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Article

Educating the Aware, Informed and Action-Oriented Sustainable Citizen

Audrey L. Schroer, Heili E. Lowman and Craig L. Just *

Department of Civil and Environmental Engineering, University of Iowa, 4111 Seamans Center for the Engineering Arts and Sciences, Iowa City, IA 52241, USA; E-Mails: audrey-schroer@uiowa.edu (A.L.S.); heili-lowman@uiowa.edu (H.E.L.)

* Author to whom correspondence should be addressed; E-Mail: craig-just@uiowa.edu; Tel.: +319-335-5051.

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Abstract: The Introduction to Sustainability course at the University of Iowa seeks to educate the aware, informed and action-oriented sustainable citizen. A phenomenographic analysis and retrospective pretest were utilized to determine how students formed conceptions of sustainability as a result of completing the course. The study indicated that student conceptions of sustainability can be characterized by the "aware, informed and action-oriented" spectrum. In written reflections following service-learning experiences, students provided ample examples of "awareness moments" where they expressed a first encounter with a wicked problem. In these same reflections, students provided examples of being able to move beyond awareness toward an action-orientation. Many students that were called to action through a service-learning experience expressed hesitation regarding their level of knowledge regarding certain issues. But, many students with this hesitation decided their next action step would be to become more informed. Therefore, even when confronted by a sustainability issue or dilemma that students felt were beyond their knowledge level, they many times expressed an action pathway to become more informed. By challenging student thought processes and exposing the immediate need for global change, the Introduction to Sustainability course empowered students to become aware, informed, and action-oriented sustainable citizens.

Keywords: aware; informed; action-oriented; service-learning; phenomenography; retrospective pretest

1. Educating the Aware, Informed and Action-oriented Sustainable Citizen

With growing environmental, economic and social justice concerns, global leaders of the early 21st century have repeatedly drawn attention to the importance of education for sustainability. In 2001, the United Nations Educational, Scientific, and Cultural Organization created the Luneburg Declaration [1], which called for institutions of higher education to incorporate sustainable education into their available course curriculum. The Luneburg Declaration clearly stated that higher education "has a special responsibility to conduct the scholarship and scientific research necessary to generate the new knowledge needed and train the leaders and teachers of tomorrow, as well as communicate this knowledge to decision makers and the public at large" [2]. Soon thereafter, the years spanning 2005 to 2014 were declared the United Nations' Decade of Education for Sustainable Development [3]. Numerous courses, workshops, conferences, and surveys have since taken place to improve our knowledge of the content, delivery, and student retention of sustainability education.

Creating an understanding about the structure of sustainability education is needed to address the challenges inherent in sustainability education. Dr. Yosef Jabareen, a professor at the Israel Institute of Technology, argues that sustainability course themes are often "vague, overly broad, and highly variable" [4]. In addition, sustainability topics are often mistaken for environmental topics when the two are "considerably different in scope, content, concepts and strategies". A successful course addressing sustainability must incorporate "social, economic, cultural, environmental, spatial, and physical" aspects. Other researchers and authors agree, stating sustainability education should be presented "as a 'perspective through which to understand the world', rather than a toolbox or an extra-curricular activity" [5]. Herein lies the challenge of sustainability education: *how do we teach students to embrace a way of thinking and adopt a personal lifestyle that are many times temporally and spatially disconnected from their current daily lives?*

Issues facing sustainability can be considered "wicked problems", which are "problems that cannot be solved in a linear manner and for which there are no clear solutions". Often, each solution appearing to solve a wicked problem often creates a different new set of problems [6]. Ever since the industrial age, there has been a focus in planning theory on finding the most efficient solution to a problem. However, this thought process must be left behind when considering wicked problems, since there are no obvious solutions [7]. As a means of engaging wicked problems, teachers and students are increasingly considering the factors and outcomes surrounding tough issues through the process of "systems thinking". Application of this process in higher education coursework gets students to think in terms stocks and flows of natural and human capital with an emphasis on the connectedness of natural human systems [8]. Embracing the "human element" in any diverse system can be challenging, especially if the system is being designed or modified to address a wicked problem. System design can be enhanced through democratic dialoging which is "[a] method [of dialoging] aimed at resolving problems through mutual understanding and concessions, rather than through the unilateral imposition of one side's views and interests" [9]. Learning how to dialogue democratically and think systematically are key attributes for the sustainable citizen that seeks to take on the wicked problems of our time.

But, where should students best encounter these wicked problems—In the classroom alone? Not likely. A social deterrent to addressing wicked problems is a level of political engagement that is, according to Edward Zlotkowski, "So low as to threaten the vitality and stability of democratic politics

in the United States" [10]. Discussion has increased recently regarding the role of higher education facilitators to not only enhance students' foundational and professional knowledge, but also to encourage and provide opportunities for students to become "socially responsive" and engaged within the community [10]. This call to action corresponds with the three main missions of an institution of higher education: teaching, research, and community service [11]; where the community service mission tends to be underdeveloped.

One method of engaging students in social responsibility and community service is through service-learning. Bringle and Hatcher define service-learning as, "A credit-bearing experience in which students participate in an organized service activity that meets identified community needs and reflect upon the service in such a way as to gain fundamental understanding of course content, a broader appreciation of the discipline, and an enhanced sense of civic responsibility" [12]. Service-learning can be a means to explore wicked problems by allowing students to engage in the larger community outside the classroom.

To address the need for increased community dialoguing in the context of sustainability and in support of fostering more meaningful community engagement, we developed an Introduction to Sustainability service-learning course that emphasizes sustainability knowledge, skills and behaviors as means to shape one vision of a sustainable citizen. Our goal was to address the idea of sustainability in a holistic fashion and to enable students to tackle wicked problems systematically. Course content is structured to present citizenship with "a social dimension that goes far beyond just residency—It encompasses all aspects of what it means to be a full member of a community" [13]. In addition, this course is designed to move curriculum beyond "education about sustainability" and closer towards a model of "education for sustainability" [3]. The course promotes basic skills of sustainability literacy, applied math and finding information as students are challenged to increase their abilities toward democratic dialoguing and with attention to increasingly larger system sizes. The traditional sustainability knowledge areas of society, economy and environment are explored before moving toward more blended-knowledge themes, such as informed consumerism, eco-economies and livable environments. Most importantly, the "bull's-eye" of the course framework is a person—One who is aware, informed and action-oriented (Figure 1).

Figure 1. The citizen-centric, "education for sustainability" model emphasizes change in attitudes, skills and behaviors of students in addition to knowledge acquisition. The model also highlights how students are taught to grow their use of democratic dialoguing, think in increasingly larger system sizes and build more sustainable habits.

2. Methods and Theoretical Approach

The goal of this research was to explore student conceptions of sustainability in the context of key instructional design elements. We viewed these conceptions as complex products of abstract or reflective thinking or as the sum of a student's ideas and beliefs concerning sustainability [14]. We hypothesized that three particular conceptions would emerge from an analysis of student surveys and coursework given the strong instructional, and almost propagandized, emphasis to "Become Aware", to "Get Skills & Knowledge", and on "Active Citizenship" as a pathway toward becoming a "sustainable citizen" (Figure 2).

Figure 2. Students in the Introduction to Sustainability course are encouraged to See, Grow and Do as they Become Aware, Get Skills and Knowledge and practice Active Citizenship. Marketing materials developed for the Sustainable Citizen Program (FIPSE Grant P116B100078) are used to emphasize these key conceptualizations in an engaging manner.

2.1. Phenomenography and Conception Development

To explore the degree to which these conceptions were embodied by students, we used the theoretical and methodological approach known as phenomenography [15–19]. Phenomenography describes qualitative differences in the ways a phenomenon is experienced, understood or conceptualized. A phenomenographic study reveals a set of qualitatively distinct, yet logically related, set of categories, referred to as conceptions. The conceptions and the relationships between them form the basis for an outcome space that describes the level of inclusivity and sophistication along what we call the "conception spectrum". For this study, a student's position on the conception spectrum was discerned from written reflections completed after each of five service-learning experiences throughout the semester. Our first phenomenographic analysis tested for conceptions of "career", "persuasion" and "intrinsic". For our second, and most extensive analysis, we defined the conception spectrum as "aware",

"informed" and/or "action-oriented" and we hypothesized that student conceptions would increasingly move beyond being "aware" toward "informed" and/or "action-oriented" as the semester progressed.

Service-learning for this course was defined in the broadest possible sense as "service to representative democracy" where students attend a variety of public fora and then describe how the experience deepened their understanding of course content. The required reciprocity between the service-learning partner (democracy) and the course comes as students learn to be more active, sustainable citizens. After each service-learning experience, the students completed a three-part reflection that captured their objective and subjective perceptions. The reflections were due at weeks 6, 9, 10, 13 and 16. In part one of the reflection, students objectively describe the event itself—where and when it occurred, its duration, the attendee makeup, etc. In part two, the students share how what they experienced challenged their pre-conceived notions and/or stereotypes about participants in the event or the topics discussed at the event. In part three, students must "fiercely relate" what they experienced to course content and to how the event created deeper understanding of key course concepts. This kind of reflection, developed by Edward Zlotkowski, is a key to the service-learning framework as it allows for students to look back and review their civic engagement in an objective and subjective manner [20].

2.2. Survey of Interest and Utility of Weekly Course Topics

Building upon the hypothesized "aware, informed and action-oriented" conception spectrum, we postulated that student interest and perceptions of utility toward course instruction would increase as course content progressed from an awareness focus to an action focus. To test this notion, we reviewed the course content and associated the weekly timeline with a position on the "aware, informed and action-oriented" conception spectrum (Table 1). Then, after week 13 of the semester, students completed an anonymous, electronic survey (Qualtrics) to capture their perceptions of interest and usefulness of course topics. Students were asked to think about the weekly topics as listed in the syllabus and reflect upon how interesting and useful those topics were to them. Students rated their interest and utility in each weekly topic on a scale ranging from *Not at all interesting to me* (1) to *Very interesting to me* (5). If students had no opinion they could select *No opinion.* Using this approach, one would predict that student interest and perceptions of utility would be greatest for the Eco-economics, Informed Consumerism, and Livable Environments units, and for the National Geographic modules titled *Population 7 Billion* and *The Price of Gold* (Table 1).

The weekly course topics were explored via *The Handbook of Sustainability Literacy: Skills for a Changing World* [21], *The Skeptic's Guide to Sustainability* [22], TED videos [23], and National Geographic magazine articles. The *Skeptic's Guide to Sustainability* was created specifically for the course and contains introductory material describing the "skeptical humanitarian", "skeptical capitalist" and the "skeptical environmentalist" as one means of beginning a non-confrontational dialogue about sustainability. The *Skeptic's Guide to Sustainability* also contains chapters describing democratic dialoguing, systems thinking [8] and applied math & finding information. A series of "sustainability dilemmas" were explored via the well written and image-rich National Geographic magazine articles titled *Population 7 Billion* [24] and *The Real Price of Gold* [25] and the accompanying group dialoguing curriculum developed by colleagues at Teachers College at Columbia University.

Table 1. Weekly topics and associated conceptions for the Introduction to Sustainability course.

Week	Topic	Conception Spectrum
1	Introduction and Terminology	Aware
2	Democratic Dialogues	Aware, Informed
3	Systems Thinking	Aware, Informed
4	Applied Math and Finding Information	Aware, Informed
5	Economy	Informed
6	Society	Informed
7	Environment	Informed
8	Mid-term Examination	Not Applicable
9	Eco-economics	Informed and Action-oriented
10	Informed Consumerism	Informed and Action-oriented
11	Livable Environments	Informed and Action-oriented
12	National Geographic: Pop. 7 Billion	Aware, Informed and Action-oriented
13	National Geographic: Price of Gold	Aware, Informed and Action-oriented

2.3. Retrospective Pretest of Change in Attitudes, Skills and Behaviors

Moving beyond student conceptions, student interest in course topics and student perceptions of course utility, students in this study responded to a set of statements deemed important by students that completed the Introduction to Sustainability course in the fall of 2010. The statement set was designed to contain mostly "I" statements as a reflection of the course focus on the student as a future "sustainable citizen". The statement set contains themes regarding workplaces, influencing others, poverty, and personal impacts on the environment (Table 2).

We utilized a retrospective pretest design [26–29] to measure changes in attitudes, skills and behaviors in students. Traditional pretest-posttest designs are common because the group being studied can provide baseline data (pretest) and post-intervention data (posttest) as points of comparison. But, the pretest-posttest method has limitations, especially when participant self-report measures are utilized [29]. Pretest overestimation is common if participants lack an understanding of the attitude, skill, or behavior the intervention is attempting to affect. This phenomenon leads to a response shift bias in participant responses, which can be avoided using the retrospective pretest approach [30,31].

After week 13 of the semester, students were asked (via a Qualtrics survey) to rate their perceptions of their attitudes, skills and behaviors, both before and after the course on a scale ranging from *strongly disagree* (1) to *strongly agree* (6). Students were asked to read a statement and circle the letter on the scale that best described the strength of their agreement or disagreement "NOW". The students were then instructed to reread the statement and think about how they were feeling approximately one year ago, before taking the Introduction to Sustainability course. The students then circled the letter that best described how strongly they would have agreed or disagreed with the statement back "THEN". The students continued in this way indicating their strength of agreement or disagreement both NOW and THEN for 19 statements in the survey. Students were informed that all answers would be considered correct and that they should provide their best estimate if not exactly sure how they felt THEN. Means for all statements, both THEN and NOW, were calculated and compared from data collected in the fall 2011, spring 2012 and fall 2012 semesters.

Table 2. Statements used to measure shifts in attitudes, skills and behaviors in students.

	Statement of Attitude, Skill or Behavior
1	I am confident that I have the knowledge and skills to facilitate a sustainable workplace
2	In my career, I will know how to make decisions that facilitate sustainability
3	I can influence people around me toward a sustainability mindset
4	I have the required literacy skills to articulate my views about sustainability
5	I am able to identify sustainability opportunities and threats in my community and the planet
6	I recognize that human population, carrying capacity and common resources are key elements to understanding sustainability
7	Companies that are sustainable are more likely to be profitable over the long term
8	I know how to find reliable information to analyze key concepts of sustainability
9	I encourage the people around me to use energy wisely
10	It is possible to pursue entrepreneurial opportunities while adhering to sustainability principles
11	I can take part in democratic dialoguing with people whose views and values are different than mine
12	Economic development, social development, and environmental protection are all necessary for sustainable development
13	Collaborative decision making is important in promoting sustainability
14	Poverty alleviation is important for sustainability
15	I plan to choose a work place that values sustainability.
16	I have the necessary applied math skills to aid my understanding of sustainability.
17	My own actions have an impact on the environment
18	In the U.S., people living in poverty are more affected by environmental problems than people living in more affluent conditions
19	The balance of nature is very delicate and easily disrupted

2.4. Participant Demographics

Survey data and written service-learning reflections were analyzed from the fall 2011 (n = 67), spring 2012 (n = 36) and fall 2012 (n = 37) course offerings. The course is open to students of all majors and year in school and is required for the university's Sustainability Certificate [32]. The most common student majors during the study were environmental science, geography, art, international studies, interdepartmental studies, and civil and environmental engineering. Students with one, two, three or four-or-more years of study were almost evenly represented with a slight skew towards three and four-plus years. Participants were 41% male and 59% female with only 15% living in the university residence halls. High school grade point average was 3.5 or above on a 4.0 scale for 54% of participants and 3.0 or above for 85% of participants. Institutional review board (IRB) approval was granted and ongoing certification continues under IRB#201203707 and IRB#201202777.

3. Results from Phenomenography of Written Service-Learning Reflections

In the fall of 2011 alone, the Introduction to Sustainability students attended public meetings organized by student, city and county governments; student and community service groups; advocacy groups; local businesses and individual residents. Students participated in more than 60 unique meetings, events, activities and lectures totaling an estimated 400 h of community-provided contact time toward their service-learning. Similar levels of community engagement occurred for the spring and fall 2012 semesters and written reflections for all three semesters provided ample examples to support the "aware, informed & action-oriented" conception spectrum.

Fitting our broadest conception, students described many simple awareness or "a-ha" moments in their written reflections that followed the service-learning experiences. Some of the awareness moments caused students to pause and question previously held beliefs or notions. Other awareness moments triggered a desire to act differently or to realize an enhanced responsibility in a representative democracy. Examples of student quotes for this conception include:

> Student 1: "This movie is causing me to rethink everything I had previously understood about war and realize that I cannot take everything the news or government is telling me at face value."
> Student 2: "I am pretty upset with myself, upon reflection of this experience that I still did not go into this meeting with an open mind."
> Student 3: "Now that I am aware, I need to make the effort and care to make the effort to change it. When people work together they can make things happen. With the proper values, structure, and agency, a lot can be accomplished." (overlap with "action-oriented")
> Student 4: "I became aware of how important it was that I had volunteered. This awareness and new found knowledge made me feel empowered and great about myself." (overlap with "action-oriented)
> Student 5: "These meetings and public hearings are one of the cornerstones of democratic society were all individuals can be heard."

Students also shared many experiences that fit well within the informed region of the conception spectrum. Students expressed awareness about a particular topic, but then made statements like "the presentation made me realize" and "she persuaded me" when describing a newfound, deeper understanding of a previously held belief or notion. Also, students began to express empathy for other groups like "the poor" and how they might be impacted differentially by sustainability actions. Examples of student quotes for this conception include:

> Student 1: "I always thought that small factors usually don't have large impacts; however, attending this presentation made me realize that these small habits are usually where bigger problems are generated from."
> Student 2: "Finally, she persuaded me that small changes could make a difference. For example, caulking air leaks and opening windows rather than turning on the air conditioner."
> Student 3: "…competitive economy is inherently unsustainable because growth has a limit and competition divides classes and fails to provide for everyone."
> Student 4: "…about the growing disparity between rich and poor, I thought an underlying factor could be resolved if the poor worked a little bit harder. However, that did not appear to be the case in the

real world…Many of (the occupiers) have worked hard all their lives yet are still entrapped within a circle which has not allowed them to better themselves."

Student 5: "(the event) helped me understand the "manners" of how to address issues within sustainability."

Student 6: "The realization that our population is still expanding (and will continue to do so) emphasizes that our sustainability-focused responses need to be faster and far-reaching to negate our increasing resource loss and heavy environmental destruction."

Student 7: "In fact, with a population of 1.2 billion, India holds 18% of the world's population in just 2.4% of the world's land. That is an insane amount of people all using and over-using the Earth's natural resources."

The most narrow, "action-oriented" conception is also the most sophisticated and was often described by students in the context of the "awareness" and "informed" conceptions. Some students realized they had yet to hone the skills to influence others, but their action step was to improve those skills. Other students expressed an increased willingness to "spread the good word" as a result of the service-learning experience. Examples of student quotes for this conception include:

Student 1: "School gardens are a great opportunity to teach kids about sustainable literacy…opportunity to work among a community of people, communicating with both people their age and not."

Student 2: "I realize this is the time to not just decide, but to change into who I want to be and how I want to live in the future, for the betterment of the future."

Student 3: "I realize I don't yet have the skills to influence other people's actions and views, but I have taken it upon myself to become a sustainable citizen."

Student 4: "This is something I would like to do as a career, plan events that promote the use of local, sustainable and humane food."

Student 5: "I am more willing to spread this good word to people and encourage people to shop there because I know I will see the local improvements from myself being a part of this organization."

Student 6: "As consumers, it's our responsibility to demand sustainable products and sustainable actions from big companies, and the speakers at the meeting echoed that aspect."

Student 7: "I feel empowered to share what I have learned from the discussion and share it with others through involvement in the community."

The results from the "career", "persuasion" and "intrinsic" phenomenographic analysis were far less compelling than for the "aware, informed & action-oriented" conception spectrum. Therefore, no further analysis of the "career", "persuasion" and "intrinsic" conceptions was undertaken.

4. Results from the Survey of Interest and Utility of Weekly Course Topics

The results from the survey of interest and utility of weekly course topics (Table 1) for the fall 2011 (n = 67) and fall 2012 (n = 37) semesters (spring 2012 data was mistakenly not collected) revealed a relative disdain among students toward the topic of "applied math and finding information" (Figure 3). The student perceptions of interest and utility for the topics of "introduction", "democratic dialoguing" and "systems thinking" clustered near a value of 3.5 on a Likert scale spanning 1 to 5, with a score of 5 representing *Very interesting to me*. The remaining course topics clustered near 4.5 for interest and

utility. Student perceptions of interest and utility of course topics generally increased as the semester progressed and as the conception spectrum embodied by the topics (Table 1) moved from "awareness" to "informed" and to "action-oriented". Our hypothesis that student conceptions would increasingly move beyond being "aware" toward "informed" and/or "action-oriented" appears to be supported by this result.

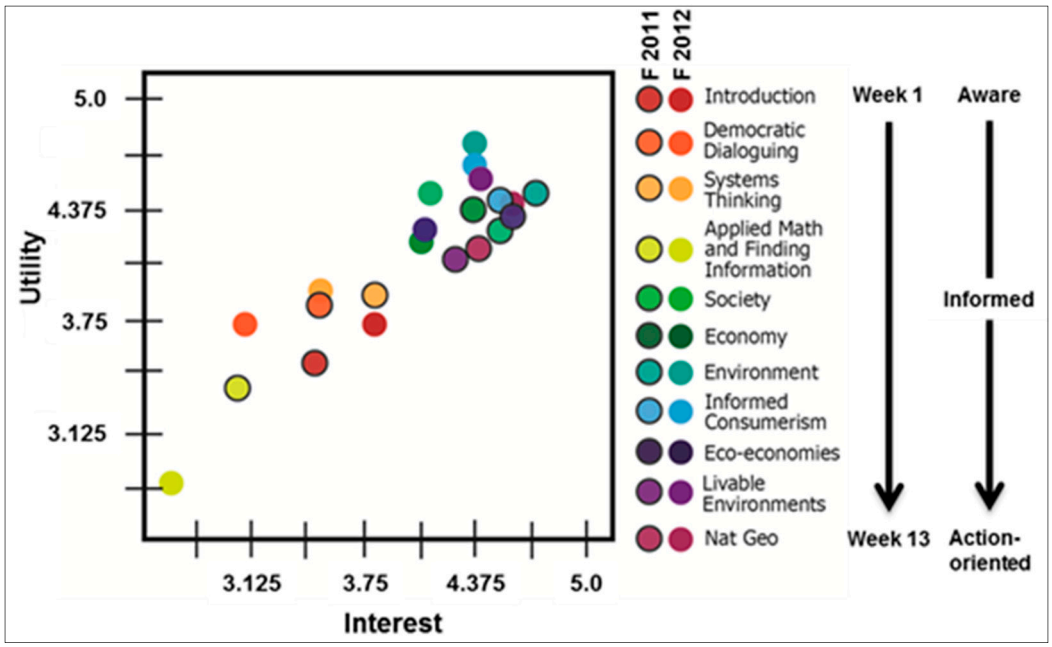

Figure 3. Results from the survey of interest and utility of course topics listed by weekly occurrence and by position on the "aware, informed & action-oriented" conception spectrum.

5. Results from the Retrospective Pretest of Change in Attitudes, Skills and Behaviors

The greatest difference in relative mean values between THEN and NOW was measured for student responses to the statements "I am confident that I have the knowledge and skills to facilitate a sustainability workplace" and "In my career, I will know how to make decisions that facilitate sustainability" (Figure 4). This is likely attributable to the fact that most participants were arts, sciences and engineering majors, as opposed to business majors, and hadn't thought about sustainability in the context of a career prior to completing the course (THEN). This newfound awareness of the career orientation of sustainability was most easily influenced by course learning outcomes. The statement "I can influence people around me toward a sustainability mindset" revealed the next greatest level of change that we feel can be attributed to the course emphasis on democratic dialoguing and service-learning via public events.

The least difference in relative mean values between THEN and NOW was measured for the statements "My own actions have an impact on the environment", "In the U.S., people living in poverty are more affected by environmental problems than people living in more affluent conditions" and "The balance of nature is very delicate and easily disrupted". It should be noted that the THEN values for these statements are relatively high which possibly indicates that students already had strong attitudes regarding these concepts prior to enrolling in the course. Of particular interest is the relatively low THEN and NOW values for the statement "I have the necessary applied math skills to aid understanding of

sustainability". This indicates that students didn't associate sustainability with applied math prior to taking the course and that the course didn't do a particularly good job of changing that perception.

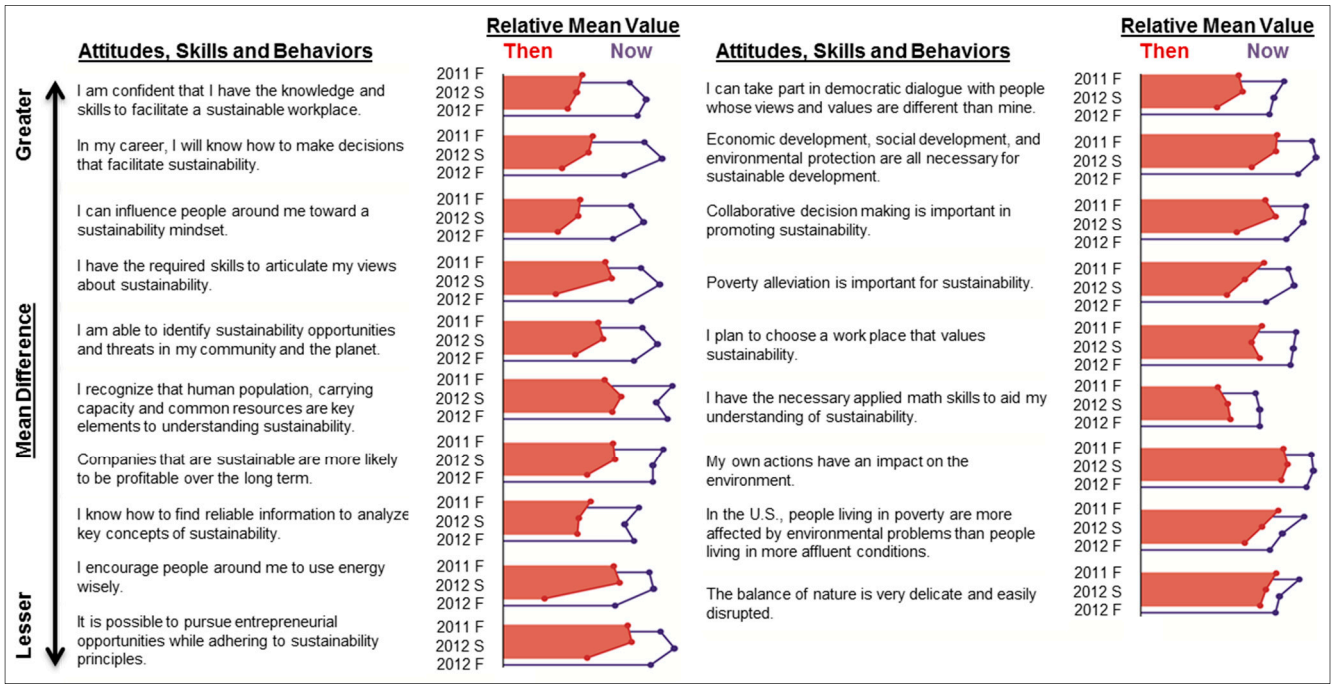

Figure 4. The retrospective pretest results for attitude, skill and behavioral changes perceived by students the completed the Introduction to Sustainability course. Relative mean values for THEN responses are shown in red and values for NOW responses are shown in purple for the fall 2011, spring 2012 and fall 2012 semesters. Items with the greatest change in mean value are shown in the upper left and those with the least change are shown in the lower right.

A general trend amongst the THEN and NOW mean values by semester was that scores were lower overall for the fall of 2012 than for the fall or 2011 and spring of 2012. At first glance, one might conclude this to be an indication of a decline in course learning outcomes over time. But, a detailed analysis of the course demographics revealed that a disproportionate number of first and second-year students completed the course in the fall of 2012. These less experienced students perceived themselves as being less aware, informed and action-oriented than the more senior student from the previous semesters. And, most notably, the difference in mean values between THEN and NOW perceptions changed the most for students from the fall 2012 course offering as compared to fall 2011 and spring 2012.

6. Discussion and Conclusions

The results from the phenomenographic analysis, the survey of utility and interest in course topics, and the retrospective pretest indicate that student conceptions of sustainability can be characterized by the "aware, informed and action-oriented" spectrum developed by this study. In written reflections following service-learning experiences, students provided ample examples of "awareness moments" where they expressed a first encounter with a wicked problem. In these same reflections, students provided examples of being able to move beyond awareness toward an action-orientation. Many students

that were called to action through a service-learning experience expressed hesitation regarding their level of knowledge regarding certain issues. But, many students with this hesitation decided their next action step would be to become more informed. Therefore, even when confronted by a sustainability issue or dilemma that students felt were beyond their knowledge level, they many times expressed an action pathway to become more informed.

The most apparent area where the design of the course might be improved is applied math instruction. The survey of interest and utility and the retrospective pretest results indicated that students came to the course with little interest in applied math for sustainability and left with only marginally higher perceptions. The students also expressed lower utility and interest in democratic dialoguing despite this topic being the most widely cited area of course content experienced through service-learning. The analysis suggests that students were largely fascinated by the democratic dialogues they experienced in public fora, but less so by the classroom training on dialoguing. This result is not surprising given the students' propensity to express higher interest in topics that were more action-oriented on the "aware, informed & action-oriented" sustainability conception spectrum.

We were pleased to see a strong increase in student perceptions of sustainable career options and sustainability self-efficacy in their future workplace. Reid *et al.* [3] found that students viewed sustainability largely in the context of their area of study and relatively few students in our study were business majors. Therefore, we attribute this strong increase to the fact that student-expressed preconceptions regarding sustainability and careers were low prior to experiencing the course. Other topic areas that are likely more widely associated with sustainability, such as the "balance of nature" and the "environment", were already embodied by the students prior to experiencing the course and, therefore, showed only marginal gains through course activities. Bowser *et al.* [33] reported large shifts for statements such as "I can clearly define sustainability as it applies to the natural sciences" (p. 696) for students that were less predisposed to sustainability concepts than our cohort.

The aim of the Introduction to Sustainability course was to tackle the challenges associated with sustainability-education by teaching undergraduates, through service-learning, to engage wicked sustainability problems. Our findings are supported by those which suggest that student attitude, skills, and behaviors improve the most from courses that: (a) emphasize how humans impact the environment and; (b) include a variety of learning activities in and out of class that facilitate student participation [34]. Several students commented on how the course challenged their previous ways of thinking while others reported that certain service-learning experiences made them more aware of their own preconceived notions. Students reported developing a greater self-efficacy about creating a sustainable future due to the course. This is a desirable outcome as entire institutions, such a Schumacher College [35], are fully devoted to sustainable futures training for students. By engaging in their community, students had the opportunity to apply their newly acquired sustainably knowledge to benefit their surroundings. By challenging student thought processes and exposing the immediate need for global change, the Introduction to Sustainability course empowered students to become aware, informed, and action-oriented sustainable citizens.

Through this experience, we have learned that students crave opportunities to be active in the community while they are expanding their sustainability knowledge. Students want to make connections between knowledge and action while they are still in school—Not after they graduate into the "real world". Courses that embrace this approach may be viewed by faculty, especially those in the sciences,

as "soft" or "easy" when quite the opposite is true. We encourage faculty from all disciplines to pursue courses that make these "real world" connections while utilizing techniques such as student reflections to prove that deeper learning regarding sustainability is indeed occurring.

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Author Contributions

Craig Just, Heili Lowman and Audrey Schroer conceived and designed the data analysis framework; Craig Just taught the Introduction to Sustainability course and collected the student data; Craig Just, Heili Lowman and Audrey Schroer analyzed the data; and Craig Just and Audrey Schroer administered the final human subjects research approval process.

Conflicts of Interest

The authors declare no conflicts of interest.

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