The Research

Summary of Research Relevant to Multidisciplinary Climate Change Education

Environmental Psychology and Climate Change

It is easy to understand why environmental educators are concerned about climate change. We are emotionally connected with nature and steeped in all of the academic underpinnings related to it. But unless we are preaching to the choir, our message may not be heard.

Even though we like to consider that people are reasoned intellectual beings, we need to look at more primal drivers of human behavior.   As social animals we respond to emotional cues within a trusted group context. The group's cues help us respond to the opportunities and threats around us. We feel safe when the message is presented in a familiar context from a trusted member (Lakeoff, 2010). Conversely, if the message is framed from another group's context, it is considered as less trustworthy. The challenge for environmental educators is to tap into the emotional cues and messengers for the groups we wish to engage.

A "If you just tell people the facts, they will reason to the right conclusion" (Lakoff, 2010, p. 73) position may align with objective scientific thinking but it does not support cognitive science research according to George Lakoff. Words, facts, and figures take a detour in our emotive brain as they seek out preexisting organizing frames intimately linked to our emotions. This pathway tells us right from wrong, shaping our judgment and conclusions. Objectivity takes a back seat. We are social constructivists.

Other primal drivers include a sense of immediacy, visibility, efficacy, complexity, and certainty. Our survival is dependent on responding to immediate threats, not future ones (Slovic, 2000 as cited in CRED, 2009.) If we can't clearly feel it we may not perceive it as a threat (Markowitz & Shariff, 2012.) If we do feel something is a threat, we respond to what we immediately see, not necessarily sizing up the entire dimension of the threat (Linville, 1991 as cited in CRED, 2009.) Our single response to it (efficacious or not) diminishes our concern and need for further action. If we are uncertain something is a threat, it decreases our willingness to take action (Markowitz & Shariff, 2012).

When considering how climate change communication has typically been presented, it is easy to see how it is contrary to everything we have learned in environmental psychology. The climate change issue is relatively complex solely based on the interdisciplinary nature of the science involved. This science is not taught at all or not taught effectively in schools, and misrepresentations of the science exist within the media. This complexity is further exacerbated by the temporal and spatial characteristics of the climate change. The effects of our actions are not immediately visible; for example, when we emit greenhouse gases by driving our car, the effects will be distributed across space (to those in other countries) and time (to future generations). Markowitz and Shariff (2012) argue that we are not morally equipped to act in this situation because "understanding climate change as a moral imperative does not occur automatically, at an intuitive level. Instead it requires cold, cognitively demanding and ultimately relatively less motivating, moral reasoning" (p. 244).

Uncertainty can breed over-optimistic behaviors, thereby reducing the motivation of individuals to change behaviors or take action. For example, the IPCC report used very carefully chosen labels to describe confidence and likelihood: "Very likely" was used to describe a 90-99% probabilistic chance of occurrence of a well-defined outcome (IPCC, 2007). However, "very likely" was systematically misinterpreted by the general U.S. public as being less likely than was intended by the experts who wrote the report (Markowitz & Shariff, 2012). Although the mechanism for over-optimism is not known, the effect is a decreased willingness to take action.

One final lesson from cognitive science speaks about the messages we shouldn't share. Opposing frames are the "elephant in the room." Lakeoff (2010) cautions communicators to quiet opposing frames so that they may atrophy as environmental frames develop.

Despite these barriers, the role of attitudes and beliefs and psychological responses, affecting human behavior and decision-making, as well as educational efforts, can call human behaviors and decision-making into play. Fortunately, The Center for Environmental Decisions (CRED) has invested much research in overcoming these barriers (CRED, 2009). The following chart summarizes CRED's findings, effective practices and psychological explanations. We have added educational strategies to provide ready applications for these principles.

The Center for Research on Environmental Decisions' 8 Principles of Climate Change Communication (CRED, 2009) with Additional Suggestions for Using these Principles in Educational Programs

Most Effective Practices *	Psychological Explanation*	Educational Strategies
1. Know your audience • Determine your students' mental model or current understanding about climate change • Discover what your students' misconceptions about climate change are • Know that all new information encountered will be filtered through a student's existing mental model	A mental model is a combination of an individual's understandings of facts, prior experiences, and intuitions. All of these factors influence what a person pays attention to and how she or he goes about solving problems. Understanding students' mental models will help to organize or emphasize certain dimensions of, strategies for, and relationships to climate change.	By surveying students' current understanding, (and misconceptions of climate change), and suggestions and concerns for addressing climate change before a lesson, instructors can get to know their audience. Surveys can range from a formalized pretest, to electronic student response systems, to dots on newsprint. Discussions about where we get our information, our perceptions of science, and what our role is in addressing issues can also help illuminate mental models.
2. Get your audience's attention • Consider framing the setting of the climate change issue in a context that is relevant to your students' lives • Carefully select words that will appeal to multiple perspectives of students • Use local examples, keeping it personally relevant (applying a "local" frame) • Portray risk as more immediate rather than distant (applying a "now" time frame) • Messages about avoiding loss tend to be more motivating than ones about realizing future gain • Broaden the frame to include effects on humans, for example, threats to national security or to human health	Framing puts issues into a certain context so that it will resonate with your audience. It is impossible not to frame when you communicate. CRED's collection of research indicates that a message should be local, focus on immediate risks with a greater emphasis on avoiding losses rather than realizing gains.	Here is an example that Illustrates how a message for teenagers could be framed: The cost of owning and driving a car is making it impossible to get around. As this country addresses practices that contribute to climate change the costs of cars, fuel, parking and other expenses are going to take a disproportionate bite out of your budget. Using less expensive options like ride shares, public transit, bikes, motor scooters, and renting or sharing a community car will keep you from missing out and help the environment!

3. Translate scientific data into concrete experience ● Trigger stronger motivation for action with use of vivid imagery and personal or anecdotal narrative rather than use of statistics and graphs ● Sustain long-term concern with more analytical messages such as trend forecasts, graphs or tables ● Use words that make sense to students, avoiding jargon, scientific terms and acronyms ● Provide time for group discussion which is more likely to bring in experiential and analytical perspectives ● Use words that make sense to students, avoiding jargon, scientific terms and acronyms ● Provide time for group discussion which is more likely to bring in experiential and analytical perspectives	We are emotional beings, and as a consequence, that is where we need to target our message. However, the primal brain is designed for immediate concerns, not future ones. Once people are concerned, analytical data provides tools to help you understand the details. Both are necessary touch points in our brain.	There are lots of opportunities for language arts activities to provide vivid imagery, anecdotal narrative and metaphors. Data analysis should highlight changes that are occurring now.
4. Beware the overuse of emotional appeals ● Recognize that students have a finite capacity for worry and can become "numb" to climate change issues ● Balance emotional messages with analytical messages ● Draw students' attention to concept of "numbing" and discuss ways to prevent it ● Gauge students' previous exposure to climate change issues (via media) ● Focus on solutions to empower students ● Provide a portfolio of possible solutions	According to research there is "a finite pool of worry." Immediate risks take precedence, but over time new worries replace old. Reactivating real or projected threats can have a numbing effect as can a host of problems presented on our many media sources. In response to the threat, people are inclined to take one action known as the single action bias. This action reduces the feeling of worry; few actions, if any, follow that. As one might	Create win-win strategies to pressing issues. Increase relevance, frame the issue, provide emotional and analytical explorations, and more connections in the brain for climate change. Making us aware of our single action bias can explain our tendency to pick one rather than all the suggested list of actions that we can take. You can also make that one action more substantive, e.g. increase home insulation and caulking rather than turn off the light. (See principle 8's educational strategies for video suggestions.)

	suspect, this can be detrimental to the sustained actions that are needed to address climate change.	
5. Address scientific and climate uncertainties • Use specific language • Be aware of differences between scientific use of words and common usage, for example, "error" in common usage means mistake, wrong or incorrect • When discussing scientific uncertainty, explain why it exists • Invoke the Precautionary Principle – taking action even when the risk is not a 100% certainty • Discuss probabilities in a group, allowing for a shared understanding	The nature of scientific uncertainty can be misunderstood as error or confusion on the part of scientists rather than an integral part of scientific research. This uncertainty can also decrease people's willingness to take action.	Educators can spend time discussing how science is a process for creating theory from evidence. In addition, educators can emphasize that these theories are dynamic, and that a theory is revised as new evidence comes to light. Promoting this as a strength, rather than a weakness, can help decrease student misunderstanding about scientific uncertainty. Additionally, educators can explicitly discuss decision-making strategies in light of uncertainty, calling upon the "Precautionary Principle" for example.
6. Tap into social identities and affiliations • Create group affiliation to activate social goals • Use smaller group sizes to allow for a stronger sense of group affiliation • Reward individual behaviors taken toward a group goal	Because people generally serve in several different roles in their daily lives – mother, daughter, and teacher – they may consider all or some of these roles important when making decisions about environmental action.	Educators can help students identify the social values and their affiliations they are using when making environmental action decisions. Educators can also, then, help students understand how others may be approaching an issue based on their own personal experience and motivations. Students can also be challenged to develop alternative frames for other affiliations, e.g. religion and protecting God's creation; parents and safeguarding their children's futures; teenagers changing their parents' antiquated system.

7. Encourage group participation ● Establish appropriate group discussion norms: who speaks when, how to disagree ● Allow ample time for questions and discussion ● Use smaller group sizes for discussion ● Recognize power and personal differences ● Provide opportunity for verbal and non-verbal forms of participation ● Represent multiple viewpoints ● Establish the expected outcome for the discussion (consensus or not)	Climate change mitigation actions are dependent on the collective action of many individuals. As such, effective actions may be those that are agreed upon and conducted by a group. However, dynamics within groups can lead to inequitable participation and influence between members.	Educators can establish group discussion norms that allow for and give credence to multiple forms of communication – narrative, factual, verbal, non-verbal. Educators can elicit multiple perspectives by creating a classroom culture that encourages dissenting voices. Debrief or meta-cognate how those different forms of communication influence how we respond to climate change issues.
8. Make behavior change easier ● Propose solutions that are feasible for students ● Make the desired behavior option the easier one ● Provide immediate incentives for desired behaviors	People generally choose behaviors with the lowest possible personal cost and the most immediate positive incentive.	Educators can challenge learners to work in small groups to investigate and propose achievable reductions in energy use/generation of greenhouse gas pollution. Consider using videos as examples to help the groups get started e.g., go to www.youngvoicesonclimatechange.com and click on "Movies" or http:// earththeoperatorsmanual.com/ and click on "Watch Operators in Action" Additionally, educators can make some of the pro-environmental behaviors the "default" behavior, such as setting school printers to double-sided printing and providing recycling containers instead of trash cans in their rooms.

* Information in this table is adapted, with permission, from _The Psychology of Climate Change Communication,_ a publication of The Earth Institute, at Columbia University, Center for Research on Environmental Decisions available at http://guide.cred.columbia.edu. The third column, titled educational strategies, was developed by K.C. Busch and Lisa LaRocque for this publication.

Literature Cited

Brown, Paige. (25 March 2012). Got Frames? Why How We Frame the Environment Matters. Retrieved from http://www.scilogs.com/from_the_lab_bench/got-frames-why-how-we-frame-the-environment-matters/

Center for Research on Environmental Decisions (CRED). (2009) _The Psychology of Climate Change Communication: A Guide for Scientists, Journalists, Educators, Political Aides and the Interested Public_. New York Retrieved from http://guide.cred.columbia.edu

IPCC. (2008). Climate change 2007: Synthesis report. Cambridge University Press.

Lakoff, G. (2010). "Why it Matters How We Frame the Environment." Environmental Communication: A Journal of Nature and Culture 4(1): 70-81.

Linville, P.W., Fischer, G.W. (1991). Preferences for separating and combining events: a social application of prospect theory and the mental accounting model. _Journal of Personality and Social Psychology_. 60, 5-23.

Markowitz, E. M., & Shariff, A. F. (2012). Climate change and moral judgment. Nature Publishing Group, 2(4), 243–247. doi:10.1038/nclimate1378

Slovic, P. (2000). _The Perception of Risk_. London: Earthscan. Slovic, P., M.L., Peters. E. et al. (2004). Risk as analysis and risk as feelings: Some thoughts about affect, reason, risk and rationality: Risk Analysis, 24, 311-322.