



Learning Off the Grid: Implementing Engineering Service Projects in Developing Countries to Achieve Student, Faculty, and Community Outcomes

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A 1997 graduate of VMI, I earned my PhD in Environmental Engineering from Virginia Tech in 2009. I believe that research and new technologies greatly enhance the overall learning experience, and that environmental engineers have a social responsibility. Therefore, I have established new research and initiatives to advance instruction at VMI through the development of VMI Keydets Without Borders (VMI-KWB), a research and study abroad program that provides design and construction of sustainable water and sanitation facilities in developing communities. This program has been instrumental in teaching the concepts of austere, rudimentary development and operation of water and wastewater treatment systems coupled with sustainable energy concepts (solar, biomass). To date, our group has designed solar and gravity powered pumping facilities for sustainable "portable farm" aquaculture projects in Uganda and Bolivia, solar thermal energy showers using recycled construction materials in Bolivia, anaerobic waste treatment and energy generation facilities and solar devices for the capture and conveyance of potable water sources within resource poor communities of Haiti, Bolivia and Uganda. This program has also focused on the pyrolytic development of manure-based biochars for the purposes of drinking water filtration. Specifically, I am focusing on the development of llama and alpaca manure biochars for the filtration of mine waste contaminated water sources in the Andes region of Bolivia. Biochars are created in the field using top-lit updraft stoves capable of low oxygen, zero emissions conversion of manures to biochar. These biochars are created during normal cooking activities; the biochar is then collected from the stove and used for filtration of drinking water. This project has proven to provide a very innovative and sustainable means of clean water filtration, thus improving overall health conditions within communities and greatly enhancing experiential learning in the field. Preliminary research suggests that our designs have reduced community infant mortality rates by more than 40%, saving the lives of more than 4,000 children worldwide. This clearly emphasizes engineering service and the need for sustainable infrastructure projects that produce positive results without negatively impacting future generations.

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Tyler is a graduate of the Virginia Military Institute where he obtained his Bachelor's degree in Civil and Environmental Engineering. While at VMI Tyler conducted research on the implementation of off grid sanitation systems. Tyler was part of a team that successfully designed and implemented a waterless eco-latrine network that was combined with a powerless solar shower for a remote village in the Andes Mountain region of Bolivia. He also successfully designed a manure based (MB) bio-char stove that would allow for multi-fuction use as a stove, indoor heating system and the creation of MB bio-char that is used for water filtration.

Currently Tyler is attending Old Dominion University in Norfolk, VA and is conducting research on the intracellular processes of anaerobic digestion with Hampton Roads Sanitation District.

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Abstract

The implementation of student service projects into higher education curricula may no longer be considered a novel engineering educational initiative since a significant number of institutions have developed and embraced this concept over the past several years. However, the introduction of civic engagement (CE) and service learning through the implementation of engineering service projects is still a novel concept for the majority of students who participate in such programs. The concept of young adults who are willing to imbed themselves in a community and environment that may appear foreign to them and volunteer time and funds to work and learn is also a novel concept for communities where these projects are implemented. The purpose of this paper is to share the development of an international service learning program (ISLP) at a small undergraduate school. The paper will discuss challenging topics to consider when implementing engineering service projects in developing countries such as safety, cost, logistics, logistics, and logistics. The paper will also discuss creating successful partnerships with academia, communities, and non-government organizations. The school has created a service committee that is currently studying the feasibility of institutionalizing civic engagement and service at the school. A significant challenge for the committee is the task to develop a universal assessment model that can quantify the student learning outcomes of multiple faculty and department service initiatives. Currently, learning outcomes are assessed qualitatively through reading journals, blogs, and reflective essays that students are required to submit. Measuring the outcomes for creating successful partnerships with academia, communities, and non-government organizations is simply a quantitative measurement based on the number of project proposals and partnerships seriously evaluated compared to the number of proposals that resulted in a successfully completed project by the program. The overall objective of this paper is to share the experiences of developing a student service program in the hope that such information will assist schools interested in developing similar student service programs. In addition, this paper will also discuss the lessons learned from past service projects in the hope that other schools, with well-established student service programs, will discuss their programs and share their best practices with the authors and conference attendees.

Background

Service programs are not a novel concept and have been around for centuries. However, servicing learning was discussed as “a rather new pedagogy approach” in the early 1990s ¹. There are far too many international service programs to discuss in this paper so the three service organizations that had a significant impact on the development of an ISLP at ABC university will be discussed. Although service learning can be accomplished with a wide range of civic engagement activities, there has been a significant increase in students volunteering and completing international engineering service projects that benefit developing communities over the past 15 years. Engineers Without Borders (EWB) is probably the most widely known among engineering and higher education professionals. Many non-government organizations (NGOs) have been created since this time thanks to the success an open collaboration of EWB-USA. The EWB program was founded in 2002 by Dr. Bernard Amadei, Professor of Civil Engineering at University of Colorado-Boulder and was the result of a collaborative effort between an academic institution, University of Colorado- Boulder, and a government agency, the Belize Ministry of

Agriculture. In 2001, Dr. Amadei was invited to visit a community in San Pablo, Belize, to assess the community's water supply where he learned that the community lacked clean water and sanitation infrastructure. Dr. Amadei returned to the community the next year with a team of eight engineering students and another engineering professional. The team installed a clean water system powered by a local waterfall to the benefit of the community. The simple engineering project that emphasized a sustainable, low technology, high impact solution expanded the collaboration between students, professionals, and developing communities. Since 2002, EWB has grown to 15,900 members in 286 chapters².

Another engineering service organization that influenced the development of ABC's program was Engineers in Action (EIA). Similar to EWB-USA, EAI was born from a collaborative effort but this time the partnership was between the Tulsa Southside Rotary Club and the Methodist Church. In 1993 a potable water well was drilled in Konani, Bolivia. Over the years this relationship continued to grow and in 2008 EIA was founded by the Evangelical Methodist Church in Bolivia and funded by the United Methodist Church in Skiatook, Oklahoma. In 2009, EAI became a secular, non-profit agency that collaborates with Rotary Clubs, EWB, universities, and U.S. and Bolivian engineers to serve the poor rural indigenous communities in Bolivia³. Where EWB-USA has hundreds of chapters and projects in 45 countries, EAI has focused on one country, Bolivia, and developing strong relationships with the indigenous communities and relying on the experience and knowledge of local engineers to continue to assist with the sustainability of the projects once completed². Both the EWB and EAI organizational models have proven to be successful and continue to grow in size and resources which results in the implementation of many projects that benefit developing communities, volunteers, professionals, and students³.

As EWB, EAI, and ABC University have learned by seeking out and developing collaborative partnerships there are organizations that have been doing similar service in the U.S. and internationally for more than a century. One of the world's first international service organization is Rotary International, which is a NGO service organization that has been dedicated to service of a diverse range of services and projects that meet the broad guidance of "does it promote goodwill and is it beneficial to all concerned." Rotary International grew from the efforts started by Paul Harris, Gustavus Loehr, Silvester Schiele, and Hiram Shorey in 1905 in Chicago, Illinois. The four professionals decided to call the new club "Rotary" after the practice of rotating meeting locations among the members. The club was promoted as a place where professionals with diverse backgrounds could exchange ideas and collaborate to form lifelong friendships and serve their communities. By 1912 the Rotary Club became an international organization and by 1917 an endowment was established, the Rotary Foundation, to "enable Rotarians to advance world understanding, goodwill, and peace through the improvement of health, the support of education, and the alleviation of poverty." The Rotary Foundation funds humanitarian activities, from local service projects to global initiatives. In addition, the Rotary has encouraged collaboration with other agencies or programs and provides grants for programs and projects that promote the Rotary's mission. The Rotary uses a "Four-way Test" for anything the organization discusses, plans, and implements⁴:

1. Is it the TRUTH?
2. Is it FAIR to all concerned?
3. Will it build GOODWILL and BETTER FRIENDSHIPS?

4. Will it be BENEFICIAL to all concerned?

Founding of the ABC University Program

In 2009, a faculty member of ABC collaborated with EWB to start a student chapter. EWB had completed a site assessment and health survey for a village in Bolivia. The assessment report identified low technology, high impact projects that would benefit the community. ABC was interested in designing and implementing the project and as a result ABC's program was born in 2010. During subsequent projects, ABC partnered with EAI which provided significant support and experience in working with Bolivia. As a result of this relationship, ABC began a relationship with several Bolivian engineers that have significantly reduced the project constraints on resources and logistics. The Bolivian engineers are also the in country experts on procuring and getting supplies delivered to the communities. In addition, their knowledge has greatly assisted in making transporting, lodging, and feeding of the student teams much easier. Rotary International also partnered with ABC and offered more opportunities to fund future projects.

The mission of ABC's program is to combine the efforts of students of all majors and interests in a collaborative effort to enhance the living conditions of developing areas worldwide. Through this effort, students learn about poverty stricken areas, combining their efforts in a creative way to work as a team to design and implement sustainable engineering solutions to improve the basic standard of living for communities in the developing world. The ABC organization is focused on providing interested students the opportunity to apply their diverse academic backgrounds in a real-life situation for the benefit of those lacking basic human needs, such as standard sanitation or potable drinking water. Students in the chapter work to design and implement sustainable engineering projects which transform communities into healthier, more productive areas. A portion of the project is completed on campus. On campus duties include:

1. Engineering design of water, sanitation, power, structural or agricultural projects
2. Economical, medical and environmental impact studies; and
3. Researching and implementing ways to increase a community's per capita income.

Upon completion of the work, students travel abroad for the implementation of their engineering designs. There is also plenty of potential for students from all majors to study the people and their communities and work with the communities to find ways to improve sanitation and create healthier lifestyles that the community has identified. The goal, as a group, is to create sustainable ways for communities to meet their basic human needs, while the student and professional members involved gain enriched global perspectives through the innovative professional education opportunities that the ABC program provides. The requirement for membership is simple: you must have an interest in helping others.

Since 2010, more than 150 ABC students have traveled to Bolivia to implement water, sanitation, irrigation and healthcare projects as requested and approved by the villagers of the communities served. The group travels as volunteers and finalizes a portion of the project during each summer. Additional projects are constantly being planned, and ABC will be heading to Bolivia every year until a sustainable situation is reached in the locations served.

The work in Bolivia involves a multi-faceted, multi-project, sustained effort in order to help the rural communities help themselves. Because this location the climate is arid and the sources of income are limited to small-scale agriculture and mining. The population of the current regions served is approximately 10,000 people, but with subsistence farming being the main source of income, many farmers have moved away in hopes of finding other ways to earn income. Major problems include migration to other countries such as Argentina, causing a decrease in the overall economy of the localities simply for the purposes of survival. Recently prices of minerals have increased, so more people are staying. Most of the population belongs to Quechua indigenous group which were exploited as mining workers since Spanish colonial times. Currently the villages served have a limited supply of water and electricity. In multiple meetings with regional leaders, they manifested sanitation as a major problem. Currently, the communities do not have much usable land for growing crops and clean water and sewage is limited to non-existent. The communities have identified clean drinking water, adequate sanitation and ample water for irrigation as their most significant needs to improve their health, diets and market their crops. Multiple projects, including drinking water collection and distribution, as well as ecological latrines and showers were identified to improve the overall health of the communities. Projects are completed in phases and all phases of the projects are closely monitored to ensure continuity in their delivery to the community members. This provides the communities with real goals and achievable milestones, allowing for a sustainable solution to reduce infant mortality and increase life-spans in these regions.

Phase I – students work with community members to accomplish the installation of a catchment basin to collect uncontaminated water and the initial installation of water and wastewater infrastructure. Initial layout and design of irrigation systems and education for improved health are also accomplished during this phase.

Phase II – students and community members apply the finishing touches on the irrigation system and the installation of two 3,000 L water tanks and one 5,000 L water tank for water storage. During this phase of the project, a health assessment is also conducted in the town to survey the medical needs of the villagers. Also, a water and sanitation assessment is conducted in order to determine the best way to address the improvement of personal hygiene and sanitation.

Phase III – students facilitate the design and construction of eco-latrines and solar showers. The team will also train villagers to manage and maintain the facilities that are constructed. The intent is that the costs of maintenance would be covered initially by ABC and later the community's local government through a very minor tax. ABC and the village leadership educate designated villagers to take on the role of facilities managers. Villagers learn how to operate and maintain all infrastructure, including the water irrigation system, eco-latrines and water supply system.

To date, ABC has completed several projects not only in Bolivia but in several other countries. Local leaders and alumni of ABC also asked if ABC could work on local and regional projects in the U.S. As a result, ABC's program strives to complete one local, one regional, and one international project per year. Projects developed or completed to date include:

1. 2011 – Bolivia – Design and implementation of a spring box/catchment basin and installation of 2,000 linear feet of 1.5-inch diameter pipe for the conveyance of clean drinking water to 80 families.
2. 2012 – Bolivia – Design and implementation of 10,500 linear feet of 1.5-inch pipe and 11,000 liter storage tanks for delivery of clean drinking water to 80 families.
3. 2012 – Haiti – Site assessment and preliminary design of a level III clinic and drinking water well.
4. 2012 – Virginia – Design and development of facility upgrades to for an early learning center.
5. 2013 – Bolivia – Design and implementation of 24,200 linear feet of 1.5-inch pipe and 6,000 liter sedimentation basin for delivery of clean drinking water to 120 families and llama livestock.
6. 2013 – Uganda – Assessment, design and implementation of personal filtration devices for the treatment of contaminated drinking waters for 50 families in the Bududa region of the Republic of Uganda.
7. 2014 – South Carolina – local labor and construction projects for underprivileged families and oyster reef rehabilitation for the purposes of bay restoration in coastal South Carolina.
8. 2014 – Bolivia – Design and construction of 16 “pipe-in-bottle” eco-latrines/shower combination facilities for enhanced sanitation and improved health.
9. 2015 – South Carolina – Design and construction of oyster reef rehabilitation beds for the purposes of bay restoration in coastal South Carolina.
10. 2015 – Bolivia – Design and construction of 16 “pipe-in-bottle” eco-latrines/shower combination facilities and preliminary assessment and design of portable aquaponics facility and grade school wastewater delivery and treatment system.

Constraints of International Service Work

Service Learning is a great pedagogy approach to teaching students project management skills and how to plan and manage for all the constraints of such projects. Typically, students are introduced to the triple constraint of time, cost, and scope of a project. The complexity of project management has increased the number of constraints and the sextuple constraint is widely used in preplanning projects. There are six primary constraints with typical construction projects: Time, Cost, Scope, Quality, Risk and Customer Satisfaction⁵.

However, even though service learning projects typically embrace low technology, high impact projects. The challenges of implementing such projects with students in a foreign environment, both cultural and climatic, makes some existing constraints more defined and adds three more: Logistics, Resources, and Environment (Cultural and Climate)⁶.

Constraints for International Service Projects:

Safety (Risk): Risk is a common constraint with all construction projects and can include risk due to weather, delays, resources (deliveries), and labor, etc. For an ISLP the risk constraint was changed to safety, being that all work and travel carry some risk but students, school administration, and parents’ primary concern is safety of the students. This needs to be planned in advance but should not scare a program from pursuing such projects. Again, the emphasis on low technology high impact projects tends to reduce the risk of injury from complex construction

sites due to power tools, heavy machinery, etc. But the nature of ISLP tends to have students traveling and working in developing countries where safety and security always needs to be addressed. For new programs the best place to start planning for this constraint is if the school has an international study abroad program. If the school does have such a program than a significant amount of information on safety and security procedures is probably already developed. The ISLP safety plan can be modified based on the location of the project by also using U.S. Department of State “country information” or the Overseas Security Advisory Council (OSAC) reports that can found easily on the Department of Sate website. The other significant safety issue will be the health and safety of the students when in the community. The project location could be in a remote location so the best option is determine what medical services are available and how far are they are located from the project site. Available transportation also needs to be factored into the project planning. Even though low tech projects have less risk due to injury from construction activities the fact that these projects are in a foreign environment greatly increases the risk of sickness. It is highly recommended that students have all the appropriate vaccinations listed by the Centers for Disease Control (CDC). But it is almost assured that stomach ailments and other parasitic illness will occur. Plan for such illnesses by having a project team large enough where there is enough allow mildly ill students for rest and hydrate. Several members should also have first aid training to treat and identify more serious illnesses in the event more intensive medical care needs to be sought⁶.

Time: Any construction project is a temporary endeavor that has a specific start and finish. For ISLPs the best strategy for this constraint is following EWBs project philosophy of low tech-high impact projects. This will allow a program to develop a project that they can meet in the allotted time. Another strategy is to build some “float”, extra time, into the project for contingency. If the “float” time is not used then students will enjoy spending the extra time after the project to sight see and accomplish some much enjoyed tourism excursions⁷.

Cost: Although cost is always a challenge at first there are plenty of NGOs that are looking for students and faculty to assist with projects already identified and funded. For a school new ISLP the best thing to do is partner with an experienced NGO that can manage the majority of the project constraints. These NGOs are very appreciative of euthanasic students willing to live off the grid for a few weeks and volunteer their time to assist in the implementation of a project⁷.

Scope: ISLPs can actually be considered as having two types of scope. Project scope is all the goals and tasks required to complete the project, to include all the project planning requirements before the project is started. Product scope is the end product or in the case of ISLP the structure, system, or process that is completed and delivered to the community and placed in service. It is easier to visualize product scope. However, for most ISLPs, project scope starts a semester or two before students even travel to the community to start construction of the project⁷.

Resources: This constraint along with logistics should be what students appreciate the most after completing an ISLP project. For projects, the major resources to address are the availability or lack of availability of skilled labor, construction tools, equipment, and subject matter experts. Since projects are planned and collaborated with developing communities, the constraint on resources is significant; otherwise the community would have already implemented a project to improve their quality of life. With guidance, students will need to plan the labor, tools, and skills

available for their project. The emphasis on selecting low tech high impact projects assists with addressing this constraint. Students will quickly gain an appreciation of having the correct tool to do the job and if not then learning to improvise⁷.

Logistics, Logistics, & Logistics: Another constraint that will be challenging due to the location of the project is logistics. The first issue will be successful completion of supply logistics and making sure everything the project team needs is at the project site or being brought by the team. This is where collaboration with a well experienced NGO such as EWB, EAI, and/or Rotary can make supply logistics a constraint the project team does not need to worry about. However, this type of collaboration can take several months to a few years to develop. The second issue will be dealing with the logistics traveling in a group to a developing country. Add in the constraints due to language, transportation, airport delays, etc., and any significant change will have a ripple effect on your project time. The third phase will be the logistics of closing the project out (completion) and returning to the U.S.

Environment: This constraint includes not just cultural but climatic factors of where the project is located. The cultural aspect is typically well planned and embraced by the students. The opportunity to learn and be exposed to different cultures has always attracted students to ISLP. However, language can be a difficult constraint if you have no translators in the group. Again this constraint can be addressed by collaborating with a NGO and/or choosing a country where the students have the skills to communicate. The factor the ISLP teams also need to plan for is the climate. Whether it involves a project at 14,000 feet above sea level or is in a hot and humid environment, programs can easily plan for this with training and allowing for adequate time in the execution phase of the project to acclimate, rest, and hydrate.

Outcomes and Assessment International Service Learning Projects

As discussed, ISLP may no longer be considered a novel pedagogy since it first became widely known in the 1990s¹. However, ISLP concepts and civic engagement objectives will still be a novel concept to many students since this opportunity may be their first experience in a developing country. The popularity of such programs and the diversity between students, academic majors, and the communities participating in such programs allow for several student outcomes to be realized in a short time period. Service work as a part of civic engagement. Learning engineering fundamentals, learning about different civilizations and experiencing a diversity of cultures, developing student leadership, and collaborating with communities, schools, and NGOs are several that students will accomplish. These outcomes are just a few and well established service programs at other higher educational institutions can easily expand this list. Student outcomes at ABC are currently assessed qualitatively by requiring students to keep a daily journal or blog and then requiring the submission of a reflective essay on their experiences participating in the ISLP. Some students are naturally motivated to write and share their experiences. However, to encourage the students to be disciplined in maintaining a journal and submitting a reflective essay with some rigor, the journal and essay represent 50% of the grade for the 3 credit hour course at ABC. Examples of some of the students comments used to assess the current program are as follows:

“This trip changed my life, something divine has happened, Dr. XXX has helped initiate a movement for the betterment of humanity.” – Student X

“My entire life was changed because of this trip; I am now on a path to fulfilling my dreams, all because XXX” – Student Y

“Service has become a huge part of my life because of XXX, and I intend to make it a huge part of the rest of my life.” – Student Z

Due to the popularity and success of not just the ABC program but others, ABC is in the process of evaluating the implementation of civic engagement into the academic curricula. The number of programs and the significant participation of students tend to lean towards the probability of succeeding in the implementation of such a program. However, assessment of such a program once it is implemented will be the next challenge. Currently ABC is establishing a test case for assessed experience within each category of service at ABC to include student life, academic programs, military programs, sports, and experiential learning. ABC has just begun studying assessment models. The Association of American Colleges & Universities (AACU) has devised a rubric for assessing civic engagement, which quotes the definition of civic engagement as “encompasses actions wherein individuals participate in activities of personal and public concern that are both individually life enriching and socially beneficial to the community⁸.” The AACU Civic Engagement Rubric is shown in Table 1.

Table 1: AACU Civic Engagement Rubric¹⁰

	Capstone 4	Milestones		Benchmark 1
		3	2	
Diversity of Communities and Cultures	Demonstrates evidence of adjustment in own attitudes and beliefs because of working within and learning from diversity of communities and cultures. Promotes others' engagement with diversity.	Reflects on how own attitudes and beliefs are different from those of other cultures and communities. Exhibits curiosity about what can be learned from diversity of communities and cultures.	Has awareness that own attitudes and beliefs are different from those of other cultures and communities. Exhibits little curiosity about what can be learned from diversity of communities and cultures.	Expresses attitudes and beliefs as an individual, from a one-sided view. Is indifferent or resistant to what can be learned from diversity of communities and cultures.
Analysis of Knowledge	Connects and extends knowledge (facts, theories, etc.) from one's own academic study/field/discipline to civic engagement and to one's own participation in civic life, politics, and government.	Analyzes knowledge (facts, theories, etc.) from one's own academic study/field/discipline making relevant connections to civic engagement and to one's own participation in civic life, politics, and government.	Begins to connect knowledge (facts, theories, etc.) from one's own academic study/field/discipline to civic engagement and to one's own participation in civic life, politics, and government.	Begins to identify knowledge (facts, theories, etc.) from one's own academic study/field/discipline that is relevant to civic engagement and to one's own participation in civic life, politics, and government.
Civic Identity and Commitment	Provides evidence of experience in civic-engagement activities and describes what she/he has learned about her or himself as it relates to a reinforced and clarified sense of civic identity and continued commitment to public action.	Provides evidence of experience in civic-engagement activities and describes what she/he has learned about her or himself as it relates to a growing sense of civic identity and commitment.	Evidence suggests involvement in civic-engagement activities is generated from expectations or course requirements rather than from a sense of civic identity.	Provides little evidence of her/his experience in civic-engagement activities and does not connect experiences to civic identity.
Civic Communication	Tailors communication strategies to effectively express, listen, and adapt to others to establish relationships to further civic action	Effectively communicates in civic context, showing ability to do all of the following: express, listen, and adapt ideas and messages based on others' perspectives.	Communicates in civic context, showing ability to do more than one of the following: express, listen, and adapt ideas and messages based on others' perspectives.	Communicates in civic context, showing ability to do one of the following: express, listen, and adapt ideas and messages based on others' perspectives.
Civic Action and Reflection	Demonstrates independent experience and <i>shows initiative in team leadership</i> of complex or multiple civic engagement activities, accompanied by reflective insights or analysis about the aims and accomplishments of one's actions.	Demonstrates independent experience and <i>team leadership</i> of civic action, with reflective insights or analysis about the aims and accomplishments of one's actions.	Has clearly <i>participated</i> in civically focused actions and begins to reflect or describe how these actions may benefit individual(s) or communities.	Has <i>experimented</i> with some civic activities but shows little internalized understanding of their aims or effects and little commitment to future action.
Civic Contexts/Structures	Demonstrates ability and commitment to <i>collaboratively work across and within</i> community contexts and structures to achieve a civic aim.	Demonstrates ability and commitment to work actively <i>within</i> community contexts and structures to achieve a civic aim.	Demonstrates experience identifying intentional ways to <i>participate in</i> civic contexts and structures.	Experiments with civic contexts and structures, <i>tries out a few to see what fits</i> .

There are actually several rubrics that could be added to assess an ISLPs in addition to civic engagement. AACU encourages users to also consult three other rubrics: Global Learning; Intercultural Knowledge and Competence; and Ethical Reasoning. These rubrics are provided in the appendix¹².

Due to the months of planning to address all the constraints of an ISLP and the student outcomes of developing student leadership and collaborating with other project stakeholders a rubric assessing the rigor of teamwork would also be very desirable. With four rubrics to draw from the AACU assessment rubrics appear to be very useful. However, for the sanity of the faculty advisors who develop these programs and assess the students, the goal is to combine the appropriate criteria from the AACU rubrics and other committee members to develop a rubric that can be utilized for all service projects that promote civic engagement regardless of location or service, i.e. engineering, counseling, mentorship, volunteering. The rubric will also need to be simplified for small service opportunities that students volunteer for over a short period of time. Nothing will discourage student volunteerism more than asking a student to write a lengthy paper after they participate in a civic engagement event. With that said, the approach is leaning to requiring a reflective essay and short answer survey for service learning programs that constitute a significant amount of course work such where course credit is awarded. A short multiple choice survey would be developed for civic engagement opportunities that students volunteer for that are sponsored by the school or one of the partners the school is collaborating with.

The students at ABC are also required to take a course in leadership that is part of the core curriculum and is managed and taught by the Psychology Department. This allows another opportunity to assess students' civic engagement experiences. Students could be asked to answer multiple choice questions and/or write short answers to questions, such as "What experiences have you had at ABC that have benefited one or more communities?" The same questions could be asked again in the senior survey that is required and by the ABC Office of Assessment and Institutional Research before students graduate.

Conclusion:

The implementation of student service projects into higher education curricula is still a novel concept for the majority of students who participate in such programs. Although implementing a ISLP at a school may be a daunting task due to the typical constraints of such projects, there is a significant amount of assistance and funding available thru well established NGOs that are very open to partnerships with universities. Another challenge of implementing such programs into the curriculum of a university is trying to develop an assessment method with rigor that can not only assess an ISLP but other civic engagement activities that students participate in. ABC University is currently studying the feasibility of institutionalizing civic engagement and service at the school. A significant challenge for the committee is the task to develop a universal assessment model that can quantify the student learning outcomes of multiple faculty and department service initiatives. However, the AACU has several rubrics that could be modified to develop a rubric for ABCs program. Currently, learning outcomes are assessed qualitatively through reading journals, blogs, and reflective essays that students are required to submit. The overall objective of this paper is to share the experiences of developing a ISLP in the hope that such information will assist schools interested in developing similar student service programs. An additional goal of this paper not only share how ABC developed their programs but to start a

discussion on similar programs current in place at other schools and how these schools assess the outcomes of these programs.

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Appendix

Table 2: Global Learning Rubric¹⁰

	Capstone 4	Milestones		Benchmark 1
		3	2	
Global Self-Awareness	Effectively addresses significant issues in the natural and human world based on articulating one's identity in a global context.	Evaluates the global impact of one's own and others' specific local actions on the natural and human world.	Analyzes ways that human actions influence the natural and human world.	Identifies some connections between an individual's personal decision-making and certain local and global issues.
Perspective Taking	Evaluates and applies diverse perspectives to complex subjects within natural and human systems in the face of multiple and even conflicting positions (i.e. cultural, disciplinary, and ethical.)	Synthesizes other perspectives (such as cultural, disciplinary, and ethical) when investigating subjects within natural and human systems.	Identifies and explains multiple perspectives (such as cultural, disciplinary, and ethical) when exploring subjects within natural and human systems.	Identifies multiple perspectives while maintaining a value preference for own positioning (such as cultural, disciplinary, and ethical).
Cultural Diversity	Adapts and applies a deep understanding of multiple worldviews, experiences, and power structures while initiating meaningful interaction with other cultures to address significant global problems.	Analyzes substantial connections between the worldviews, power structures, and experiences of multiple cultures historically or in contemporary contexts, incorporating respectful interactions with other cultures.	Explains and connects two or more cultures historically or in contemporary contexts with some acknowledgement of power structures, demonstrating respectful interaction with varied cultures and worldviews.	Describes the experiences of others historically or in contemporary contexts primarily through one cultural perspective, demonstrating some openness to varied cultures and worldviews.
Personal and Social Responsibility	Takes informed and responsible action to address ethical, social, and environmental challenges in global systems and evaluates the local and broader consequences of individual and collective interventions.	Analyzes the ethical, social, and environmental consequences of global systems and identifies a range of actions informed by one's sense of personal and civic responsibility.	Explains the ethical, social, and environmental consequences of local and national decisions on global systems.	Identifies basic ethical dimensions of some local or national decisions that have global impact.
Understanding Global Systems	Uses deep knowledge of the historic and contemporary role and differential effects of human organizations and actions on global systems to develop and advocate for informed, appropriate action to solve complex problems in the human and natural worlds.	Analyzes major elements of global systems, including their historic and contemporary interconnections and the differential effects of human organizations and actions, to pose elementary solutions to complex problems in the human and natural worlds.	Examines the historical and contemporary roles, interconnections, and differential effects of human organizations and actions on global systems within the human and the natural worlds.	Identifies the basic role of some global and local institutions, ideas, and processes in the human and natural worlds.
Applying Knowledge to Contemporary Global Contexts	Applies knowledge and skills to implement sophisticated, appropriate, and workable solutions to address complex global problems using interdisciplinary perspectives independently or with others.	Plans and evaluates more complex solutions to global challenges that are appropriate to their contexts using multiple disciplinary perspectives (such as cultural, historical, and scientific).	Formulates practical yet elementary solutions to global challenges that use at least two disciplinary perspectives (such as cultural, historical, and scientific).	Defines global challenges in basic ways, including a limited number of perspectives and solutions.

Table 3: Teamwork¹³

	Capstone 4	Milestones		Benchmark 1
		3	2	
Contributes to Team Meetings	Helps the team move forward by articulating the merits of alternative ideas or proposals.	Offers alternative solutions or courses of action that build on the ideas of others.	Offers new suggestions to advance the work of the group.	Shares ideas but does not advance the work of the group.
Facilitates the Contributions of Team Members	Engages team members in ways that facilitate their contributions to meetings by both constructively building upon or synthesizing the contributions of others as well as noticing when someone is not participating and inviting them to engage.	Engages team members in ways that facilitate their contributions to meetings by constructively building upon or synthesizing the contributions of others.	Engages team members in ways that facilitate their contributions to meetings by restating the views of other team members and/or asking questions for clarification.	Engages team members by taking turns and listening to others without interrupting.
Individual Contributions Outside of Team Meetings	Completes all assigned tasks by deadline; work accomplished is thorough, comprehensive, and advances the project. Proactively helps other team members complete their assigned tasks to a similar level of excellence.	Completes all assigned tasks by deadline; work accomplished is thorough, comprehensive, and advances the project.	Completes all assigned tasks by deadline; work accomplished advances the project.	Completes all assigned tasks by deadline.
Fosters Constructive Team Climate	Supports a constructive team climate by doing all of the following: <ul style="list-style-type: none"> • Treats team members respectfully by being polite and constructive in communication. • Uses positive vocal or written tone, facial expressions, and/or body language to convey a positive attitude about the team and its work. • Motivates teammates by expressing confidence about the importance of the task and the team's ability to accomplish it. • Provides assistance and/or encouragement to team members. 	Supports a constructive team climate by doing any three of the following: <ul style="list-style-type: none"> • Treats team members respectfully by being polite and constructive in communication. • Uses positive vocal or written tone, facial expressions, and/or body language to convey a positive attitude about the team and its work. • Motivates teammates by expressing confidence about the importance of the task and the team's ability to accomplish it. • Provides assistance and/or encouragement to team members. 	Supports a constructive team climate by doing any two of the following: <ul style="list-style-type: none"> • Treats team members respectfully by being polite and constructive in communication. • Uses positive vocal or written tone, facial expressions, and/or body language to convey a positive attitude about the team and its work. • Motivates teammates by expressing confidence about the importance of the task and the team's ability to accomplish it. • Provides assistance and/or encouragement to team members. 	Supports a constructive team climate by doing any one of the following: <ul style="list-style-type: none"> • Treats team members respectfully by being polite and constructive in communication. • Uses positive vocal or written tone, facial expressions, and/or body language to convey a positive attitude about the team and its work. • Motivates teammates by expressing confidence about the importance of the task and the team's ability to accomplish it. • Provides assistance and/or encouragement to team members.
Responds to Conflict	Addresses destructive conflict directly and constructively, helping to manage/resolve it in a way that strengthens overall team cohesiveness and future effectiveness.	Identifies and acknowledges conflict and stays engaged with it.	Redirecting focus toward common ground, toward task at hand (away from conflict).	Passively accepts alternate viewpoints/ideas/opinions.