
AC 2011-1859: SERVICE RESEARCH AND SERVICE LEARNING: DEVELOPING COLLABORATIVE RESEARCH AND EDUCATION BETWEEN A UNIVERSITY AND A NONPROFIT.

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Service Research and Service Learning: Developing collaborative research and education between a university and a nonprofit

Abstract

The principles of service-learning are expanded to create a model of service-research that is employed in a collaboration between the University of Pittsburgh and a Pittsburgh nonprofit, GTECH Strategies. Service-learning is a well known strategy that integrates meaningful community service with instruction to enrich the learning experience by providing practical experience, to teach civic responsibility, and to strengthen connections with communities. We define service-research in a similar manner: research that integrates meaningful community service with research activities to enrich the learning experience of the service partner as well as the researchers.

GTECH (Growth Through Energy and Community Health) Strategies is a nonprofit dedicated to fostering community and growing the green economy through creative community revitalization. GTECH Strategies nurtures community growth through green job creation and the elimination of blight, specifically through growing biofuels on abandoned lots within the city of Pittsburgh. Dr. Landis' research team at Pitt is exploring the potential to utilize marginal lands for biofuel production and are evaluating the comparative environmental impacts of biofuels grown on marginal lands with other fuels. Naturally, a mutually beneficial research collaboration was formed.

This paper describes a service-learning and service-research collaboration between the University of Pittsburgh and nonprofit GTECH Strategies. Through our collaboration, we employ service learning at multiple scales (involving communities, high schools, college students, and professors) as well as integrate research into service projects with the aim of increasing community awareness of research and higher education. Based on findings from evaluating our collaboration and student participation, we discuss a model of service-research for graduate programs.

Introduction

The principles of service-learning are expanded to create a model of service-research that is employed in a collaboration between the University of Pittsburgh (UPitt) and a Pittsburgh nonprofit, Growth Through Energy + Community Health (GTECH) Strategies. Service-learning is a well known strategy that integrates meaningful community service with instruction to enrich the learning experience by providing practical experience, to teach civic responsibility, and to strengthen connections with communities [1]. We define service-research in a similar manner: research that integrates meaningful community service with research activities to enrich the learning experience of the service partner as well as the researchers.

GTECH Strategies is a nonprofit dedicated to fostering community and growing the green economy through creative community revitalization. GTECH Strategies nurtures community growth through green job creation and the elimination of blight, specifically through growing biofuels on abandoned lots within the city of Pittsburgh.

The work done by GTECH aligns well with a team at UPitt investigating impacts of biofuels grown on marginal lands. Drs. Landis and Monnell's research team at UPitt is exploring the potential to utilize marginal lands for biofuel production and is evaluating the comparative environmental impacts of biofuels grown on marginal lands with other fuels. A mutually beneficial research collaboration was formed between the research group and GTECH. The collaboration allowed the UPitt team to collect data for research purposes while enabling GTECH to utilize the research as a form of educational outreach.

This paper describes a service-learning and service-research collaboration between the University of Pittsburgh and nonprofit GTECH Strategies. Through our collaboration, we employ service learning at multiple scales (involving communities, high schools, college students, and professors) as well as integrate research into service projects with the aim of increasing community awareness of research and higher education. Based on findings from evaluating our collaboration and student participation, we discuss a model of service-research for graduate programs.

Overview of research project

Biofuels are currently derived from corn and soybeans in the US to make ethanol and biodiesel, respectively. While energy and greenhouse gas savings are realized, several significant tradeoffs have arisen including a) increase in food prices and b) a shift in environmental burden to impacts manifesting as eutrophication and hypoxia (i.e. the Dead Zone in the Gulf of Mexico) [2]. Cultivating biofuels on marginal lands may alleviate these problems and may serve to contribute additional environmental benefits in the form of soil remediation and the beneficial reuse of marginal lands.

The purpose of the research is to determine the overall effectiveness of using biofuel crops to phytoremediate heavy metal contaminated soils in vacant urban lots. Through the collaboration, researchers at Pitt are quantifying the benefits of growing bioenergy crops on the urban lands that GTECH has been cultivating since 2007. Throughout this project, faculty at Pitt quantify on-site phytoremediation of biofuel crops on several GTECH managed sites and compare the life cycle environmental impacts (i.e. global warming potential, eutrophication potential) of biofuels grown on marginal lands to petroleum fuels and traditional biofuels (i.e. soy biodiesel, corn ethanol). The crops examined were canola (*Brassica napus*), sunflower (*Helianthus annuus*), and switchgrass (*Panicum virgatum*); each of these crops are grown on different GTECH sites. Research is being continued with these sites to determine the effectiveness of the remediation; phytoremediation is determined by the uptake of heavy metals and the environmental impacts are determined via life-cycle analysis of the biofuels.

Overview of GTECH

GTECH Strategies is a non-profit organization in Pittsburgh that is striving to address the issue of vacant lots in the city. GTECH was formed out of a master's project at Carnegie Mellon University's Heinz School of Public Policy and Management. The master's students, through a partnership with the Mayor's Office, completed comprehensive research regarding the number of vacant lots in the city and provided guidance on how to manage them. At the time of the study

(2005), there were more than 14,000 vacant lots in Pittsburgh, around 5,000 acres (or 10% of the city). Vacant lots have historically burdened the city financially, detracted from neighborhoods, and impeded development. Vacant lots demand human energy to maintain, all while underutilizing environmental assets. Several studies have shown that unmanaged vacant lots can decrease property value by as much as 18% and increase the number of violent crimes [3]. Additionally, studies by other institutions have shown an increase in property value when a vacant lot in the area is turned into a park, a garden, or simply a field of trees [3]. Green spaces are important to neighborhoods, as told by the buying power in that area.

GTECH's main strategy to utilize marginal lands includes converting empty lots into fields where bioenergy feedstock is cultivated. They grow crops such as canola and sunflower as a multipurpose strategy addressing several issues. First, canola and sunflower seeds are the starting material for biodiesel, a fuel that is renewable and cleaner than petroleum-based diesel [3]. These crops are much more efficient than soybean (the currently popular biodiesel feedstock); canola and sunflower produce about double the amount of gallons per acre than soybean (100-125 gallons/acre compared to 48 gallons per acre) [3]. Another benefit of canola and sunflower is that they both potentially remediate the soil; phytoremediators can draw toxins such as lead and heavy metals out of the soil. Urban areas are susceptible to high levels of lead in the soil as a lingering result of old paint and gasoline, among other sources.

Besides improving soil and creating biofuels, GTECH is using the projects to create a training platform for green jobs; these sites provide opportunity to educate about alternative energy, land remediation, and sustainability. Green jobs are a great opportunity, providing people with meaningful and sustaining careers while improving environmental quality.

Community outreach activities

GTECH has an extensive array of community programs that not only train local residents in green jobs, but also involve the community in beautifying their vacant lots. The UPitt team conducts research on only a handful of GTECH sites, and when possible participates in the volunteer days for those sites.

Community programs created by GTECH are very dependant on the community. For past projects, community partners have included Green Teams (self-selected residents interested in neighborhood greening and sustainability), Student Conservation Association Students, Pittsburgh Cares volunteer groups, among others. The majority of community programming is based around the growing season and activities on GTECH sites starting with site preparation and ending with the harvest. By basing community programming around the growing season, educational components are partnered with the work that needs to be done. Educational opportunities include in-class lessons with the youth, biodiesel-making demonstrations, and presentation to groups about GTECH's projects.

GTECH organizes volunteering days to involve the community in cultivating biofuel crops on lots within their community. To enable successful volunteering days, the GTECH team prepares carefully for the activities to encourage safety and education. The site coordinator must convey basic information and expectations before volunteer days so that all volunteers arrive prepared.

This preparatory information includes respect towards all persons, safety with machinery and landscape, appropriate dress for the work and varied weather conditions. When organizing volunteer days, it is important to ensure that the amount and level of work that is planned for the day is appropriately matched with the number and capability of volunteers (e.g. something easy for younger kids, or something more involved for older ones). Some backup work is always planned, in the event that the group works quicker than expected or more volunteers show. It is easier to decide to do less than planned than it is to come up with extra tasks during the event.

Communication is critical with the volunteer group; everyone should be clear on details such as arrival and departure time, what the volunteers should bring (water, gloves, food, etc.), what the volunteer coordinators will provide (e.g. food or tools), what the task(s) for the day will be, and how many volunteers are going to show. Almost as critical as the list of tasks is expectations, as they can make or break a day. Having a crew show up really hoping to weed a site, and then asking them pick up litter can put a damper on the day. It is important to give the volunteers a clear sense of what they will be doing, if they will be working with other groups, and any other relevant pieces of information.

As part of having clear communication there is the morning-of spiel; the purpose of this presentation is to give all the volunteers a sense of with what they are involved [3]. In addition to a description of the tasks; it is important to provide a quick overview of what GTECH does with the sites and Pitt and why these activities and research are important. The presentation is adapted to the audience; a middle school group's attention span often will not last more than five minutes, less if the information is dry, while a group of adults might last longer. GTECH has found that one-on-one conversations during the workday tend to be more meaningful. Thus, it is often beneficial to have researchers intermingled with volunteers. UPitt graduate and undergraduate students are involved in the volunteer days on sites that UPitt conduct research.

To both enable and document successful community outreach, GTECH developed a handbook for others to recreate their efforts, called the 'Reclamation Bible'. The Community Programs Manager at GTECH is responsible for ultimately compiling this document, which contains a significant educational portion, including Primers on Ecosystems, Carbon Footprints, and Biofuels. UPitt researchers contributed a section on Testing and Remediation to help further the educational aspect and encourage interest in environmental engineering research. This document also includes how to work successfully with communities and to create long lasting, productive community partnerships.

University-nonprofit collaboration

The collaboration between the University of Pittsburgh and GTECH began in the summer of 2008 with the help of two undergraduate students funded through the National Science Foundation's Research Experience for Undergraduates program. In 2009 the service-research collaboration was funded by the National Science Foundation, and as such required a new level of collaboration. As the team of students working on the project grew to include graduate students; the UPitt team found that it was important to GTECH to have a specific point of contact. Thus in early 2010 one graduate student from the UPitt team was identified as the liaison that would work closely with GTECH's Community Programs Manager. The task of

keeping up to date with the other half of the collaboration fell to these two individuals. Keeping each collaborating group adequately informed is vitally important for such a project since sampling times are dependent on harvest and plantings times, which are frequently changed. Transferring the responsibility of communication to two individuals allowed for more frequent meetings that were informative and allowed for significantly greater communication of time schedules. These meetings were held approximately once a month during the growing season. Biannually there are also large meetings held with all the collaborators from both Pitt and GTECH. These meetings are important to ensure that all members are up to date and informed on current activities. In addition, ideas for new programs and activities are discussed.

To enable a successful working relationship there has been learning on both sides of the collaboration. UPitt researchers needed to be aware and respectful of the different ways a nonprofit works in comparison to a university research team in order to be respectful of GTECH's needs. As a small nonprofit, each member of the GTECH team has many different responsibilities and need more turnaround time for requests from UPitt. The focus of the nonprofit is to stay true to their mission and goals while fostering healthy community relations. GTECH has to answer to community members, so actions are not always immediate and awareness and respect of this on the part of the researchers has helped to create a more productive environment.

In addition to research activities, three undergraduate classes at UPitt were integrated into the research and nonprofit activities. First, Dr. Landis, had her life cycle assessment class conduct a comparative LCA between conventional agriculture and GTECH's low-impact urban farming. Students in this class applied what they had learned about LCA in a service-learning project with GTECH. Dr. Landis also involved GTECH in a project in her Design for Environment class; student teams were charged with two different projects: a) designing a composting system for GTECH and b) designing a low-impact irrigation system for GTECH. Most recently, a geology class became involved in our collaboration with GTECH; however this class became involved through a graduate student enrolled in the class, not through the professors' integration of research and service-learning into their classes. The geology class encourages active student involvement in sustainability initiatives on campus and in the community. One group of students approached our group through a graduate student in their class. The geology class group's goal was to help bring wilderness into the city for educational and aesthetic purposes; they wanted to plant a community garden for their class project. The UPitt research group became involved and connected them with GTECH to aid the students' in planning and planting their community garden on a plot of land owned by UPitt. The research group planted some biofuels crops on the site in collaboration with the geology team, who planted other plants and foods.

The collaboration has benefited GTECH because through the communication with researchers they are able to better understand how the work they do can benefit the community in a scientific sense. Collaborations also help nonprofits like GTECH grow; without collaboration nothing of significant size to can happen, according to members of the GTECH team. Another benefit is that collaboration with a research institution helps to lend credibility to GTECH.

Pitt has benefited from collaborating with GTECH not only from the data that is collected from GTECH's sites, but also from the ability to connect to communities. Without GTECH, UPitt

would have to work directly with land-owners to conduct this research; which would have made collecting data much more difficult due to the time and community presence necessary to create successful and trusting relationships. Dissemination of research and outreach to communities is also seamless with the aid of GTECH. When communities work with a nonprofit it allows for a consistent, familiar face to the community but still allows for the research to take place and for the information to end up in the hands of the community members.

Future community outreach

UPitt researchers are developing a document to become part of the Reclamation Bible concerning the collaboration between the UPitt and GTECH. This document will detail lessons learned from a university-nonprofit collaboration including the roles and responsibilities of each party. The contributions from the UPitt research team are: how research is done and ways to acquire funding that are applicable to both a university and a nonprofit. The development of this material will be useful in two main ways: it causes both the nonprofit and research institution to layout their role in the project, and also enables future collaborators to learn from our experience and avoid some of the same problems. Compiling this document while actively working on the project helps to increase the clarity of communication and the effectiveness of the collaboration.

In order to raise awareness and inform the public of the collaboration between GTECH and the UPitt a flyer is being developed for distribution at GTECH's planting events. This flyer will help to give the public a general idea of the research being conducted, which could possibly play a role in encouraging a greater interest in higher education by a populace that is rarely exposed to these educational career paths. A brief description is provided of the collaboration as well as the sampling procedure followed by Pitt, to encourage hands on participation by local volunteers. This sampling allows the public to sample scientifically, but the collected samples are not intended for actual testing to help ensure the quality of the data.

Conclusion

The collaboration between the UPitt research team and GTECH has enabled productive research while also enhancing community outreach and education. Without this collaboration it would have been exceedingly difficult for the research team to collect the necessary data and to have such a profound outreach within the community. The community outreach and education has benefited in both directions: from the university perspective, the educational and outreach elements disseminated to the community by GTECH greatly enhance the Pitt project. The collaboration with UPitt has allowed GTECH to increase the knowledge imparted to the community about technical issues such as heavy metals in soils and phytoremediation as well as expose the community to higher education in STEM fields and research activities. This last aspect is of great importance since for some of the community it may be the only exposure to engineering they have – so it may play a crucial role in increasing interest in engineering among some of the young volunteers. Working with GTECH has been insightful for the UPitt researchers as they have learned not only best practices of working with communities but also with nonprofits. The joint development of the “Reclamation Bible” will further help disseminate this knowledge among the academic community to encourage positive community outreach experiences and collaborations between nonprofits and researchers.

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