Education is Power: A Service Learning Project
Educating Students in the USA and Empowering Students in Malawi

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Abstract
The people of Malawi have a saying: “maphunziro ndi chuma” --education is power. This article features a three-tiered service learning collaboration between college students in an infectious disease class at a liberal arts college in Pennsylvania, high school students in Blantyre, Malawi, and civilians in the Blantyre district. The college students learn about microbiology by designing hands-on lab exercises which are then packed into kits and mailed to the high school in Malawi. The high school students in Malawi enjoy the hands-on experiences provided by the kits and use them as tools for helping their communities understand more about the transmission of infectious disease. Project Malawi gives both the college students and the high school students a sense of purpose and a clear goal, which enhances their motivation and helps them learn biology. It also provides them with an opportunity for civic engagement and to learn about life in another country. Project Malawi is entirely...
funded by the college students’ fund-raising projects. The rationale behind the project is explained below, as well as details on how the project was developed and is run, followed by a discussion of outcomes and lessons learned.

**Purpose**

Project Malawi is a small-scale, international service learning project. While larger international development efforts can help to build infrastructure in recipient countries, smaller scale projects such as ours are important for increasing human capital. Before starting the project we researched self-identified needs of Malawi so that we could tailor the project to meet those needs (Bruce and Brown, 2010). Currently, Malawi has a need for science education and more people educated in science to contribute to a growing pool of technologists and health care professionals.

We had four goals when developing Project Malawi, which are described in detail below. Briefly, goal one was to improve engagement and motivation by American college students in a non-majors infectious disease course, BIO 113. Goal two was to enhance the college students’ consciousness of cultural diversity and to help them develop leadership skills. Goal three was to enhance the learning experience and stimulate excitement for science in high school students in Malawi. Goal four was to provide an opportunity for high school students in Malawi to become engaged in outreach activities themselves and to help educate their community about the transmission of infectious diseases.

Goal 1: In 2006, the American Association of Colleges and Universities adopted the aim to improve scientific literacy by connecting science education to larger public questions (American Association of Colleges and Universities, 2006). Of course, many colleges require core-curriculum science classes for non-majors. However, many of these students are poorly prepared, unmotivated, and do not see the relevance of such courses (Arwood, 2004; Glynn, 2009). Motivation to learn has been defined as the nature of students to find academic activities meaningful and to try to attain benefits from them (Brophy, 2004; Glynn, 2009); lack of motivation is linked to underachievement (Balduf, 2009). Project Malawi was intended to increase motivation by making the academic activities meaningful and relevant. The BIO 113 course and labs have a clearly defined objective: to learn about infectious diseases and to use that knowledge to design hands-on experiments for high school students in Malawi. This objective is
highly motivating; what the students learn in class becomes highly relevant to achieving the service learning goal.

Goal 2: In addition to improving motivation and learning of biology in the college students, it was anticipated that Project Malawi would also enhance their appreciation for cultural diversity and contribute to their development of leadership skills (Caffrey et al., 2005; Clark et al., 2013). During part of the course that is devoted to learning about Malawian, the college students meet people who have either visited or who are from Malawi. They are also shown photographs of and short movies about people in Malawi, and are introduced to Malawian pop music. All of these activities, along with discussion throughout the course, give the college students a glimpse of culture in another country. By asking the students to form teams and carry out student-designed and organized fundraising activities for a semester-long project, we hoped they would develop their leadership skills while funding Project Malawi at the same time.

Goal 3: Education is a key contributing factor to economic growth and empowerment of peoples in developing countries (Rose, 2003) and education in the sciences has been identified as a priority by the government of Malawi (Ministry of Education, 2011). Well-designed, hands-on activities have been shown to increase excitement for science and understanding of scientific concepts in children of high school age (Holstermann et al., 2010). We anticipated that the kits we designed would provide the high school students in Malawi with an improved learning experience and would excite their interest in science.

Goal 4: Education of civilians is fundamental for improving health literacy and for reducing epidemics that occur as a result of unsanitary conditions or poor hygiene (Feachem, 1986; Kickbusch, 2001). By encouraging high school students in Malawi to become engaged in outreach activities, we anticipated an increase in their motivation and it was hoped that they would contribute to the welfare of their communities by educating them about the transmission of infectious diseases.

Selection of a Community Partner
While the selection of Malawian was intentional, the selection of Kalibu Academy as a community partner was a fortuitous accident. Kalibu Academy turned out to be an excellent community partner for reasons that we didn’t
predict, which in retrospect has revealed much about the types of considerations worth making when selecting a community partner for any international project. Malawi was chosen firstly because our college already has some connections with Malawi. Our college chaplain has taken missions and class-related field trips to Malawi several times and is in regular contact with missionaries in Malawi through a nearby Presbyterian church. This means that many of our college students already have a feeling of personal connection to the country through the chaplain, friends, or the college even if they know nothing about it. Our college chaplain strengthens their bond by visiting BIO 113 and talking to the students about his experiences. He also shows them photographs of students in Malawi and recently he arranged for some Malawian visitors to come and meet the class. The personal connection that the college students feel has proven to be a great motivator for them; in a survey, 86% of participating students agreed that meeting visitors from Malawi strengthened their desire to help people there. One student, after meeting the visitors, volunteered to travel to Malawi with the aforementioned Presbyterian mission, which she said she wouldn’t have done before taking the class.

Malawi was also chosen because it is a stable democracy (Cammack, 2012), whose government has made education in science and technology for all citizens, including women, a priority in its fight to reduce poverty (Ministry of Education, 2011). Malawi has many schools whose official language is English, so the likelihood of finding a suitable community partner was high. However, the schools are severely underfunded and lack equipment and supplies for teaching science labs, and attendance at high-school is still only 20% (UNICEF, 2011).

The fortunate discovery of Kalibu Academy began with an internet search for other outreach projects occurring at American universities in order to see what they were doing and how they were organized. Networking through social media yielded a connection to Osman at Kalibu Academy. The school is well-funded compared to many schools in Malawi and some of the college students were concerned that we were not targeting schools with the most need. However, this turned out to be of benefit because they have cool, dry buildings for properly storing the kits; they have some basic equipment, such as a microscope, which would be too expensive to send and increases the variety of experiments they can do; and we can contact each other by e-mail, which has been essential to the coordination of the project. The high school students of
Kalibu Academy are also well-positioned to do outreach projects of their own and to reach younger and/or poorer children directly. The college students particularly liked the idea of encouraging students at Kalibu Academy to become involved in civic engagement themselves.

The Project

BIO 113 is a biology course with a lab that fulfills the Scientific Discovery requirement for non-biology majors. The course has been taught three times (three sections) to a total of 66 students so far. Project Malawi is still in its infancy and continues to evolve into what we hope will be a long term project that lasts for many years, but it is already proving to be successful at fulfilling most of its goals. Below, we describe how BIO 113 and project Malawi has been carried out so far, as well as some results of a survey taken by the college students at the end of the most recent section.

BIO 113 consists of three one-hour lectures and one three-hour lab per week. During all three sections, the college students learned about the biology and epidemiology of infectious disease through a series of lectures and case histories that focused on a new disease each week. The focal diseases were selected to represent a wide range of causative organisms and because they have a common occurrence in either the USA or Malawi, or had been associated with recent outbreaks. Each new topic was accompanied by a documentary that illustrated either how the disease impacted a particular community, or how organizations such as the CDC or WHO intervened to prevent an epidemic.

The first few lecture periods were devoted to lectures and movies about Malawi, a discussion of the project, and organization of the students into teams. Students also viewed Malawian pop music videos in class, since pop music is something our students relate to. It was beneficial to be explicit about Project Malawi and our expectations from the beginning, particularly in terms of how much the project would contribute to the students’ final grades so that they could plan their time accordingly. The lectures on Malawi proved to be an essential component of the syllabus; 90% of the students revealed in a survey that before the course their knowledge of Malawi was poor or very poor, while only 10% rated their knowledge as good or excellent, and 90% perceived that their knowledge had improved after taking the course.
During the first few labs of the first section in 2011, the students learned some basic microbiology techniques such as aseptic technique, bacterial culture, Gram-staining, and microscopy. They also tried some experiments of their own to get a feel for what can be done, such as collecting, culturing, and identifying bacteria from various locations around campus (the field house showers and lab partners’ ears were popular choices). About four weeks in, one week was set aside for each team to come up with a simple lab exercise that could be done by high school students and to write a protocol. Next, the teams tested their own lab exercises to make sure they worked and to make adjustments to their protocol. During the remaining weeks, the whole class tried each other’s exercises. Each team was responsible for explaining the objectives and the protocol to their peers, a practice that enhanced their own understanding of the concepts. At the end of the course, the two exercises that were deemed “ready to go” by the instructor were packed into kits and mailed to Malawi. In addition to designing the exercises, the students were encouraged to design homemade lab equipment, so that the exercises would be repeatable even after the kits had been used up. The most successful initiative was the production of homemade culture dishes from cut-off soda cans that were sterilized in boiling water before being filled with culture media.

In the second (2012) and third (2013) sections, the students were given protocols written by previous students and asked to carry out the exercises with little or no prior explanation. They were told that they could ask for help, but were to simulate being a naïve consumer of the protocol and use their experience to help them edit the protocol for clarity. We did this because experiences during the first course indicated that writing clear lab protocols was more challenging than anticipated, requiring a lot of editing. It was a good learning experience for the students to edit them, rather than the instructor. All six of the protocols that have been sent to Malawi thus far are student-written but have been through several rounds of editing and testing. The process of developing, testing, and adjusting the exercises and protocols has been slow and may have led to some frustration at Kalibu Academy, but it instructed college students in the art of producing a well-tested, reliable final product.

In addition to designing experiments, the college students worked in teams to come up with and carry out small fundraising or public awareness ventures on behalf of Project Malawi. Some examples of ventures they came up
with include writing to fraternities, sororities and local businesses for sponsorship, selling Project Malawi bracelets on campus, organizing a Malawi movie night on campus, organizing a Project Malawi awareness week (with posters, flyers, and a table in the cafeteria), and holding a week-long, dollar-a-day fund raiser. To date, the students have raised $2,000 through these events. The students were graded for both their exercise protocols and their fundraising projects, which together made up approximately 30% of their final grade.

In addition to submitting an exercise protocol, the students also wrote a report, describing the execution of their exercises, their results and conclusions, and an account of problems encountered with suggested modifications. The grade for the exercise protocol and report was based on originality of the experiment and the quality of the protocol and report, including content, clarity, grammar, appropriateness for target audience, format, and attractiveness. The fundraising projects were harder to grade, since the students worked on these mostly outside of class. They were not graded on the amount of money raised or attendance at awareness events, but on creativity and effort. Throughout the semester, there were four “committee meetings” during class, chaired by one of the students, during which each team gave a presentation on their progress so far. The instructor and two confidential peer reviewers used these committee meetings to grade effort. While the fundraising project carried a substantial weight (10% of their final grade), it didn’t contribute enough to significantly affect a student’s letter grade unless they expended no effort at all. Students’ perceptions of the third section (2013) were assessed in a post-course survey, in which 22 students participated (figure 1).
<table>
<thead>
<tr>
<th></th>
<th>Agree – Strongly Agree</th>
<th>Neutral</th>
<th>Disagree – Strongly Disagree</th>
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<tbody>
<tr>
<td>After BIO 113 I was more informed about aspects of infectious disease that are relevant to me (such as vaccines)</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Before BIO 113, my knowledge of Malawi was good</td>
<td>10%</td>
<td>0%</td>
<td>90%</td>
</tr>
<tr>
<td>After BIO 113, my knowledge of Malawi had improved</td>
<td>90%</td>
<td>10%</td>
<td>0%</td>
</tr>
<tr>
<td>Meeting visitors from Malawi strengthened my desire to help people there more than just learning about it</td>
<td>86%</td>
<td>14%</td>
<td>0%</td>
</tr>
<tr>
<td>I believe that my education would be enhanced by visiting another country</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Service Learning is an important part of any liberal arts education</td>
<td>86%</td>
<td>14%</td>
<td>0%</td>
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<tr>
<td>BIO 113 was a valuable learning experience</td>
<td>95%</td>
<td>5%</td>
<td>0%</td>
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Fig. 1. Some results of a survey given to college students after taking BIO 113. 22 students participated.

Outcomes

Thus far, the outcomes of Project Malawi have been promising. Our first goal was to improve motivation and thus learning of biology by American college students in a non-majors infectious disease course. Motivation certainly seemed to have improved; the students were engaged in class and their average GPA was better than previous non-major courses (3.0 vs. 2.4). While GPA is not a very reliable measure for student learning in this case, since the course design was very different after adding a service learning component, it is supported by the finding that no students have dropped the course where as an average of 1 out of 10 students dropped previous non-major courses after the first exam. In
addition, the post-course survey revealed that 90% of the students perceived that they had learned a lot, while 71% strongly agreed and 29% agreed, that they had become better informed about topics that were relevant to them such as the efficacy of vaccinations. In course evaluations, 95% of the students agreed that the course was a valuable learning experience.

Our second goal was to enhance the college students’ consciousness of cultural diversity and to help them improve leadership skills. There is no doubt that the course enhanced the students’ appreciation for cultural diversity. Their knowledge of Malawi’s geography, demographics, culture, and music did improve. The opportunity to talk to missionaries and visitors from Malawi gave them an understanding of the everyday concerns of Malawian people, from their struggles with failing electricity to their love of soccer. In the post-course survey, 86% of the students stated that meeting people from Malawi strengthened their desire to help Malawian people in the future. 100% of the students perceived that learning about another country or visiting another country enhances their education in general, and 86% agreed that service learning is an important part of any liberal arts education. However, whether or not the class helped students to develop their leadership skills is less certain. While some fundraising teams did a good job and expended a lot of effort, many of them appeared uncertain about how to start, required more guidance than anticipated, and had trouble getting organized.

Our third goal was to excite Malawian high school students about science education and enhance their learning experience through hands-on experiments. Project Malawi appears to have instilled excitement in the high school students, who found the kits fun to use. It proved to be a motivating factor in encouraging them to join Osman’s science club. They were also excited to share photographs of themselves and to pin up photographs of their American partners on their classroom wall. Exchanging photographs made the high school students feel connected to students in the USA, and the knowledge that the college students appreciated their feedback gave them a sense of purpose. Osman’s fifth graders (n = 56) recently sat for their International General Certificate of Secondary General Education and all of them passed, with 90% of them earning a grade C or above and 11% earning an A+. This pass rate reflects a higher pass rate than previous years. Osman cites their improved motivation due to Project Malawi as a contributing factor. Our assumption that Project Malawi improved their
learning is supported by findings that hands-on experiments improve learning in other, similarly-aged groups of students (Holstermann et al., 2010).

Goal four was to engage the high school students in Malawi in outreach projects of their own. The students at Kalibu Academy have already been able to use the kits to successfully do some outreach themselves. They were able to culture coliform bacteria (an indicator of contamination with sewage) from a stream in a local community which serves as a source of drinking water for many families. In doing so, they were able to demonstrate to those families that the stream was contaminated with sewage from an upstream source and that if they use the stream as a toilet, they risk transmitting infections to other people further downstream. Cholera becomes a problem in Malawi during the rainy season, particularly in small communities which depend on overflowing streams for their domestic water. The Kalibu Academy students thought it would be a useful community project to see if they could culture Vibrio cholerae from local streams, and to test the water for pollutants at the same time. In response to their request, the college students sent them water testing strips (that test for common polluting minerals such as copper) and selective culture media (TCBS Cholera medium™, Oxoid, UK) for the culture and identification of V. cholerae, in preparation for the next rainy season. This is a good start and we anticipate that there will be more outreach opportunities in the future.

Lessons learned

Some lessons we have learned during the teaching of BIO 113 and the development of project Malawi are outlined below. Firstly, it proved beneficial to select a country to which our college already has some connections and to invite visitors from Malawi and from a local organization that regularly visits Malawi into the classroom. Instilling a feeling of personal connectedness to Malawi in the college students greatly improved their motivation for the class as well as their engagement in the lectures about Malawi. If our college hadn’t had that connection, I would have sought a local organization or church with a connection to Malawi and invited them to meet my students or get involved in the project. I discovered through talking to the students and through the survey that they knew much less about Malawi than I had expected; several of them hadn’t heard of Malawi. When talking to students about foreign countries, it is advisable to assume no knowledge on their part in the beginning.
Finding a community partner was much easier than expected. People in Malawi (and likely in other developing countries) value education and are motivated to participate in projects that promise to enhance it. Initial e-mails were passed around a number of interested parties until one of them connected with Osman in a surprisingly short amount of time.

It proved useful to select a community partner that has access to e-mail. Mailing items to Malawi takes several months and due to time differences and phone-line problems, telephone is not the best means of communication. Email was not only useful for coordinating the project, but provided a means for updates on the status of the kits. For mailing the science kits, private mail couriers such as FedEx turned out to be unrealistically expensive, but the US mail service proved to be cost effective and reliable. However, the cost of mailing items to Malawi is still high, so it was important for the college students to take weight of materials into account when designing exercises and to use plastics as much as possible.

Last year, some of the college students carried out a clothing drive for Malawian children, but this will not be repeated in the future. Many of the donated clothes turned out to be unsuitable, being in poor condition or only appropriate for cold climates. The cost of sending heavy items such as packs of clothing made the drive impractical. We did, however, find that small gifts are a good motivator for high school students. We sent them rubber bracelets with the words “Education is Power” printed in both English and Chichewa on them. Osman found these to be a good motivator for her students to join the science club.

Developing the kits and making sure that they were accompanied by well-written protocols has been a slow process. Initial plans and proposals underestimated how long such a project would take, which might have caused disappointment or disengagement for some community partners. Fortunately, Osman has been tenacious and patient.

The biggest hurdle to overcome has been keeping the college students on track with their fundraising projects. College students are often overcommitted and unused to working independently. Taking on a fundraising project was a daunting task for some of them, and their fear of failure likely led to lowered
motivation (De Castella and Byrne, 2013). Future classes will need more structure and guidance. The survey for formative assessment of the fundraising project was used as an opportunity for the students to suggest ways in which to better motivate the next class. Some of the students indicated that they have a need for deadlines and constant feedback in the form of a grade to motivate them. Another suggestion was to involve the students in one teacher-organized fundraising project, as well as letting them do their own, so that they can learn from example. Finally, several students suggested that a single class fundraiser might work better, with teams working on different aspects of it.

Conclusions

International service learning projects have been criticized in the past because, while their intentions are good, they can result in unforeseen, negative outcomes for both parties (Bryce and Brown, 2010; Crabtree, 2013), some examples of which are discussed below. Our experience thus far is that project Malawi has been a worthwhile endeavor for both parties.

The most obvious benefit provided by Project Malawi was that it improved motivation and learning (average GPA and retention in the class both increased) in the American college students by providing them with an immediate, clearly-articulated purpose for their learning of biology and by making the class more meaningful to them (Arwood, 2004; Brophy, 2004; Glynn, 2009). For this reason, we recommend adding a service learning component to any non-majors class.

Students also learned something of another culture. Admittedly, it was only a snapshot, but the technology available (e.g. the internet, YouTube etc.) made it a more realistic snapshot that they might have gotten a few years ago. We were careful not to reinforce a common perception that “the third world is inherently poor, needy, and underdeveloped” (Crabtree, 2013) by discussing the colonial history of Malawi and unjust global relations as well as showing them all walks of life in Malawi, including the more sophisticated city lifestyles of the residents in the capital city of Lilongwe. Students were also asked to critically reflect on social problems such as how the lack of infrastructure in developing countries contributes to the spread of HIV (Bruce and Brown, 2010). My own understanding of Malawian culture has been increasing over the years and my ability to accurately portray the country for my students is improving. The effect
of teaching a service learning class on the professor is rarely discussed, but I believe it has made me a better teacher.

Osman has reported that the kits enhanced learning for her students in two ways. The students enjoyed doing hands-on experiments and appeared to be more motivated because of it, which in turn may motivate more of them to take future science classes or even consider a career in science or medicine. Osman also reported that the kits helped her to explain difficult concepts and simplified the teaching process. Practical demonstrations of scientific phenomena are known to improve understanding (Holstermann et al., 2010).

We did experience some unforeseen problems which we are now taking steps to correct. For example, because of a limited number of appropriate microbiology experiments, there is a need to expand the project into fresh areas. With this in mind, we are now collaborating with Sarah Kennedy, a faculty member in our Chemistry department who is going to work with students to develop chemistry kits. I intend to recruit other faculty later. Fortunately, Westminster College values service learning efforts for tenure and promotion. I would caution those who are at other schools to think carefully before recruiting colleagues who may have other priorities.

In projects which aim to provide something that was previously non-existent, the end of the project (which in our case, happens when the kits expire or run out) often brings a sense of loss felt by the recipient community (Crabtree, 2013). Making the experiments sustainable was a major concern of ours. We spent a lot of effort designing experiments that didn’t require perishable parts and/or could be carried out with homemade equipment. We were also careful not to send overly expensive or sophisticated equipment because we wanted to demonstrate the ability to do science on a budget and encourage resourcefulness in the high school students rather than making them feel disaffection for their own circumstances (Crabtree, 2013). Rather than making the high school students feel like recipients of charity, which can instill feelings of disillusionment (Crabtree, 2013), we attempted to empower the students by asking for their help in providing feedback and by encouraging them to get involved in some outreach activities of their own, making the arrangement reciprocal and non-hierarchical (Bruce and Brown, 2010).
Our goal of developing the American students’ leadership skills was not realized; we were probably overly ambitious in our expectations for this goal. Organizing a single fundraiser is probably not adequate for the development of leadership skills, which are likely better developed through sustained, continuous practice. In retrospect, students are more likely to achieve this outside the classroom by participating in activities such as student government. I will continue to encourage the students to do fundraising for Project Malawi, as some of them expressed a sense of pride at having collected the money to pay for a particular item or shipment, but will not rely on it. We are beginning to explore external funding for the future and Kennedy recently received a grant from the American Chemical Society to produce the chemistry kits.

The key features of our project that have contributed to its success so far are sensitivity, collaboration, frequent communication, sustainability, and the ability to adapt to problems as they arise. Running a service learning project takes a lot of time and commitment on the part of the instructor, who should expect to continuously assess and modify what they do; but if the project is done properly, it can also be extremely rewarding for all involved.

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References


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