

# Exploring the Effectiveness of Interdisciplinary Instruction on Learning: A Case Study in a College Level Course on Culture, Aid, and Engineering

**Timothy Frank, P.E.**  
**Department of Civil and Environmental Engineering, USAF Academy**  
**USAFA, CO 80840, USA**

and

**J. R. Aldred, P.E.**  
**Department of Civil and Environmental Engineering, USAF Academy**  
**USAFA, CO 80840, USA**

and

**Alice Meyer**  
**Department of Foreign Languages, USAF Academy**  
**USAFA, CO 80840, USA**

## ABSTRACT

The opportunity for higher education students to study a topic through multiple, integrated angles is rare even though life outside of the classroom is filled with problems that require blending of knowledge areas to make appropriate decisions. The authors created a course at the United States Air Force Academy called Foreign Area Studies (FAS) 495 in the Spring 2012 semester that integrated African studies, economics, history, political science, literature, project management, military strategy, language, culture, and environmental engineering in the study of how foreign aid has affected Mozambique and how an engineering technology along with cultural consciousness can be effectively used for good. To determine effectiveness of the interdisciplinary approach, qualitative data from student reflection papers and in-class discussions were collected and analyzed. The intent of this paper is to highlight the challenges and lessons learned from developing a project based interdisciplinary course. Results suggest a project based course with interdisciplinary pedagogy can be effective in meeting course goals and increasing meaningful student learning.

**Keywords:** Interdisciplinary Education, African Studies, Cultural Consciousness, Environmental Engineering, Water Treatment, Project-based Course, Reflection.

## 1. INTRODUCTION

Though having potential to accommodate the growth in general knowledge over time and increase curriculum relevance [1], interdisciplinary teaching can take faculty out of their comfort zone and be a resource drain on teaching institutions. To provide some context, the Air Force Academy is an undergraduate-only institution of about 4,000 students and, while producing about \$70M in research per year, teaching is the institutional priority. Thus, faculty are not required to conduct research and they have the flexibility to collaborate with other departments as their interest and time permits. A

government run institution, only the top 10% of the well rounded, diverse applicants are accepted to the Air Force Academy. They come from all 50 states and beyond, and while there is no tuition, students must serve at least five years in the US armed forces upon graduation. Thus, many of them are inherently interested in service and learning about other cultures.

In September 2011, a sophomore civil engineering student at the Air Force Academy approached his Portuguese instructor and asked how he could combine his interest in engineering with his passion for volunteer service and empathy for the less privileged. This sparked collaboration between his Portuguese instructor, his academic advisor, and an environmental engineering instructor, each of whom shared similar excitement about humanitarian work in Africa, had experience overseas, and were energized by the student's inquiry. These three core instructors--the authors--decided to create a brand new course (Foreign Area Studies, FAS 495) for the spring 2012 semester so students could explore engineering in the developing world in a way that intertwined language and culture.

With such a broad, holistic vision for the course, it became quickly clear that no one person, nor even three people, had the expertise to deliver the fully conceptualized semester-long course. Further, we recognized that FAS 495 could be a very unique course for students at the Air Force Academy due to the extent of interdisciplinary inputs we planned to incorporate. Therefore, the three course leaders partnered with the local Scholarship of Teaching and Learning (SoTL) program to brainstorm ideas about course design, develop the means by which to assess the course impact, and seek out a variety of additional instructors who might like to be a part of the course.

Although almost any department could have had something to offer to the development of our course, we targeted five departments beyond our own for additional inputs to the course curriculum: history, literature, psychology, political science, and economics. History, political science, and economics were

chosen to provide a foundational base of knowledge that students could build upon. Literature and psychology were chosen to provide a holistic point of view of African cultures, intrinsic motivators and typical biases westerners might have towards Africans. All faculty who were approached had some connection to Africa and, despite an initial concern that faculty would not be willing to devote the time to create and teach a lesson for FAS 495, all were drawn by the course description and signed on unequivocally to help. Ultimately, a total of 18 different individuals led discussions in their respective area of expertise and share personal experiences.

As part of their vision for the course, the three core instructors believed a cultural immersion trip to Mozambique would be a great culmination to the course, and they applied for funding through the Air Force Academy Department of International Programs as well as through the US Air Force Africa Command. The trip was not a necessity for the course, but it would complement the course's learning objectives, allow for real-world application of a course project, and be an incentive for students to enroll. Mozambique was chosen as a good fit because of the reliance on the Portuguese language, the personal experiences of the instructors, and the ability to apply engineering technology to a relevant need in the country (water purification). While the instructors and students were hopeful for the cultural immersion trip, the course was ultimately designed to produce a tangible product to provide to a non-governmental organization (NGO) in Mozambique. This product gave the course a meaningful outcome even if the trip was not funded.

Even with the trip being tentative, by early December 2011, seven students enrolled in the course, exceeding the Registrar's minimum of five, and it was official that the course would commence, starting in about 30 days. Within the first 10 lessons, however, the enrollment dropped to five students as two determined they could not keep up with a seventh class in their schedule. This class would have been appropriate for students of any major, but of the five remaining students, three were environmental engineering majors, one was a FAS (Africa) major, and one was a FAS (Latin America) major.

## 2. DEVELOPMENT OF COURSE LEARNING GOALS

The Air Force Academy's overarching vision is *to develop leaders of character* and two specific institutional outcomes we focused on were 1) *intercultural competence and involvement* and 2) *understanding of civic, cultural, and international environments*. To achieve these outcomes, FAS 495 needed to be inquiry oriented, discussion focused, and relevant to the students after graduation rather than content focused. The three core instructors decided to offer a real-world, hands-on, under-defined service learning project-based course utilizing interdisciplinary instruction and an interdisciplinary student body. This course parallels recommendations by Badley and Habeshaw [2], in which they write that higher-ed teachers "will have to be...committed to a multi-discipline approach to learning."

### Fink's Taxonomy

The "Taxonomy of Higher Learning" [7] developed by Dr. L. Dee Fink was used as the backbone of development for FAS 495. The taxonomy focuses on six key criteria that are meant to be synergized throughout a course to facilitate optimal learning:

1. Learning how to Learn
2. Foundational Knowledge
3. Application
4. Integration
5. Human Dimension
6. Caring

On the first lesson, in order to fulfill the *caring* and *human dimension criteria*, students were introduced to the ongoing human suffering and humanitarian challenges in Africa. In subsequent lessons, *foundational knowledge* was incorporated through the various perspectives and experiences shared by the variety of instructors. *Application* and *integration* criteria were achieved by implementing the construction of a bio-sand water filter as an open-ended problem that would require the students to use critical thinking and a combination of ideas presented throughout the course. Finally, *learning how to learn* was incorporated through a lesson covering adult learning techniques and an assigned project that required students to develop a workshop to teach other adult learners in Mozambique how to construct their bio-sand water filter design.

The curriculum was also designed to incorporate different modes of learning. Class interactions and participation were intermixed with slides, videos, and hands-on activities to help enable more continuous engagement by all students in the class.

### Course Topics and Outcomes

Beyond the general vision stated for the course, as we developed the semester lesson plan, we realized that there were several main topics on which we would focus. More specifically, by the end of the course, we wanted our student to gain understanding into the following questions:

- What are some of the characteristics of the way of life for Africans?
- How did Africa get the way it is today?
- How has aid affected Africa?
- Can charity aid be employed effectively?

In particular, the topic of foreign aid became a critical component of the course because Africa's history of receiving aid has shaped its political system, economy, physical infrastructure, and environment. Furthermore, countless individuals and organizations today are dedicated to smaller scale charity aid. We believed that the students enrolled in this course would be interested and sympathetic to giving aid, but would want to become more informed about effective ways to provide aid in Africa.

These topical goals were linked to more general learning outcomes for the course:

- Increase cultural competency through multi-faceted, holistic learning about a country and its culture
- Research and make effective decisions to select and implement a humanitarian project in a foreign environment while demonstrating an understanding of existing cultural conditions
- Solve a real world humanitarian problem in a developing country through a hands-on service project and the proper application of cultural awareness, engineering technology, and community partnerships

### 3. INTERDISCIPLINARY CONSIDERATIONS

The key to an interdisciplinary course taught by multiple instructors is seamless integration from lesson to lesson to avoid a choppy, disjointed series of classes. The authors subscribe to the Jacobs [1] definition of *interdisciplinary* instruction where integration between disciplines is critical and differentiates it from multidisciplinary instruction. To encourage this seamless integration, the course goals were given to all instructors and the course director discussed the logic of the course flow and shared notes from previous instructors to those teaching subsequent lessons.

In an attempt to prevent what Jacobs [1] calls the “polarity problem,” where lack of clarity and tensions between subject matter experts inhibit learning, the three core instructors attended all the lessons, participated in the class discussions, and actively integrated the subjects together. Furthermore, by participating in each lesson, they modeled positive learning behaviors to the students, while showing their level of commitment to the students and the subject matter.

We should note that FAS 495 was not the precedent for interdisciplinary instruction at the Air Force Academy. Certain majors such as Foreign Area Studies are interdisciplinary between courses and some courses are co-taught in an interdisciplinary manner, but the extent and diversity of collaboration we accomplished in FAS 495 is unique at our institution.

#### Instructor Roles

The three core instructors divided the roles of executing this intensely interdisciplinary course among themselves and created three positions with associated responsibilities:

- Course Director
- Engineering Director
- Cultural Director

The course director was responsible for the administrative effort, developing the assignments, grading, overall curriculum development and integration, and locating and coordinating the 18 guest speakers.

The guest speakers represented faculty members at the Air Force Academy, external guest speakers, faculty and non-faculty who had been to Africa, a founder of an NGO in Senegal, and an executive from a company who does socially responsible, for-profit work extensively in Africa. The speakers and topics were designed to infuse the course with global sustainability challenges, appropriate technology, global water availability, and social aspects of sustainability, based on lessons learned from Bhandari et al [8].

The engineering director designed the course components involving the water filter. Overall, the engineering focus was closely aligned with existing learning materials created by the Center for Affordable Water and Sanitation Technology (CAWST) [3]. Not all of the students in FAS 495 were engineering majors, or were engineering majors with an extensive background in water treatment. Thus, we incorporated peer-to-peer learning and interactive activities in order to make the engineering components more manageable for the students with less background. Student comprehension of course material was ultimately evaluated during the

construction of the bio-sand water filter. As part of the engineering curricula block, the students also received a lesson on adult education and how to teach construction and maintenance of the bio-sand water filter. This approach applied Fink’s taxonomy per Widmann et al [9].

The cultural director designed course components involving the distinguishing characteristics of Mozambiquan culture and language. Students were able to understand that another culture is not wrong, just simply different. Having this understanding was crucial because even when one has the best intentions to help, one’s efforts can be misunderstood when they do not reflect the values of the society being helped.

Armed with this new cultural knowledge, students explored language. Cultures occur when people share the same beliefs and ideas, and language serves as a bridge for these interactions. Mozambique has 43 languages, one being Portuguese. All of the students in FAS 495 had had at least two semesters of Portuguese language instruction prior to the start of the course. Students came to understand that different languages can elicit different connotations such as intelligence, power, poverty or mistrust, which was helpful to their understanding of how their interactions with Mozambiquans might be received depending upon whether they communicated in English and/or Portuguese versus one of the local indigenous languages.

#### Syllabus Design and Implementation

Working together, the three core instructors designed FAS 495 with flexibility in mind. The syllabus consisted of five blocks of instruction:

- Background
- Portuguese
- Engineering
- Project
- Lessons learned / course take-aways

Because not all of the 18 guest instructors had experiences or knowledge that allowed them to exclusively focus on Mozambique, it was left up to each of them to tailor their discussion within the larger framework of Africa, Sub-Saharan Africa, former Portuguese colonies, or Mozambique as they felt comfortable. This approach kept instructors within their areas of expertise, allowed students to understand the relationship between a country and its neighbors, and provided a broader experience for students to potentially work in, around, or with in the future.

Only the first 12 lesson topics were planned prior to the start of the semester. Subsequent lessons were developed based on student feedback and what the instructors believed would best help students achieve the course learning goals. This led to students being able to steer the course to some extent based on their interests and curiosities. The course design was aligned with the template developed by Marshall, et al. [4] with the intention of students developing “personal ownership of the learning process.”

The addition of the geography and microfinance lessons were a direct result of student input and reflected the flexibility of the course. The final syllabus along with lesson topics is shown in Table 1 below.

**Table 1 – FAS 495 Syllabus**

Lesson	Topic
1	Introduction <sup>1</sup>
2	Pre-colonial African History <sup>2</sup>
3-5	African Literature <sup>2</sup>
6	Psychology <sup>2</sup>
7	Project Management <sup>1</sup>
8	Political Science <sup>2</sup>
9	Systemic Aid <sup>2</sup>
10-11	Economics <sup>3</sup>
12	Geography <sup>2</sup>
13	African Militaries <sup>2</sup>
14	Midterm Exam
15	Culture introduction <sup>1</sup>
16	Military Influence <sup>2</sup>
17-20	Language, Culture, and Education <sup>1</sup>
21	Humanitarian Work in Africa <sup>4</sup>
22	Environmental Issues in Sub-Saharan Africa <sup>2</sup>
23	Environmental Resource Management <sup>2</sup>
24-26	Water Treatment <sup>1</sup>
27	Project presentation, reflection
28-29	Workshop Pedagogy: How Adults Learn <sup>1</sup>
30	Microfinance <sup>3</sup>
31	Purpose Plus Profit: Working in Kenya <sup>4</sup>
32	Environmental and Economic Sustainability <sup>4</sup>
33-35	Workshop Development
36	US Air Force Experiences in Africa <sup>2</sup>
37	Military / Civilian Operations in Africa <sup>2</sup>
38	Economics, Politics, and Aid in Africa <sup>2</sup>
39	UN Work in Liberia <sup>2</sup>
40	Course Wrap-up, reflection, critique

<sup>1</sup>led by one of the three core instructors

<sup>2</sup>led by another faculty member

<sup>3</sup>led by a student guest speaker

<sup>4</sup> led by an external guest speaker

#### 4. ASSIGNMENTS

Reflection writing assignments, reflective discussion, and projects were integral to the course.

##### Reflections

Both the students and the three core instructors completed written reflections throughout the semester. Previous research, including Conway et al [5], has shown that, in order to more fully gain appreciation for and develop from service-learning activities, courses should include meaningful opportunities for reflection. Therefore, this course included reflection to promote student development and growth with respect to the service-learning components of the course.

The purpose of student reflections was metacognition on how the course might have affected them and for the course director to qualitatively assess student learning and development. For the instructors, the reflections were important to document lessons learned in the administration of a project-based interdisciplinary course. Student reflection assignments were without specific format or length requirements. The assignment instructions simply reminded the students of the course vision and objectives and asked them to document their feelings at that point in time. Written reflections were completed by each student on lessons 2, 15, 27, and 40. The reflection assignments

were collected and assigned a grade as either complete or incomplete, but were not read until the conclusion of the semester to avoid introducing instructor bias. It was expected that these reflections would provide evidence (or lack thereof) of students' ability to comprehend "personal and social implications" and "care about the subject," which Fink [7] emphasizes as important general course goals.

Additionally, in-class reflection discussions were conducted twice during the semester so students could share what they felt comfortable talking about and piggy-back on each other's thoughts. These were valuable for the course director to adjust curriculum and assignments later in the semester. For example, the students expressed an interest in lessons learned and how they might use their newfound knowledge in their lifetimes post-graduation. The instructors would not have known about this interest until after the semester was over if in-class reflections were not conducted. Therefore, the final, lessons learned block of the course was kept (despite the project taking longer than anticipated), and a final lessons learned assignment was created. This assignment allowed students to reflect on the effects of both systemic and charity aid and draw their own personal conclusions based on the entire semester's worth of class discussions. An individual presentation by each student was shared with the class for this culminating reflection assignment.

##### Projects

A real-world, hands-on service learning project was desired to be the focal point of FAS 495. In some ways this course can be considered a service-learning course, as one of the course objectives was to engineer a solution to the real problem of unclean drinking water based on deep understanding of the people's needs and culture as learned throughout the semester. Markus et al [6] concluded that service learning can help students develop a better understanding and awareness of the cultural concepts than strictly in-class discussions. Thus, not only did FAS 495 give students a chance to apply classroom knowledge of culture and engineering technology, but also it offered an opportunity for deeper learning and personal growth.

With the time constraint of one semester, we determined that there would not be enough time for students to learn some initial background information about Mozambique, the people, culture, and way of life then decide on a project to design and develop. Thus, instructors conducted some initial research, gave the students an idea for providing Mozambiquans an inexpensive, sustainable way to access clean drinking water, and showed them one way to do it through the use of a bio-sand water filter. On the first day of class, students were introduced to the class project and water filtration was discussed. After learning that only 61% of Africans have access to improved drinking water sources, instructors obtained student buy-in and transferred ownership of the project to them. This initial buy-in was crucial to tap into the intrinsic motivation already existing in the students and ensure it was a student-motivated project, not simply an instructor-mandated project.

For the course project (and evaluation of learning), students built a prototype bio-sand water filter using a design guide developed by CAWST. The students utilized the basic design and made a few strategic changes to facilitate construction with locally available building materials in Mozambique.

The downside of the time constraint and not letting the topic for the course project develop organically by the students, instructors wanted to provide students some type of open-ended, under-defined problem. Therefore, another class project was created separate from, and assigned before the bio-sand water filter project. This particular assignment modeled an application to the US Agency for International Development (USAID) Mission Director in Mozambique in which students had to take their knowledge of the challenges, culture, and way of life in Mozambique and apply it to choose an effective method for providing aid. Students were required to justify their selection, and create a logical business plan, cost estimate, timeline, implementation strategy, and clear, definable objectives and measures of success in the form of a single written report accomplished by the class as a whole.

The fact that only 51% of Sub-Saharan Africans live on more than \$1.25 per day stood out to many students, and the class chose to focus their USAID project on microfinance. Although microfinance had not originally been a planned topic for the course, the topic impressed the instructors and after an in-class discussion with the students, the instructors decided to integrate microfinance aspect of the USAID project into the real-world bio-sand water filter project. Subsequently, two Air Force Academy students who had started a non-profit micro-lending organization were invited to lead a lesson on microfinance principles, implementation, and possible integration with the FAS 495 project. The ultimate goal of the course project was now firm: for the students to teach and develop curricula that could be re-taught by an NGO in Mozambique on both water filtration using a bio-sand water filter as well as the development of a sustainable small business model focusing on selling and maintaining the bio-sand water filters.

## 5. RESULTS AND DISCUSSION

The FAS 495 course project resulted in a tangible bio-sand water filter, a written assembly / maintenance manual, and an outline for a workshop that could be provided to residents in Mozambique who might want to use the water filter. The student and instructor reflections and the project products provided tangible means to evaluate the course goals. Additionally, in-class observation and reflection discussions allowed the instructors to subjectively assess the course goals and the effectiveness of the interdisciplinary pedagogy.

### Course Project

In-class observation and some student comments showed that students struggled a bit with the underdefined real-world problem. Of the three class sessions dedicated to developing their workshop and build a prototype bio-sand water filter, the students were slow to get started and were looking from direction from the instructors on how to get started. With some encouragement, the group developed a plan of action and began work. They researched what tools and materials might be available to locals by asking guest speakers who had spent time in Africa and searching the internet. They had to construct some of the specialized tools required to build a bio-sand water filter, such as sieves for separating soil particles by size as shown in Figure 1 below, then completely assembled a prototype.



**Figure 1 – Student tests a soil sieve after constructing it from wire mesh and wood**

Application of the interdisciplinary lessons showed in the cultural understanding of the students' project write-up as evidence by their emphasis on locally available, sustainable materials, understanding of the economic and social systems of Mozambique, and anticipated challenges they documented. Using the materials provided from the adult learning class, the students developed an outline for a workshop to teach an NGO in Mozambique how to build and maintain the filter using locally procured tools and building materials as well as an educational curriculum on personal finance and micro-lending to assist the NGO on training entrepreneurs (similar to a train-the-trainer course). Although none of the students in the course traveled to Mozambique, the filter manual and workshop outline were provided to an NGO for implementation.

### Reflections

It was rewarding for the instructors to read the reflection papers once the course was over. It was clear that FAS 495 changed the mindset of the students and learning was achieved. With an open-ended project that emphasized cultural understanding as much, if not more, than technical content, the three core instructors were concerned that the students might not realize they learned anything and might not consider the course relevant. The reflections, however, suggest otherwise.

On lesson two, one student wrote, "being a FAS major with an emphasis on Africa, I already moved beyond most people's misconceptions about Africa and have a deep understanding for the region." The same student wrote on lesson 15, "I have lots to learn about Africa," on lesson 27, "realized how much I still need and want to study about Africa," and on lesson 40 that FAS 495 "was a tremendous growth opportunity for me." This student's journey was remarkable and if one of the more knowledgeable students in the class could grow this much, it's an indicator that other students may have grown similarly.

In addition to in-class discussions, the reflections also showed that students drew clear conclusions about aid and developed or altered personal convictions. One student commented she "really enjoyed the holistic approach" and it was "one of the best classes I have taken." Additionally, relevance of the interdisciplinary material was shown in several students'

references to applying the knowledge from FAS 495 later in life.

To complement the data collected by Marshall et al [4], students were asked to respond on a five point Likert scale (1 = not at all to 5 = extensively) how much each of 24 skills were developed by taking FAS 495. Figure 2 below lists all 24 skills and the range and mean student responses. Some of the skills that students reported as being most developed in FAS 495 include:

- Drawing on multiple perspectives to solve issues
- Considering a broader context when problem-solving
- Relating to people with backgrounds different from yours
- Being open to others' points of view

How Much did you Develop the Following Skills in FAS 495?

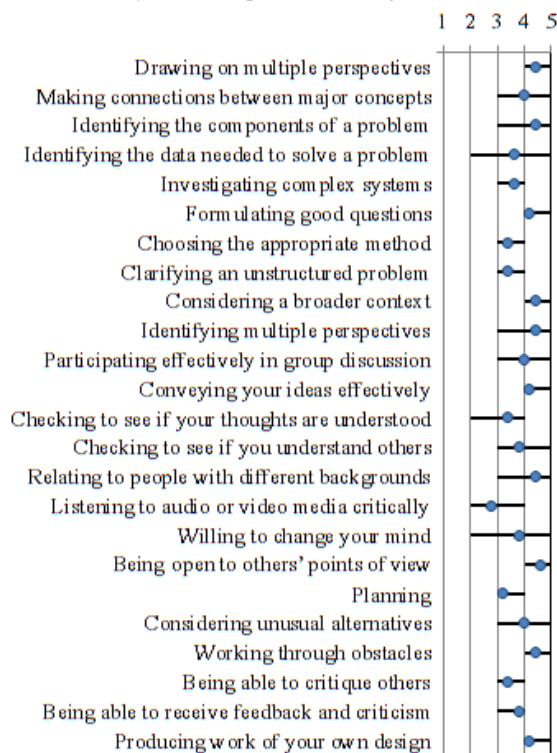


Figure 2 – Self-reported skill development as a result of FAS 495

These results were very encouraging for the three core instructors and support the two specific institutional learning outcomes that we discussed previously (*intercultural competence and involvement and understanding of civic, cultural, and international environments*). We strongly believe the development of these institutional outcomes will prepare our students for the global demands of young professionals, especially those in the military. Of the five skills least developed by FAS 495, three were somewhat surprising. *Choosing the appropriate method to solve a problem, clarifying an unstructured problem, and planning* were skills that students reported they did not develop as much as others through FAS 495. It was expected that a real world, underdeveloped project would develop these three skills, but it is believed that students either felt constrained by the time limitations of the semester or may have felt steered into a specific solution by the instructors. Overall, every student reported at least slight development in

every skill in Figure 2, which was a positive result of the course.

Reflections also indicated students particularly enjoyed the guest speakers from outside the Air Force Academy faculty. It is deduced that they provided realism and credibility that faculty could not, similar to the positive results drawn by Nielsen et al [10] in which outside experts were consulted and worked with students on a class project. Furthermore, multiple students commented the diverse background among the students in the class in addition to instructor diversity contributed to the learning experience.

## 6. LESSONS LEARNED AND FUTURE DIRECTIONS

A great deal of time planning, locating instructors, and developing meaningful curriculum and assignments went into FAS 495. All the instructors, especially the core three, were passionate, which helped despite other intradepartmental priorities. If this course is to be offered again, it should be easier to execute and take less planning time; however, with a high faculty turnover rate at the Air Force Academy, an interdisciplinary course like this can never be identical from one semester to the next.

### Real-world Projects

All real-world projects would be better than one real world project and an artificial USAID project. Students did not respond as well to this project and had trouble bridging from it to the bio-sand water filter project. The primary challenge in the spring 2012 semester was time. More time is needed to allow the students to learn about a region, culture, way of life, etc., then choose a focus area, and finally develop a solution.

### More Time

To combat this time constraint, an interdisciplinary course like FAS 495 which deals with foreign culture should be spread out across multiple semesters. So as to not become a coursework overload for a student to take outside of their graduation requirements, students could use an initial cultural immersion trip to develop relationships in-country and get a feel for what kind of project might be effective. The trip could be followed up by a full semester course, where students already have the background and an idea to further develop into an executable project. Alternatively, if lack of funding prohibits a trip, a full semester interdisciplinary course could be followed up by an independent study course to fully develop the project into something executable. A trip or some sort of cultural immersion should be an integral part of a course like FAS 495, but not necessarily all interdisciplinary courses.

Alternatively, if students are not willing or able to devote more than one semester to this type of course, multiple semesters could build-off of each other, for example the fall 2012 offering of FAS 495 could include the same type of background information on history, economics, culture, etc. but that group of students would continue to develop the micro-lending and bio-sand water filter project where the spring 2012 semester left off. Extending the project or even executing similar project in the same country or region could assist the faculty in developing a rapport with government officials or NGOs as partners in the process.

### Expanded Influence

As this project gets implemented through NGO-led workshops, the role of microfinance could be spread as a force multiplier for entrepreneurship and as a means of increasing the health of Mozambiquans by providing bio-sand water filters for clean drinking water. The FAS 495 class project was truly a double win-win. Students benefited from the learning process of developing a cultural conscious hands-on project to benefit the people of Mozambique. The benefits could grow indefinitely through the region as time and manpower permits to lead more workshops and locate more entrepreneurs. Working with a local university could amplify our efforts and introduce peer collaboration among students from different cultures as well.

### Codified Interdisciplinary Courses

Based on student feedback for FAS 495, interdisciplinary courses can be successful in achieving the learning outcomes and making a course fun and rewarding for students. More interdisciplinary courses should be codified where practical, especially those where not only the instructors are interdisciplinary, but so too is student body. To not impose an undue amount of work on faculty, departments and interested faculty should look for ways to make existing curricula interdisciplinary. For example, the capstone civil engineering course at the Air Force Academy includes not only civil engineering majors, but also systems engineering majors. Faculty that teach this course get credit for teaching a majors course and all students enrolled fulfill a graduation requirement. These types of courses might be a way to incorporate more interdisciplinary instruction and integrate students from diverse majors without increasing the overall workload for faculty as a whole.

## 7. CONCLUSION

The primary outcomes of FAS 495 included a rewarding interdisciplinary teaching experience for the instructors and a significant learning experience for the students. When trying to employ instructors from different disciplines, no matter the subject matter, it was helpful to identify a universally appealing underlying theme, i.e., helping people with basic sanitation needs.

The diverse backgrounds of the students in addition to the faculty was beneficial in assembling the interdisciplinary skills and critical thinking required to complete a challenging real-world humanitarian project. As the semester progressed, students took ownership of the project and influenced the direction of the course to meet their unique interests in African culture and humanitarian work. This flexibility contributed to the course's success.

Through extensive in-class observation and a series of student reflection assignments, the instructors determined that relevance

was achieved and that significant learning occurred. The interdisciplinary pedagogy of FAS 495 resulted in both a tangible product that will be employed in a cross-cultural environment as well as lasting knowledge and attitudes.

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