

## **If it please the court: Using a simulated trial as the basis for an introduction to sustainability science course**

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**Abstract:** This report describes a unique technique for presenting an introduction to sustainability science course that is both required for sustainability science majors at a large Mid-Atlantic state university and a general education non-laboratory science course. The World Scientists' Warning to Humanity, released by the Union of Concerned Scientists in the late 1990s, serves as an indictment of humanity. The course mimics a trial as it proceeds from the indictment through an arraignment, pre-trial, trial, verdict, and sentencing with students acting both as the accused and the jury.

**Keywords:** education; environmental; experiential; innovative; sustainability; undergraduate

In 2009, Kean University (NJ) received formal state approval to offer a B.S. in Sustainability Science. It is one of only two such degree programs in the nation. In fact, there are fewer than 100 programs in the nation that include the word sustainability or sustainable in the degree name (S. Vincent, personal communication, 16 June 2012). This is a paradox because it has been suggested, “Higher education institutions bear a profound moral responsibility to increase the awareness, knowledge, skills and values needed to create a just and sustainable future” (*The Essex Report*, 1995, p. 4). A decade later, it was observed, “At the Earth Summit in Rio in 1992, education was identified as one of the key forces central to the process of sustainable development during the 21<sup>st</sup> century. Some years later, the goal of sustainability and the need for education in all of its forms in order to seriously engage with this imperative remain as significant as ever—possibly more so...” (Blewitt, 2004, p. 1).

In 2010, Smith presented a case study of how he teaches a graduate-level course that pertains to sustainability. This presents another paradox because it is the only such detailed description of sustainability education pedagogy that I’ve been able to locate in the literature. So, clearly there is a need for more reports about how sustainability education is being accomplished.

The sustainability science program strives to provide students with educational experiences that will provide them with the knowledge, skills, abilities, and experiences that will position them to demonstrate comprehension of: 1) the unique characteristics of Earth that have facilitated the development and evolution of life as we know it, 2) the human actions and behaviors that are compromising these characteristics, 3) the reasons why humans are acting and behaving in unsustainable ways, and 4) the solutions that will produce long-term reversal, if not elimination, of unsustainable actions and behaviors in favor of those that are sustainable. The program seeks to empower students to embrace sustainable lifestyles whereby they will serve as change agents for others in their personal and professional communities.

Students are required to enroll in 14 courses (37 semester hours) as part of the major foundation requirements. The course described in this case study is the absolute foundation for the entire program. It is a required course for all sustainability science majors, but because it is also an approved general education non-laboratory science course, students from other majors enroll in it. It is offered in both the autumn and spring semester, but it is not offered during the summer sessions. The additional 13 courses as well as additional non-major courses in biology, chemistry, Earth systems, etc. complete the foundation of the program and serve as the basis for understanding the four components of the curriculum. Once students have completed roughly 60 semester hours, they self-select into one of two concentrations: Earth systems or human systems. The Earth systems concentration coursework, much of which is upper division, focuses on Earth’s atmosphere, hydrosphere, geosphere, and biosphere. The human systems concentration coursework, much of which is upper division, focuses on communication, business, infrastructure, and social topics.

The challenge I presented to myself in 2009 regarding this course was to present it in a way that would provide the students with an authentic experiential learning experience that allowed them to gain understanding of the concept of sustainability while at the same time convincing them of the urgency with which humanity must abandon so many of its unsustainable behaviors all without coming across to them as proselytizing. The answer came to me while re-watching the

movie, *The Hunt for Red October*. In it, Alec Baldwin is seen pondering how to get a Russian submarine crew off of the ship that the Capitan wants to present to the United States as part of his and his crew's defection. He is shown thinking out loud, "So how's he gonna get the crew off the sub?" he pondered. "They have to *want* to get off. How do you get a crew to want to get off a submarine? How do you get a crew to want to get off a *nuclear* sub (an abrupt end to his speaking and his facial gestures indicates he has found his answer)?" [emphasis added to indicate his intonation] His epiphany was the fact that a threat of exposure to radiation would be all that is necessary to convince the sailors to abandon ship regardless of other circumstances. I wondered how I could make students want to care about sustainability. That made me think that the way to do so was to make it intensely personal; to make it so that they perceive their own welfare is at stake much like the sailors would think their own welfare is at stake as a result of a potential radiation contamination; to make it experiential. Now the question became how to do so.

Having worked for 6 years at a residential experiential environmental education field campus, I was familiar with the concepts of experiential education. I considered that according to the Association for Experiential Education, in addition to other conditions, experiential education occurs when:

- carefully chosen experiences are supported by reflection, critical analysis and synthesis;
  - experiences are structured to require learners to take initiative, make decisions and be accountable for results;
  - learners are actively engaged in posing questions, investigating, experimenting, being curious, solving problems, assuming responsibility, being creative, and constructing meaning;
  - learners are engaged intellectually, emotionally, socially, soulfully, and/or physically;
  - the results of learning are personal and form the basis for future experience and learning;
  - opportunities are nurtured for learners and educators to explore and examine their own values; and
  - the educator's primary roles include setting suitable experiences, posing problems, setting boundaries; supporting learners, . . . and facilitating the learning process.
- (<http://www.aee.org/about/whatIsEE>).

So, I thought long and hard about how I might achieve some of these conditions after all, I did not have the same situation as the commander of a nuclear powered submarine. I wondered under what situation would a learner need to experience these conditions. The light went off when I considered being on trial, not that I ever had been. Still, I cannot image a more deeply personal experience than having to defend one's self from prosecution for a crime. I also considered that having to serve on a jury and determine the fate of an accused would also likely be a deeply experiential event. I realized that structuring a course reasonably to resemble a trial in which the students were both the accused and the jury would likely involve achieving most, if not all, of the bulleted points above, thereby providing a truly unique experiential and motivational, perhaps even transformative, learning opportunity.

So, I began investigating aspects of the legal system for which I was not knowledgeable and learned that a criminal prosecution commonly begins with an indictment, which is "a formal

written statement framed by a prosecuting authority and found by a jury...charging a person with an offense” (<http://www.merriam-webster.com/dictionary/indictment>). A subsequent step is the arraignment, which is commonly defined as a formal reading of a criminal complaint in the presence of the defendant to inform her/him of the charges against her/him, followed by the pre-trial and trial and the verdict/sentencing if appropriate.

Ever since its release, I’ve used the *World Scientists’ Warning to Humanity* in my teaching. Written by the late Nobel Laureate Henry Kendall, the *Warning* was sent to nearly 2,000 of the most preeminent scientists in the world in 1992 for their endorsement. Over 1,700 provided theirs. Since the advent of the Internet, the substance of the pamphlet is now available at <http://www.ucsusa.org/about/1992-world-scientists.html>.

The folded pamphlet opens to an 11-inch by 17-inch document. The introduction reads: *Human beings and the natural world are on a collision course. Human activities inflict harsh and often irreversible damage on the environment and on critical resources. If not checked, many of our current practices put at serious risk the future that we wish for human society and the plant and animal kingdoms, and may so alter the living world that it will be unable to sustain life in the manner that we know. Fundamental changes are urgent if we are to avoid the collision our present course will bring about.*

One particular sentence, ***Human activities inflict harsh and often irreversible damage on the environment and on critical resources***, seemed to me to read like an indictment. Clearly, the *Warning* is a formal written statement. I considered the Union of Concerned Scientists the prosecuting authority and the more than 1,700 scientists that endorsed it the jury. The “person” charged with the offense I considered as all human beings. My thinking evolved to conclude that if I were to present this document in its entirety to students, that would constitute arraignment. I decided that I would play the role of the prosecuting attorney, so I began to gather evidence to support the indictment that would be introduced during the course, which serves as a proxy for the trial. I decided to present the materials based on what seemed to me as a logical progression that a prosecuting attorney might use. I consulted a friend/colleague who is a practicing attorney to confirm that my thinking was appropriate and he did so.

On the first day of the course, before exposing the students either to the readings or the documentaries, I explain my intentions to them and I poll them to determine if they understand the idea of an indictment, arraignment, trial, etc. For the seven times that I’ve offered this course, the students have unanimously embraced the idea of them being both the defendant and a member of the jury.

We explore the concept of burden of proof in the U.S. legal system and the difference between the standard of beyond a reasonable doubt (the standard in a criminal prosecution) and the standard of a preponderance of the evidence (the standard in a civil prosecution).

For the first unit of the course, I assembled a group of readings and a documentary that constitutes the arraignment. In addition to the *World Scientist’s Warning to Humanity*, the readings include<sup>1</sup>:

- Hinrichsen, D. & Robey, B. (2000). *Population and the environment: The global challenge, Population Reports, Series M, No. 15*. Baltimore, MD: Johns Hopkins University School of Public Health, Population Information Program.
- Millennium Ecosystem Assessment. (2005). *Ecosystems and human well-being: Synthesis* (pp. 1-24). Washington, D.C.: Island Press.
- Steffen, W., Crutzen, P.J., and McNeill, J.R. (2007). The Anthropocene: Are humans now overwhelming the great forces of nature? *Ambio*, 36(8), 614-621.
- The H. John Heinz III Center for Science, Economics and the Environment. (2008). The state of the nation's ecosystems 2008 (pp. 13-27). (Available online at <http://www.heinzctr.org/Ecosystems.html>).
- Secretariat of the Convention on Biological Diversity. (2010). Global biodiversity outlook 3 (pp. 5-7, 9-13, 89). (Available online at <http://www.cbd.int/gbo3/>)
- WWF International, Institute of Zoology, & Global Footprint Network. (2010). *Living planet report 2010: Biodiversity, biocapacity and development*. (Available online at [http://wwf.panda.org/about\\_our\\_earth/all\\_publications/living\\_planet\\_report/2010\\_lpr/](http://wwf.panda.org/about_our_earth/all_publications/living_planet_report/2010_lpr/))

Each of these readings clearly identifies how human actions have inflicted harsh and often irreversible damage on the environment and on critical resources. The documentary is intended to provide a segue from the arraignment to what might constitute the pre-trial by starting with an effort to address the question “Does sustainability, or the lack of it, represent an indictment of human actions?” In other words, is there just cause to proceed with a trial of the accused? To explore this question, I show the students *Ancient Futures: Learning from Ladakh* and either the 174-minute, 2007 CNN special *Planet in Peril* or the 140-minute 2009 CNN special *Planet in Peril: Battle Lines*.

The assessments for all reading assignments are 10-item pencil and paper instruments I designed for each reading that include multiple choice, false/true, and short answer response items. Three critical thinking questions for each reading are also assigned. The assessment for all documentaries has its origins in several of the techniques proposed by Angelo and Cross (1993). I call it a reaction paper. I ask the students to reflect in 1,000 words or less on how viewing the documentary affected their

- knowledge of the topic (addresses the cognitive domain);
- attitudes, opinions, beliefs, values, etc. regarding the topic (addresses the affective domain); and
- behavior regarding the topic (addresses the conative domain).

The writing assignment recognizes Shulman's (1996) claim that “We do not learn from experience; we learn by thinking about our experience” (p. 208). I explain this to my students and ask them to think about their experience of viewing the documentary when they compose their responses. I also share with them the notion that “the point of...education is change; if there is no change, there is no point” (Van Mater, 1990, p. 19), and suggest to them that if they watch the documentary and cannot identify how their above domains have changed, then it is as they did not experience the viewing. The documentaries and the readings have been carefully selected to illicit critical thinking and change. I also strongly encourage them to consider the often-heard admonition: if you're not part of the solution, you are the problem. Lastly, I

deliberately try to embrace the Chinese proverb: Tell me and I'll forget; show me and I may remember; involve me and I'll understand. By embracing both written and electronic media and by requiring the students to serve as both the accused and a juror, I hope to tell, show, and involve them in their assessment of sustainability.

The second unit (the remaining units are considered to be analogous to the witness testimony phase of a trial) of the course is intended to address the question: Is sustainability a new paradigm? I take this approach, as I explain to the students, because I think it is conceivable for a defense attorney to argue that her/his client is not guilty as charged because sustainability is so new that no one really knows what it is or what it means. To explore the plausibility of this notion, I have them read

- Lemonick, M.D. (2009). Top 10 myths about sustainability. *Scientific American: Earth 3.0*, Vol. 19.
- Raskin, P.D., Electris, C., & Rosen, R.A. (2010). The century ahead: Searching for sustainability. *Sustainability*, 2, 2626-651.
- Warde, P. (2011). The invention of sustainability. *Modern Intellectual History*, 8(1), pp. 153–170.
- Adams, W.M. (2006). The future of sustainability: Re-thinking environment and development in the twenty-first century. Report of the IUCN Renowned Thinkers Meeting. (Available online at <http://www.scribd.com/doc/57189764/Future-of-Sustainability-The-World-Conservation-Union>)
- Cairns, J., Jr. (2007). Sustainable co-evolution. *International Journal of Sustainable Development & World Ecology*, 14, 103-08.
- Orr, D.W. (2006). Framing sustainability. *Conservation Biology*, 20(2), 265-268.
- Dernbach, J.C. (2002). Synthesis. In J.C. Dernbach (Ed.), *Stumbling Toward Sustainability* (pp. 1-8). Washington, D.C.: Environmental Law Institute.

The documentaries we watch are *Affluenza* (56 minutes), *Escape from Affluenza* (56 minutes), and *The End of Suburbia* (78 minutes).

The third unit of the course is intended to address the question: What are the unique characteristics of Earth that have allowed life to evolve and to develop to the extent that it has? This is background information about the concept of sustainability that further reinforces the information presented in the opening remarks of the trial. Remembering that this experience is a university course and certain content must be provided, I suggest to the students that, so far as we know, Earth is the only celestial body on which life is found. I suggest that we may be wrong about this, but, so far, that is what the evidence suggests. So, Earth must be characterized by unique features not found anywhere or we would find life elsewhere. I further opine that in order to understand fully sustainability, one must understand how it is possible for life to exist on Earth, much like a physician must fully understand the anatomy and physiology of the human body in order to understand both health and disease. It is important to understand that the question is not how life came to exist on Earth; rather it is how life is sustained. So, for students who have a religious belief regarding how life can to exist on Earth, the question remains the same because if they believe a creator put life on Earth, then it is logical to presume that the

creator would have assured that life support systems existed prior to doing so. For this unit, I have them read:

- Costanza, R., d'Arge, R., de Groot, R., Farber, S., Grasso, M., Hannon, B., et al. (1997, 15 May). The value of the world's ecosystem services and natural capital. *Nature*, 387, 253-260.
- Daily, G.C., Alexander, S., Ehrlich, P., Goulder, L., Lubchenco, J., Matson, P.A., et al. (1997). *Issues in ecology: Ecosystem services: Benefits supplied to human societies by natural ecosystems*. Washington, D.C.: Ecological Society of America. (Available online at [http://www.esa.org/science\\_resources/issues\\_ecology.php](http://www.esa.org/science_resources/issues_ecology.php))
- Reid, W.V., Mooney, H.A., Cropper, A., Capistrano, D., Carpenter, S.R., Chopra, K., et al. (2005). How have ecosystems changed? In Millennium Ecosystem Assessment, *Ecosystems and human well-being: Synthesis* (pp. 26-38). Washington, D.C.: Island Press. (Available online at <http://www.maweb.org/en/Synthesis.aspx>)
- Reid, W.V., Mooney, H.A., Cropper, A., Capistrano, D., Carpenter, S.R., Chopra, K., et al. (2005). How have ecosystems services and their uses changed? In Millennium Ecosystem Assessment, *Ecosystems and human well-being: Synthesis* (pp. 39-48). Washington, D.C.: Island Press.
- Hardin, G. (1960, 29 April). The competitive exclusion principle. *Science*, 131, 1292-297.

The documentaries we watch come from the 13-part *The Habitable Planet: A Systems Approach to Environmental Science* series. The four 30-minute parts we watch are: Many Planets, One Earth; Atmosphere; Oceans; and Ecosystems. We do not watch the other nine programs because they do not address the specific question of interest in this unit. We also watch *Dirt! The Movie* (80 minutes), which addresses the ecological importance of soil.

The fourth unit of the course is intended to address the question: Why do humans behave in such maladaptive, unsustainable ways? I think psychologists Michael Maloney and Michael Ward summarized the sustainability issue quite accurately, even though they did so before the word sustainability had become fully established in our vocabulary. Back in 1972, they opined, "the ecological crisis [read sustainability crisis] is a crisis of maladaptive behavior... the solution lies with the sciences that deal with changing human behavior" (p. 583). What I encourage my students to consider is that if the sustainability crisis is caused by inappropriate human behavior and because there is abundant evidence that human behavior can in fact be modified, perhaps if we understand the precise nature of the maladaptive behavior, we might be able to design behavior interventions that will promote adaptive and sustainable choices. For this unit, I have them read:

- White, L., Jr. (1967, 10 March). The historical roots of our ecological crisis. *Science*, 155, 1203-1207.
- Moncrief, L.W. (1970, 30 October). The cultural basis for our environmental crisis. *Science*, 170, 508-512.
- Hardin, G. (1968, 13 December). The tragedy of the commons. *Science*, 162, 1243-1248.

- The Narcotizing Dysfunction, which is a one-page portion of Lazarsfeld, P.F. & Merton, R.K. (1957). Mass communication, popular taste and organized social action. In B. Rosenberg & White, D.M. (Eds), *Mass culture: The popular arts in America* (pp. 457-473). Glencoe, IL: The Free Press.
- Kollmus, A. & Agyeman, J. (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, 8(3), 239-260.
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- Kordell, H.K. (2008). The latest on trends in nature-based outdoor education. *Forest History Today*, 14(1), 4-10.

The documentary we watch is *The Corporation*.

The fifth unit of the course is intended to address the question, “What are the impacts of our actions?” It is important for students to understand that if the majority of the scientific community is correct, human actions are degrading the life support system of the planet, but their understanding must be sophisticated and substantially more insightful than simple recognition of the obvious. They must understand how human actions might be perturbing biogeochemical cycles, accelerating species extinctions, altering landscapes, etc. They must also link impacts with behavior. To do this, the assigned readings are:

- Díaz, S., Fargione, J., Chapin, F.S., III, & Tilman, D. (2006). Biodiversity loss threatens human well-being. *PLoS Biology*, 4(8), 1300-1305.
- Cordell, D., Drangert, J-O, & White, S. (2009). The story of phosphorus: Global food security and food for thought. *Global Environmental Change*, 19, 292-305.
- Vitousek, P., Aber, J., Howarth, R.W., Likens, G.E., Matson, P.A., Schindler, D.W., et al. (1997). *Issues in Ecology: Human alteration of the global nitrogen cycle: Causes and consequences..* Washington, D.C.: Ecological Society of America. (Available online at [http://www.esa.org/science\\_resources/issues\\_ecology.php](http://www.esa.org/science_resources/issues_ecology.php))
- Vitousek, P.M., Mooney, H.A., Lubchenco, J., & Melillo, J.M. (1997, 25 July). Human domination of Earth’s ecosystems. *Science*, 277, 494-499.
- Myers, N. & Kent, J. (2003). New consumers: The influence of affluence on the environment. *PNAS*, 100(8), 4963-4968.
- Amundson, R., Guo, Y., & Gong, P. (2003). Soil diversity and land use in the United States. *Ecosystems*, 6, 470-482.

The documentaries we watch are *The Human Footprint* (120 minutes), *Power Surge* (60 minutes) and *The Light Bulb Conspiracy* (75 minutes).

The final unit of the course addresses the question, “How do we correct our actions and embrace sustainability?” It is vital that the students are able to propose solutions to the sustainability challenge. These solutions must move beyond mere symbolism. They must be measurable and they must be sustainable. They will most likely require a substantial paradigm shift and *out-of-the-box* thinking. The assigned readings are:



- Ridley, M. & Low, B.S. (1993). Can selfishness save the environment? *Atlantic Monthly*, 272(3), 76-78.
- Ruckelshaus, W.D. (1989). Toward a sustainable world. *Scientific American*, 261(3), 166-174.
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- Owen, D. (2010, 20 & 27 December). The efficiency dilemma. *The New Yorker*, 86(41), 78-85.
- Harriss, R. & Shui, B. (2010, November/December). Consumption, not CO<sub>2</sub> emissions: Reframing perspectives on climate change and sustainability. *Environment*, 52(6), 8-15.
- Despommier, D. (2009, November). The rise of vertical farms. *Scientific American*, 301(5), 80-87.
- Union of Concerned Scientists. (2009). *Climate 2030: A national blueprint for a clean energy economy, Executive Summary*. Cambridge, MA: Union of Concerned Scientists. (Available online at [www.ucsusa.org/blueprint](http://www.ucsusa.org/blueprint))
- Friedman, T.L. (2007, 15 April). The power of green. *New York Times Magazine*, 40-51, 67, 71-72.

The documentary we watch is *Architecture to Zucchini* (120 minutes in segments).

Throughout the semester, at the beginning of each class meeting, I ask the students to state the indictment. I provide a recap of the evidence presented to date. At the start of each unit, we discuss each of the readings and examine them in a manner that we believe is consistent with how a jury would consider evidence.

On the final meeting of the course, I poll the students for their verdict. Without exception, every time I have taught the course, the verdict has been unanimous: guilty. The final meeting is reserved for discussing the implications of such a verdict and a recommendation for sentencing.

In addition to having to render a verdict, I encourage the students to reflect upon their reactions to what they've read and viewed. I remind them that thinking about their experiences is vital. I encourage them to consider the suggestion: if it is to be, it is up to me. This is important, because there is abundant evidence that the psychological construct locus of control of reinforcement, particularly an internal perceived expectancy for reinforcement, which would be representative of a person who believes it is up to me, is linked to the adoption of and perhaps sustained performance of behaviors representative of sustainability. If they have encountered any piece of information that they find undesirable or uncomfortable, then I suggest to them that they have the option to change it. To extend the idea presented earlier that the point of education is change, there are two types of change associated with education: the change the student experiences directly regarding her/his affective, cognitive, conative domains and the societal change that the student instigates as a result of her/his education.

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<sup>i</sup> I have edited a text for McGraw Hill, for which I receive no royalties, in the *Annual Edition* series that includes edited versions of all save one of the articles as well as an instructor's resource guide to facilitate others who wish to teach a similar course.

