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Assessing Sustainability Literacy

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Measuring Sustainability Literacy: The Use of the Sustainability Literacy Test to Assess Student Learning in Environmental Economics and Freshman Seminar Courses

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ABSTRACT

An international tool called the Sustainability Literacy Test was developed in 2014 with the goal of providing an instrument for academics to assess student knowledge and skills on current social, economic and environmental challenges. This assessment was administered to a sustainability-themed Freshman Seminar and two Environmental Economics courses at the University at Albany between January 2015 and May 2016. The intention was to determine if sustainability literacy improved as a result of the course and if there were differences in growth between the economic and freshman seminar courses. It was assumed that the Sustainability Literacy Test served as a valid measurement of sustainability literacy and provided a means to compare results across campuses. The first administration of the test to an Environmental Economics class yielded statistically significant increases in scores. Subsequent administrations to a Freshman Seminar course and second Environmental Economics class did not garner similar results.

OBJECTIVES

The purpose of using the Sustainability Literacy test in these courses was to answer the following questions:

1. Did students' overall sustainability literacy improve as a result of the course and was that improvement statistically significant?
2. If there was an improvement, what areas did they improve the most?
3. Are there areas where scores did not improve?
4. Is there a difference between the gains (if any) made by the Environmental Economics students vs. the Freshman Seminar class?
5. How did the University at Albany students compare to other students taking the exam?

ASSUMPTIONS

1. The Sustainability Literacy Test is a valid measurement of sustainability literacy.
2. The Sustainability Literacy Test allows for comparison of campus results to other campuses using this assessment tool.
3. The Environmental Economics class will see higher gains, especially in the economic trend domain, than the Freshman Seminar course.
4. The Environmental Economics students will have higher baseline knowledge about sustainability than the Freshman Seminar students, evidenced by higher pre-test scores.

INTRODUCTION

The Sustainability Literacy Test is a tool developed by a multi-organizational and international coalition including higher education institutions, NGO's and businesses. It is intended to gauge student understanding of key sustainable development concepts and allow for universal applicability across institutions and nations. The test has had two versions. The students in this study were all administered version 1.0 of the test. It is comprised of 50 randomly selected multiple choice questions; 30 of the questions focus on the international level authored by an international experts committee and the remaining 20 touch on local/regional actions that are developed by regional experts. The 10 topic domains include: Inter/Supra National Issues, Local Issues, Founding Principles, Environmental Trends/Sustainable Development, Social Trends, Economic Trends, Organizational Government, Human Rights, Environment Social Responsibility, and Fair Costs & Labor. The first version of the test was launched in October of 2014 and was implemented in over 200 universities in 34 countries. One advantage gained by using the Sustainability Literacy Test is that as a standardized tool, we can compare our campus results to other campuses. This will allow us to benchmark our students in comparison to other universities.

Further information about the Sustainability Literacy Test can be found at: www.sulitest.org

METHODS

In this study, the test was administered to three separate classes; two Environmental Economics classes offered during the spring semester of 2015 and 2016 and one Freshman Seminar course in the fall of 2015. Environmental Economics is a 300 level upper-classmen course that examines how the natural environment is affected by the economic activities of society, the physical and biological limitations imposed on the economy by the natural environment, the incorporation of the value of environmental and social benefits into analyses and solutions designed to support environmental and social sustainability. The Freshman Seminar course, entitled "Visual Images of Sustainability" covers the variety of ways that sustainability is portrayed in the visual arts, exploring the meaning of sustainability, examining examples of sustainability in the visual arts and reflecting on the link between lifestyle choices and the associated impact on the Earth.

This implementation followed a diagnostic approach. Students took the exam in the early stages of the course and again in the last stages of the course. Specifically, they were given a two week period in which to take the on-line exam in the beginning of the course. This process repeated itself in the last two weeks of the course.

The Sustainability Literacy Test compiled the scores for each student and calculated an average score in each domain and this information was downloaded to excel. Student data that did not have a pre and post test completion were eliminated from the data pool. The averages for each domain as well as an overall average score was calculated for each course. These scores were analyzed using a comparison of the means T-Test (one tail) to determine if any of the results were statistically significant.

The first administration of the test version 1.0 was given in the spring of 2015 to an Environmental Economics class. A total of 41 usable data points were collected (91% of the class). A second administration for Environmental Economics students occurred in the spring of 2016 when 45 usable data points were recorded (94% of the class). To gauge the effects in a non-economics class, another administration occurred in a sustainability themed Freshman Seminar in the fall of 2015. This class yielded 13 usable data points (59% of the class).

Figure 1

Spring15 Env Econ n=41	PRE	POST	Change
Total*	51	58	7
Inter/Supra*	48	53	5
Local*	55	65	10
Founding Principles*	64	86	22
Environmental Trends*	43	57	14
Social Trends	45	46	1
Economic Trends*	53	64	11
Organizational Government	64	64	0
Human Rights	56	56	0
Environment Social Responsibility*	54	74	20
Fair Costs & Labor	55	60	5

Figure 2

Spring16 Env Econ n=45	PRE	POST	Change
Total	47	51	4
Inter/Supra*	46	53	7
Local	50	51	1
Founding Principles	56	62	6
Environmental Trends	41	45	4
Social Trends	38	44	6
Economic Trends	50	55	5
Organizational Government	60	58	-2
Human Rights	49	54	5
Environment Social Responsibility	45	44	-1
Fair Costs & Labor	55	56	1

* Indicates statistical significance, $p < .05$

RESULTS

For the 2015 Environmental Economics (2015 EE) class, the post-test scores were higher than the pre-test score in 8 of the 10 domains with significant increases in 6 of these domains as well as in the overall total score. See Figure 1.

In the 2016 Environmental Economics (2016 EE) course, post-test scores improved in 8 of the 10 domains as well but significance was only achieved in one domain, the Inter/Supra National relations area. See Figure 2.

The Freshman Seminar (2015 FS) saw improvement in post-test scores in 8 of the 10 domains with statistical significance in the Environmental Trends/Sustainable Development topic area. See Figure 3.

When comparing the results between the Environmental Economics courses and the Freshman Seminar class, the Economic courses had higher pre-test and post-test averages in the every category.

The increases between pre and post-test scores across the courses was mixed. The 2015 EE course saw a greater increase in 7 of the domains than the 2015 FS with the exceptions being Environmental Trends, Social Justice and Human Rights. Overall, the 2015 EE course saw larger and more significant gains than 2015 FS, improving by 7 points, which was statistically significant. The 2016 EE course, did not improve as much as the 2015 FS. Overall the 2016 EE course improved by 4 points while the 2015 FS improved by 5. The 2016 EE course saw larger gains than the freshmen in 4 of the domains; Inter/Supra, Social Trends, Economic Trends and Human Rights.

The courses showed the largest improvements in the following domains by rank: (* indicates statistically significant)

2015 EE: Founding Principles*, Environmental Social Responsibility*, Environmental Trends*

2016 EE: Inter/Supra*, Founding Principles, Social Trends

2015 FS: Environmental Trends*, Founding Principles, Local Issues

This indicates that the courses all had a positive impact on the foundations of sustainability to a larger degree than the other domains and two of the courses showed greater improvement in environmental trends.

The following domains saw a decrease or no gain (by rank):

2015 EE: Organizational Government, Human Rights

2016 EE: Organizational Government, Environmental Social Responsibility

2015 FS: Economic Trends, Environmental Social Responsibility, Organizational Government

This illustrates a lack of knowledge and instruction in the organizational government and the social responsibility domains.

In order to compare to other institutions, the Sustainability Literacy Test provided the international average of 54% correct for the total score. Only the 2015 EE post test score of 58 topped this average with the 2016 EE post test score achieving 51% and 2015 FS reaching 43% respectively.

Figure 3

Fall15 Freshman Seminar n=13	PRE	POST	Change
Total	38	43	5
Inter/Supra	41	44	3
Local	33	41	8
Founding Principles	42	49	7
Environmental Trends*	24	39	15
Social Trends	43	46	3
Economic Trends	46	38	-8
Organizational Government	41	41	0
Human Rights	47	50	3
Environment Social Responsibility	38	37	-1
Fair Costs & Labor	49	51	2

DISCUSSION

The data was inconclusive as to whether the Environmental Economics course fostered an increase in sustainability literacy. The 2015 class results show strong improvement but the results were not replicated in 2016. The two courses shared the same syllabus, textbook and professor however, there was one change in the content of the two courses which may have been a factor. The 2016 class took part in the Power Dialog, a national event that brought together college students and state administrators charged with implementing the Clean Power Plan. As a result, significant class time was spent on this topic. The 2015 class featured a series of guest speakers on a variety of topics including coal extraction, NAFTA, green building and sustainably sourced products. This change in content may have influenced the results. Also, the nature of the study habits of the students in the class and their receptivity to course content plays a role in determining outcomes. Given the relatively small sample of classes, more data is needed to account for these trends over time.

The freshman seminar course did not show a large improvement in most domains, although this was expected given the very focused nature of the course content. The significant change in the environmental trends domain does indicate that the course may have made an impact on their knowledge in this area. Since there is only one administration of the Freshman Seminar class for test version 1.0 and that pool yielded a small number of usable data points (13), it would be difficult to characterize the results as robust indicators, regardless of their statistical significance.

The hypothesis that students in the Environmental Economics courses would have a higher base knowledge of sustainability was evidenced in our data set. Possible explanations for this could be that upper-classmen have developed better study methods as well as having been exposed to a broader range of academic courses and experiences. However, the data did not support the hypothesis that Economic students showed higher gains overall, however they did improve at a greater rate than the Freshman students in the Economic Trend domain. The results further indicated that the courses affected the student's knowledge of the foundations of sustainability but did not advance student's understanding of organizational government and social responsibility issues related to sustainability and that two of the three classes tests scored below the international average for literacy.

Finally, there are many other factors over the course of the semester that could alter a student's knowledge. This study is not meant to imply that the course was the sole factor attributable to any gains but rather an element that contributed to an increase in sustainability literacy.

FUTURE RESEARCH

A new version of the Sustainability Literacy Test (version 2.0) was released in mid fall 2016. Implementation using this version has already begun with a spring 2017 Environmental Economics course. A new longitudinal data collection can begin with the Freshman Seminar course this fall to garner a larger pool of data.

Version 2.0 of the Sustainability Literacy tool provides data on the average scores on both the national and international level and for all of the domains instead of just the overall total. This will allow for deeper analysis of local results to national and international outcomes.

The sections of the quiz have also been altered to the following domains: Core Knowledge, Sustainable Humanity and Ecosystems, Global and Local Human Constructed Systems, Transition towards Sustainability, Individual and Systemic Change. Currently the test has been given in 605 universities and companies across 57 countries.

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Dr. Mary Ellen Mallia oversaw the administration of the literacy tests, data analysis and research findings. Cassidy Drasser and Elizabet Genis are University at Albany students who assisted in the preparation and analysis of the data.

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