - *Promote student autonomy*
    - *Facilitate social interactions*
    - *Encourage active involvement*

- Designing content (what content to emphasize and how to design it)
    - *Focus on relevant topics*
    - *Make socio-ecological connections*
    - *Highlight role models*
    - *Use multiple modalities to make content accessible*
    - *Challenge students to use higher cognitive processes*
    - *Use positive framing*

- Supporting participants (how to facilitate learning)
    - *Prepare them to succeed*
    - *Provide feedback*

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Participant engagement

As you consider platforms and tools for your distance learning programs, begin by thinking about how participants will interact with the content and each other. Look for interfaces and develop activities that allow for *student autonomy*, *social interactions*, and *active involvement*. Can students make choices within the activities? Can they create or develop their own products to share? How might they work collaboratively? Can two-way communication strategies (either real-time discussion or asynchronous responses to posted comments) be included? Most importantly, how can students be induced into active participation and thought?

Multiple platforms provide easy means for polling or sharing ideas. Breakout rooms allow students to discuss ideas and brainstorm together. Platforms such as *FlipGrid* or *Zoom* allow students to pose questions and respond to each other's ideas. Some organizations lead activities with materials that are easy to find at home or provided in a kit. Autonomous tasks, such as journaling, scavenger hunts, art activities or contests can also be engaging. Annie Kilby uses an open-ended drawing task to help students imagine themselves visiting and experiencing different life zones at Grand Canyon National Park (Figure 1).

Designing content

Our literature review revealed the value of demonstrating the *relevance* of content to learners' lives, *challenging* learners so that they employ 21st century skills and go beyond just learning facts, making *socio-ecological connections*, using *positive framing* and *role modeling*.

As a major theme in **ANCA's Blue Ribbon Report**, *relevance* is a goal that we all strive for. Deciding what's relevant for online programs can be rather complex, because participants can connect from anywhere around the country (or world!). When designing programs for local groups, leverage what you know about them from prior work. For broader audiences, issue-based programs that include clear actions and consequences to human communities can often enhance relevance, as can activities that engage participants to create or investigate issues of personal interest.

Role models help to put a human face on otherwise abstract issues and can enhance relevance. Stories and examples shared by others can motivate

Figure 1: Using a drawing prompt. Photo by Kim Popek.
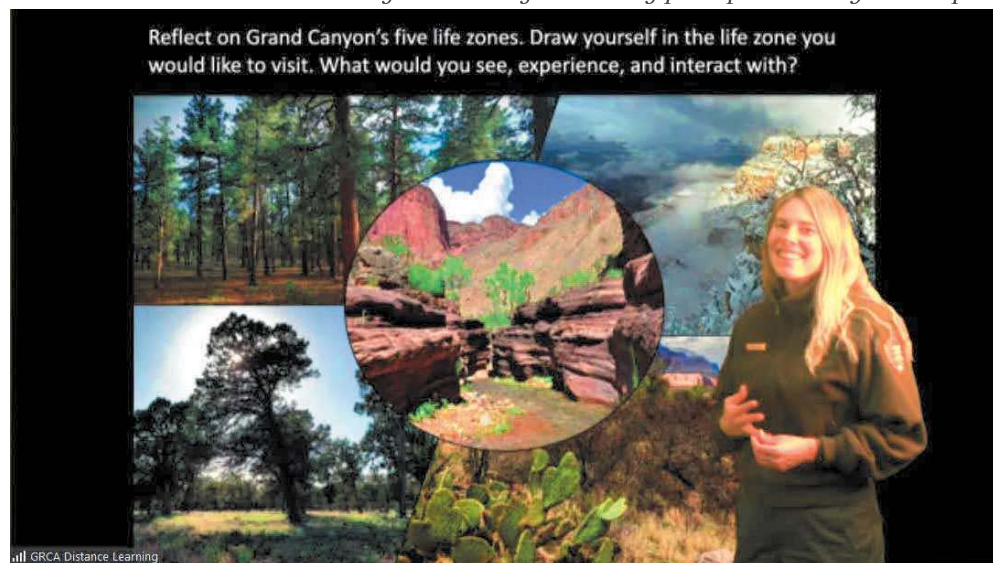
students to become interested in topics, learn new skills or fuel motivation to take action. What expertise do people at your organization and within your wider networks have to share, and what stories can they tell about their lives or work that will inspire students?

Socio-ecological connections relate ecological systems to human systems. The depth of exploration of these connections can influence program outcomes. For example, is the program focused on aquatic wildlife with a brief mention of ocean acidification or is it focused on how a changing climate impacts people and wildlife in coastal areas? One way to help make these connections visible is to document and share visual evidence of environmental change. Changes are often hard to see when you only visit a place once, but photographs and videos (e.g., glacial melt, water levels, pollution) can make them concrete for students in distance learning programs. For example, educators from the Gulf of Maine Research Institute use images that span across 30 years to engage students in reflecting on how temperature changes influence available lobster habitat (Figure 2).

Including *multiple modalities*

(visual, audio, kinesthetic) makes content accessible to diverse learners with different levels of background knowledge. As you design your program, use of both words and images to explain complex concepts can increase understanding (Mayer, 2008). English language learners, in particular, comprehend content better when provided with sensory (pictures, objects, activities) and graphic (tables, charts) supports and through discussions with others (WIDA, 2014). Which modalities (audio, visual, textual, etc.) are most useful for your intended purpose, and how might they be combined to optimize learning?

In our literature review, programs that pushed students beyond factual recall, toward higher order learning (e.g., formulating and testing hypotheses, considering multiple possible futures, debating opinions or courses of action, applying knowledge to a specific problem), tended to yield more positive outcomes. Can you guide students to pose interesting questions or hypotheses? Design ways to investigate them? Analyze data? Draw conclusions? Evaluate possible solutions to a messy problem? How might students use their

knowledge and skills to advocate or educate others as part of their learning experience?

A recent article by Ben Eldredge exemplified *positive framing* in his words and story about fostering civic engagement in his community. He opened the article saying, "we are involved in a long game, and we are definitely making a difference" (2019, p. 12). These words remind us that EE matters, and we are all in this work together. Studies in the literature review provide evidence for the importance of positive framing (e.g. Kleinhenz & Parker, 2017). To remind students of *their* agency, share examples of local solutions involving youth, individually or collectively, that are working. Communicate hope and empowerment, not doom and gloom.

Supporting participants

What do students need to know to be able to succeed in distance programs? Are there technology tools and features that you need to draw their attention to up front? Are there certain vocabulary or concepts that need a quick review before explaining more complex ideas? Brief audio or video intros can be helpful. We might also consider sending some content ahead and/or partnering with school teachers or others to ensure students feel sufficiently prepared when they embark upon programs.

Providing students with *feedback* can help keep them engaged and on track. Feedback can be provided by peers, instructors or even

Figure 2: Using visual evidence. Image by the Gulf of Maine Research Institute.
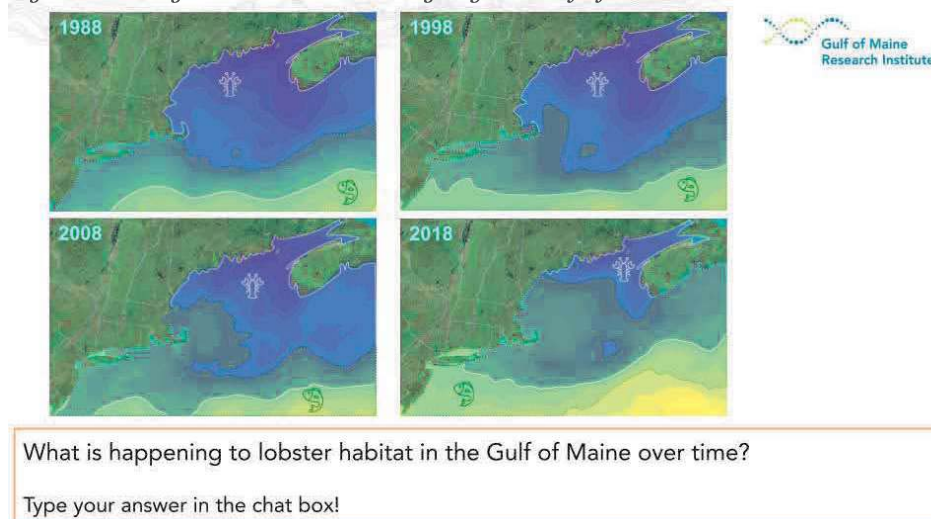
technology tools. Some platforms such as *Canvas* and *VoiceThread* have tools that enable feedback to students through text, audio or video. This feedback can be brief and immediate or can occur over time. For example, Caitlin Stone-Webber, a naturalist at Huron County Nature Center, recently initiated a **pen pal project** to keep students thinking about science while they were learning at home. She asked students to send letters to her with questions, and she responded with answers (Stone-Weber, 2020). These letters advanced their knowledge and validated their curiosity and ideas. Other meaningful forms of feedback might include simple badge icons or automated praise for advancing through a program, pre-programmed feedback if students appear to stray from learning objectives, or live encouragement in synchronous settings.

The path ahead

There is no clear road map for distance learning; many environmental educators are entering uncharted territory. However, the principles we've just described appear to have positive impacts on learner outcomes. We therefore put forth the list of principles as a reference for distance learning providers. While not all are necessary for a successful program, incorporating those that feel feasible may enhance participants' experiences.

Distance learning opens new doors for students, and may have special appeal to students who are digital natives. Technology can do things that can't be done in person, such as observing changes over time or introducing role models from distant places. The lessons we learn about how to do distance learning now can help enhance pre- and post-visit experiences for field experiences and connect with new audiences who cannot make it to our sites. Collectively, if we all invest our best into distance learning, we can inspire and enable youth attending our programs to help solve the socio-ecological problems we face in society today.

__See our website__ to learn more about our current research. The research in this article was partly funded by a grant from the North American Association for Environmental Education.

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