SUSTAINABILITY EDUCATION IN HIGHER EDUCATION
Educating Future Aviators for a Changing World

Tyler B. Spence¹ & Scott R. Winter²
San Jose State University¹ & Embry-Riddle Aeronautical University²
San Jose, CA, USA¹ & Daytona Beach, FL, USA²

Abstract

- Problem Statement: Education opportunities at colleges and universities are at the front of giving the next generation leaders and decision makers knowledge and skills to be forward thinking in this rapidly changing twenty-first century.
- Purpose: The purpose of this study was to examine the current curriculum offerings of aviation universities who are members of the University Aviation Association to determine which percentage of courses offer specific sustainability courses as part of their aviation curriculum degree offerings. The researchers evaluated the extent to which aviation schools identified through membership in the University Aviation Association, have a venue to teach their students about various aspects of sustainability.
- Results: The findings revealed there is a large variety of sustainability courses offered among the college aviation programs around the country. There appeared to be more of a focus among the graduate programs, particularly with universities that have programs dedicated to sustainability among the handful of post-baccalaureate degree programs.

Introduction

- Sustainability has become a focal point within the last decade. Specifically, in aviation, tertiary journals such as the International Journal of Sustainable Aviation, Sustain on these topics, along with studies dealing with carbon emissions agreements, homeland, & Hansen, 2010), aviation and tourism (Dale, Dimond, & Thomas, 2007), aviation, environment, (Levison, 2010), and airport construction (Walters, Winter, Harrell, & Steiger, 2015).
- A gap has developed between the importance of this topic, the research being conducted, and the current availability of aviation programs through their associated university degree programs.

Methodology

- The researchers collected the 159 member schools of the University Aviation Association. University of Miami is the only USA member school to bill have an aviation program, so 118 schools were evaluated.
- Searched the course catalogs of each aviation school for the contents of the aviation program.
- Looked at course titles and course descriptions for "sustainability" or a description that defined sustainability.
- Identified key courses in sustainability and the extent to which all four pillars are addressed.
- Developed the type of degree offering and coded yes or no for sustainability offering.

Results

- Sustainability among Aviation Programs and Programs

<table>
<thead>
<tr>
<th>Sustainability Course Examples</th>
<th>Sustainability</th>
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| - Airports | - Environment Management |
| - Carbon Footprint | - Water Conservation |
| - Renewable Energy | - Waste Management |

| Sustainability Pillars in Aviation |

- Environment
- Operations
- Community/Social
- Economy

| Adapted from the Federal Aviation Administration description of Sustainable Aviation Pathways: Mission to Chart a course for sustainable aviation pathways.

Conclusions

- Course on sustainability in aviation programs do exist.
- Many programs train the necessary requirements for current pilots, mechanics, dispatchers, air traffic controllers, and other technical career positions, but do not directly address critical thinking skills for the future.
- Sustainability topics may be taught in specific courses not directly focused on sustainability depending on instructor preference.
- Students in undergraduate or graduate courses may be exploring special topics in areas of sustainability, but these guided projects such as a Senior Capstone Project may only be pursued by individuals already aware and interested in learning more.
- Aviations do not help the current generation of students understand the importance of sustainability in the ecosystem of world aviation, and to not project that ecosystem for the future generations, the current efforts likely will not be able to rely on aviation as a means of reliable transportation. Remote locations will not be able to get necessary survival supplies, and argue health and environmental effects will fail to be appropriately mitigated.

References


On Sustainability

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Toward Adequate Treatment and Disposal of Industrial Waste -
A Case Study on Zinc Waste Recycling

Carlos Alberto Chaves, Universidade Federal Fluminense - UFF, Niterói, RJ, Brasil
Webster da Silva e Silva, Universidade Federal Fluminense - UFF, Niterói, RJ, Brasil
Tasso Tabayara Filho, Research Manager, Nova Resources, J. Pena, MG, Brazil
Marco Antonio Alves Tavares, Operations Manager, Nova Resources, J. Pena, MG, Brazil

Abstract

The ready production of metals from recycling of scrap and waste from industrial processing has always been a complex process in the metallurgical industry and is a highly relevant activity, vital for the economic and environmental sustainability of the business. This work deals with the technical, economic and environmental aspects of the recycling of zinc containing wastes through a case study of recycling of industrial waste generated in the smelting process in Niterói Arc Furnace, known as Arc Furnace Dust (EAFD). The metal industry is still in search of technologies to reduce the generation and recycling of industrial wastes. The objective of this study is the use of the Analytical Hierarchic Process (AHP) method for the evaluation and selection of the best alternative, among a diverse available, for the treatment and recycling of EAFD. As a result, it was demonstrated the efficiency of the methodology used in the zinc based waste recycling project implemented by Nova Resources, in the city of Júlio de Fora, State of Minas Gerais, Brazil.

Background

One big and worrying issue is what to do with the increasing amount of solid waste generated by the metallurgical industry. Although many actions have already been implemented by the industry in minimizing the generation and recycling of waste, most are still waiting for solutions capturing the used for large areas in order to avoid becoming an environmental problem. The industrial residues are, in most cases, as obstacle, hindering the productive activity. For example in the metallurgical sector it is estimated that there has an expenditure in the US $50.00 to 200.00/tonne with handling, treatment and adequate disposal of solid wastes (CREUTZBERG, R. et al, 2014 and ABBRELL, 2015). In the current competitive environment, in order to obtain a higher profit, lower costs, companies have sought to minimize production by extracting more and more products with finer and less materials. inputs and energy. To achieve this goal in production processes, we seek to maximize production and minimize losses (materials and energy).

Results

The reduction of zinc use reserves caused a dramatic increase in the price of zinc concentrate (ZCS), jeopardizing the sustainability of the zinc business.VM-Nova Resources sought alternative supply of raw materials for the production of zinc, essential for the national industry, especially for civil construction and automotive industry. A raw material that proved to be technically and economically feasible for use in the zinc production process of the VM Plant was the Electric Arc Furnace Dust (EAFD) and process, on average, 0.5% zinc.

Several technological solutions exist for processing the hazardous waste EAFD. After detailed technical, economic and environmental feasibility study the VM-Nova Resources chose the Waste Technology of zinc metal recovery.

Methodology

- Research on Industrial Waste recycling and best practices on Sustainability
- Technical visits to Industrial Plants (AYPAEF/INTIMA) and Interview with Project Teams.
- Bibliography Research.
- Application of Analytic Hierarchic Process (AHP).

Conclusions

The technological alternative chosen by VM-Nova Resources resulted in the implementation of the Polymetallic Plant in Júlio de Fora, MG, an investment of US$ 190 Million with a capacity to treat 200,000 t / year of zinc residuals. This research work used the design of the industrial plant of the VM-Nova Resources as a Case Study to analyze the reasons and criteria that the company arrived at this decision. The study allowed the development of a methodology for the evaluation of investments in industrial waste, using the Analytic Hierarchic Process (AHP) methodology together with a Technical and Economic Feasibility Study (TEF) based on Appraisal Game (TAG).

Acknowledgments

To Vitorino Nova – Nova Resources for the kind permission to use the Júlio de Fora Plant Project as a Case Study and for the use of project data.

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Figure 1. Analytic Hierarchic Process applied to Nova’s Resource Case Study.
Engaging in Pro-Environmental Actions May Predict Subjective Well-being

Shawna Jordan\(1\) MOT, OTR, Carole Dennis\(1\), Sc.D., OT/L, FAOTA, Srijana Bajracharya\(2\), Ph.D., MCHES

\(1\)Bright Start Pediatric Services; \(2\)School of Health Sciences and Human Performance, Ithaca College

**Background**

Human activities are the main contributor to climate change. As we participate in the activities that comprise our daily lives, we may contribute to depleting natural resources and degrading our natural environment. Engaging in pro-environmental actions, while good for our planet, may also be good for us.

Researchers have proposed that there are possible psychological impacts from engaging in pro-environmental actions, such as increased life satisfaction, happiness, and well-being.

**Terminology**

**Pro-environmental actions:** individual behaviors that limit the negative effects of environmental threats, maintain the ecosystem’s integrity, and promote sustainable living. This behavior considers future implications of everyday actions on the environment, and promotes a balance between meeting the needs of the present generation while still ensuring that the needs of future generations will be met.

Pro-environmental actions include behaviors that reflect:

- Affluence
- Equity
- Preparing of Actions
- Fragility
- Processing of Actions

These variables were measured with four scales adapted from Carroll-Vergacio et al. (2013).

Subjective well-being (SWB) consists of three domains: life satisfaction, happiness, and affect.

These variables were measured using:
- Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985)
- Scale of Positive and Negative Experience
- Subjective Happiness Scale (Lyubomirsky & Lepper, 1999)

**Research Questions:** Is there a significant positive association between sustainable behaviors and subjective well-being?

This research project addresses whether pro-environmental actions are associated with subjective well-being in a sample of employees at a northeastern institution of higher education.

**Design:** Cross-sectional anonymous survey

**Participants:** 45 faculty and staff from a college in central New York, 18 years of age or older, email addresses gathered through staff meetings

**Analysis:** A hypothesized model was created to assess the relationship between the four components of sustainable behaviors and the three domains of subjective well-being. Survey data was then applied to the model. Structural Equation Modeling (SEM) was used to determine whether the hypothesized theoretical model created was consistent with the data collected.

**Results:** The data fit the model based on the criteria needed, indicating that the data from the survey supports the hypothesized model. The four components of pro-environmental actions significantly converged on the three domains of subjective well-being, revealing a significant association between pro-environmental actions and subjective well-being. It can be assumed that the more pro-environmental, altruistic, frugal, and equitable a person is, the more feelings of well-being he or she will experience. The model indicated that 65.9% of a person’s subjective well-being is influenced by pro-environmental actions.

**Discussion and Conclusion:** This positive relationship between subjective well-being and pro-environmental actions may point because of the intrinsically satisfying nature of participating in ecologically sustainable behaviors. This study supports the concept that sustainability is not only beneficial for the planet, but can also positively affect humans overall well-being.

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*“... humans influence the health of their natural environment and the health of the natural environment, in turn, impacts on the health and wellbeing of humans.”*

—Andrew Thatcher
Environmental injustice and denial in a small rural community: Unexpected findings of a school-based health needs assessment

Anne Scheer, Ph.D. Southern Illinois University School of Medicine, Department of Population Science and Policy

Introduction

While our research team was originally commissioned to conduct a school health needs assessment in a small rural town in the Midwestern United States, we came across an environmental injustice in the process: the town was the site of a zinc smelter that closed down in the mid-1980s. Since then, the site of the former smelter has been declared an EPA Superfund site. Materials from the smelter (cinder blocks, fill dirt, etc.) were widely distributed to community members for use in residential construction projects after the smelter closed down, disregarding possible contamination of these materials and the corresponding potential health hazards this posed for residents.

While EPA soil sampling did find several residential yards with elevated lead levels that were attributed to materials from the former smelter, community members’ accounts of EPA interactions suggest that health hazards were downplayed.

The case study

- Document Review: What do we know about the town and the school district?
- Focus group with teachers and administrators: What are the perceived health issues?
- Health survey for parents and teachers and students in grades 3-12: What are the health concerns for the school and community?

Survey participation:
- 20 adults (10 parents/caregivers, 40 school staff, 29 teachers, 9 professional/support staff, 1 administrator)
- 225 of 339 students in grades 3-12 (67.5%) Key themes identified in the survey results:
- Mental health, student well-being, and addiction
- Access to safe and clean housing and home environments.
- Additional outlets for physical and social activity.
- More options to foster healthy eating behaviors.
- Youth disconnecting from school and community.

Contamination and EPA involvement

- Zinc smelter in the community closed down in 1980s
- Smelting wastes used as fill material on site, to make secondary roadways, and as material for surfacing residential roadways, driveways, sidewalks, and parking lots
- Reasonable expectation of exposure from site contamination to lack of site containment
- EPA recommended the site for inclusion in the National Priorities List (NPL), declaring the site a “superfund site” in 2011 – a site containing “known releases or threatened releases of hazardous substances, pollutants, or contaminants” (1)

The dilemma

As a team trying to do community-focused work that is driven by needs identified by the communities themselves, we face a dilemma: How do we proceed if and when community members signal that they don’t want to pursue questions of environmental injustice. At the very least, our team feels that the scope of testing and the way and extent health hazards have been communicated to community members leaves much to be desired.

Possible next steps

Possible steps we can undertake to address the environmental injustice while being mindful of the community’s reluctance:
- Identify additional funding strategies to address environmental toxins and exposures
- Help the community apply for funding and develop a plan for sustainable action (based on community interest and buy-in)
- Identify other rural communities who have already successfully addressed (or solved) similar issues – establish connections
- Provide educational activities to community (in close collaboration and only if there is sufficient buy-in) to educate about health risks of relevant toxins and ways to address environmental contamination

Environmental toxins are the lowest priority for community members – survey results (by mean)

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<tr>
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<th>STUDENTS</th>
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<tbody>
<tr>
<td>Drug use</td>
<td>Jobs (6.22)</td>
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<tr>
<td>Jobs</td>
<td>Drug use (6.12)</td>
</tr>
<tr>
<td>Addiction</td>
<td>Having things to do (5.94)</td>
</tr>
<tr>
<td>Having things to do (7.11)</td>
<td>Health (5.48)</td>
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<td>Health (7.06)</td>
<td>Addiction (5.46)</td>
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<tr>
<td>Crime (6.38)</td>
<td>Safe Housing (5.09)</td>
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<tr>
<td>Safe Housing (8.36)</td>
<td>Crime (4.79)</td>
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</tbody>
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Environmental toxins (6.11) Environmental toxins (4.79)

Community voices – denying injustice?

References

(1) https://www.epa.gov/superfund/superfund-national-priorities-list-npl

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