Can eco-leadership save the planet?

Educator guide

Beyond the roots of human inaction: Fostering collective effort toward ecosystem conservation

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1. Learning standards alignment

Learning Performance: Students will evaluate a review article's evidence-based claim that ecologically harmful human behaviors are the root cause of Earth's environmental problems and that there are psychological barriers that prevent humans from changing these behaviors.

The following tables provide an overview of the learning standards covered by this article, including the A Framework for K-12 Science Education (Framework), Common Core State Standards English Language Arts-Literacy (CCSS ELA), Common Core State Standards Statistics and Probability (CCSS HSS), AP Science Practices, and Vision and Change for Undergraduate Education.

Note that other connections are likely and that the information in this guide is just one step toward reaching the performance standards outlined below. Where possible, activities and information will be marked with specific standards to which they are linked.

A Framework for K-12 Science Education		
Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Engaging in Argument from Evidence (SEP7) Evaluate the claims, evidence, and/or reasoning behind currently accepted explanations or solutions to determine the merits of arguments. Make and defend a claim based on evidence about the natural world or the effectiveness of a design solution that reflects scientific knowledge and student-generated evidence. **Obtaining, evaluating, and communicating information (SEP8)** Critically read scientific literature adapted for classroom use to determine the central ideas or conclusions and/or to obtain scientific and/or technical information to summarize complex evidence, concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. Evaluate the validity and reliability of and/or synthesize multiple claims, methods, and/or designs that appear in scientific and technical texts or media reports, verifying the data when possible.	**ESS3.A: Earth Materials and Systems** The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles. (HS-ESS2-4) **ESS3.C: Human Impacts on Earth Systems** The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. **ETS1.B: Developing Possible Solutions** When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (Secondary to HS-ESS3-2),(secondary HS-ESS3-4)	**Cause and Effect** Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS4-7), (HS-ESS3-1), (HS-ESS3-2)

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Common Core State Standards English Language Arts-Literacy		
Key Ideas and Details	Craft and Structure	Integration of Knowledge and Ideas
RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. **RST.9-10.2** Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. **RST.11-12.1** Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **RST.11-12.2** Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.	**RST.9-10.4** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics. **RST.9-10.5** Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). **RST.9-10.6** Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. **RST.11-12.4** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics. **RST.11-12.5** Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. **RST.11-12.6** Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.	**RST.9-10.8** Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. **RST.9-10.9** Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. **RST.11-12.8** Evaluate the hypotheses, data, analyses, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **RST.11-12.9** Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

AP Science Standards	
AP Science Practices	AP Biology Content Standards
Science Practice 7 (SP7) The student is able to connect and relate knowledge across various scales, concepts, and representations in and across domains.	**Essential knowledge 4.B.4: Distribution of local and global ecosystems changes over time. (EK4.B.4)** Human impact accelerates change at local and global levels.

Connections to the Nature of Science	
Vision and Change for Undergraduate Biology Education Core Competencies and Disciplinary Practices	A Framework for K-12 Science Education Understandings About the Nature of Science
Ability to understand the relationship between science and society Identify social and historical dimensions of biology practice: evaluating the relevance of social contexts to biological problems, developing biological applications to solve societal problems, evaluating ethical implications of biological research	**Scientific Knowledge is Based on Empirical Evidence** Science arguments are strengthened by multiple lines of evidence supporting a single explanation. (HS-ESS3-5)

2. Article Overview

Article summary (recommended for educator use only)

This review article synthesizes the current body of evidence examining the psychology underlying human inability to correct behaviors causing major disruptions to Earth's ecosystems. Human behavior is placed in the context of internal and external motivations and pressures, providing a framework for understanding human choices leading to the destruction of our own habitat, despite our exposure to the growing body of evidence that this destruction is causally related to our choices. The article closes with evidence-based suggestions for behavioral modifications that can be accomplished individually and collectively, which would result in more sustainable, less harmful choices.

Importance of this research

Though many studies of sustainability refer to "environmental problems," the field of conservation psychology is redefining ecosystem disruptions and destruction as an issue of human behavior. Human behaviors have been intensively explored in the field of psychology, revealing internal drivers (such as emotions, beliefs, values, and attitudes) and external drivers (such as immediate danger or discomfort, social contexts, roles, and rules). Given the difficulty of considering the big picture—weighing long-term benefits with short-term benefits and choosing the behavior that provides the most optimal result overall—humans suffer from an inability to correct behaviors harmful to their own habitat. Considering interventions that have successfully changed behaviors in individuals, psychologists are realizing that much of the change must also be collective and collaborative, as external societal drivers have a substantial effect on human behavior. To truly sustain human habitation of Earth, motivated "sustainability leaders" will need to inspire collective action that results in a major behavioral shift.

Experimental methods

There are no experimental methods presented in this article. This paper is especially useful for having students explore secondary scientific literature, comparing it to primary literature. The article is not reporting results and conclusions from a set of experimental methods. Rather, this review is meant to synthesize results and conclusions from previous experiments, choosing the most promising evidence to create or explore a framework for the field of study (in this case, producing a set of conclusions for how best to correct human behaviors to prevent further disruption and destruction of Earth's ecosystem).

Conclusions

- Change perception of "environmental problems" to "human behavioral problems," and begin to use psychological tools to shift human behavior to sustainable habits.
- Use Community-Based Social Marketing (CBSM) approach to address sustainable behavior on an individual level; there is evidence that this method is effective.

- A larger-scale collective change must also occur in response to the rapid, widespread destruction of the Earth ecosystem.
- Research investigating political psychology may prove invaluable for understanding how to motivate collective behavioral change.
- For effective collective action, people must:
    - consider sustainability actions the “norm” within their social groups;
    - believe that their individual actions are impactful;
    - feel a sense of urgency about these issues; and
    - feel confident that there are possible solutions (i.e. that it’s not too late)
- Emboldened leaders within existing formal organizations can lead a change in the mission and worldview of their organization and its members.
- Methodical approaches must be implemented for successful, institutional-level change; mentoring and inquiry-driven education programs have been effective.
- Research focusing on indigenous cultures and their knowledge of ecological conditions has demonstrated that human behavior can respond to changes in those conditions. Other research shows that modern human behavior can shift to more sustainable practices, *if* the individual feels connected to nature. Several methods are suggested for helping people connect to nature in our current urbanized environment.

3. Activities for interactive engagement

Learning Performance: Students will evaluate a review article's evidence-based claim that ecologically harmful human behaviors are the root cause of Earth's environmental problems and that there are psychological barriers that prevent humans from changing these behaviors.

Primary literature vs. secondary literature

Students use the annotated list of references and compare these papers to the review paper. Students will evaluate what differentiates primary and secondary sources of scientific evidence. Comparing one or two of the cited papers to the review, students can decide if the review accurately summarized the results of the primary literature.

SEP8
RST.9-10.1/RST.11-12.1
RST.9-10.6/RST.11-12.6
RST.9-10.9/RST.11-12.9
SP7

Exploring the collaborative nature of science

Using this review of the current literature in a specific field, students will explain how each research project builds on the published work of at least one other independent group of scientists, and reflect on the statement that scientific knowledge is a "community effort."

SEP7
RST.9-10.1/RST.11-12.1
RST.9-10.5/RST.11-12.5
RST.9-10.6/RST.11-12.6
RST.9-10.8/RST.11-12.8

Science in the news

Students explore news stories in the Related Resources tab and evaluate the stories for tone, accuracy, missing information, etc. They may then write their own news stories on the article.

SEP7
SEP8
RST.9-10.1/RST.11-12.1
RST.9-10.2/RST.11-12.2
RST.9-10.6/RST.11-12.6
RST.9-10.8/RST.11-12.8
RST.9-10.9/RST.11-12.9
SP7

The next steps

Students design a follow-on experiment to this review that either addresses flaws or unanswered questions in the research at hand, or builds on it to explore a new question.

ESS3.C
ETS1.B
EK4.B.4

4. Discussion questions

1.	How might the current understanding of political psychology be applied to research about conservation psychology? Can lessons learned in one field be applied to another?	SEP8 SP7
2.	Examine some of the human behaviors that are contributing to ecosystem disruption and destruction. Many of these behaviors are widespread and part of the fabric of modern life. Discuss which widespread behavior shifts are most needed, and how that could be accomplished.	ESS3.A ESS3.C ETS1.B Cause and Effect EK4.B.4
3.	The authors mentioned avenues for further study. Looking at the full body of evidence presented in the review, what still needs to be explored? Were there areas where you didn't think the evidence was strong? Where are the gaps in the current research, and how would you address those?	SEP7 SEP8 SP7
4.	The authors refer to the evolutionary origins of human behavior. How is it possible to examine the behavior of ancient groups or species? What lines of evidence can be pursued?	SEP7 Cause and Effect
5.	Would it be possible to design a model for changing human behavior based on specific actions suggested by conservation psychology? If so, what might it look like?	SEP8 ESS3.A ESS3.C ETS1.B Cause and Effect SP7 EK4.B.4
6.	In *The Tragedy of the Commons*, Garrett Hardin stated that the human overpopulation problem has no technical solution and that, without management, it would ravage the Earth and deplete our resources. The paper was published in 1968; how was Hardin able to predict many of the current issues that we're facing? Why do you think human behaviors did not change at that time?	SEP7 ESS3.C Cause and Effect EK4.B.4