

Expanding Engagement Opportunities at a Large Land-Grant Research University: The Engagement Ecosystem Model

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Abstract

How does a public university with over 80,000 students across 24 campuses provide every student with an engaged scholarship experience? This article chronicles the first steps of this ambitious journey to educate a new generation of engaged scholars by building engagement ecosystems: networks of students, faculty, courses, and communities working together on compelling socially relevant projects around a common theme. By incorporating projects from an impact-focused community engagement program into a cross-section of existing classes, universities can expand engagement opportunities from a select few to the vast majority of the students. This article reviews current approaches to scale engagement opportunities before describing the principles and mechanics of the Engagement Ecosystem model. A case study of the pilot implementation of this model is presented with preliminary assessment results ($n=1,165$), key lessons learned, and future expansion plans.

Introduction

Now more than ever, in the heart of the engaged scholarship movement, there is high student and faculty interest in engaging with communities, locally and worldwide. As of 2015, 361 colleges and universities have demonstrated their commitment to integrating engagement into the mission and operations of their institution by earning the distinction of the Carnegie Community Engagement Classification (Carnegie Foundation for the Advancement of Teaching, 2015). Unfortunately, despite strong interest and commitment, only a limited number of students and faculty members get involved in engagement opportunities (Association of American Colleges and Universities, 2009). Universities are innovating and adopting a plethora of approaches to expand engagement opportunities from a select few to the vast majority of the students. Depending on their size, location, history of engagement, and access to resources, there are different kinds of approaches to integrate and expand engagement opportunities:

(1) Engagement within or outside of class time. Expecting students with packed schedules to commit their time outside of class voluntarily to community engagement may not be reasonable. At the same time, many courses have no room for integrating engagement into class time. Jenkins (2011) arranged for her students to complete service learning during regularly scheduled class time and reported that the negative impact that reduced

face time might have had on her course outcomes and course evaluations was offset by the positive impact of the service-learning project. Jenkins's model solved the problem of engaging students with significant demands on their time, but she had to alter her course's learning outcomes to integrate the engagement experience.

(2) Engagement championed by individual faculty members or a college- institution-wide approach. UMASS-Lowell's College of Engineering has integrated service learning into all of its core courses (Duffy, Barrington, West, Heredia, & Barry, 2011), while smaller institutions like Tougaloo College and Wittenberg College have made service learning a requirement for all students (Tougaloo College, 2015; Wittenberg College, 2015). Some universities have been successful in attracting resources from private donors to support more faculty and students getting involved (Weerts & Hudson, 2009; Cornell University, 2015), while others have raised funds by increasing tuition after a successful student vote (Bernhardt, 2015). All of these college- and institution-wide models require significant resources and may not be feasible at larger institutions where the number of students would likely overwhelm community partners and would require heavy commitment from a large number of faculty. It would also not be feasible to require all students to do service learning in areas with low population densities, i.e. rural areas where land-grant institutions are located and there are relatively few community partners to work with.

(3) Real-time engagement or virtual experiences. While real-time, in-person community engagement is the norm, virtual approaches to develop student competencies and prepare them for deeper engagement have been championed. Michigan State University has integrated online lessons (“Tools of Engagement”) that introduce students to the concept of university-community engagement and develop their community-based research and engagement skills (Michigan State University, 2015). The online lessons are a scalable approach to get more students interested in community engagement because they are created once for use over and over again, are relevant to students from all disciplines, and can be integrated into existing courses. At the individual course level, a faculty member created a virtual service-learning project for his online students where they used the website Appropedia.org to coordinate an information campaign on saving money and energy by retrofitting traffic lights with LED bulbs (Pearce, 2009). Another course used a problem-based service-learning model where students acted as consultants for a nonprofit, completing and delivering commissioned assignments to them via email (Dallimore, Rochefort, & Simonelli, 2010). Both the Appropedia and problem-based service-learning projects provided non-travel-based engagement experiences where the project enhanced course-based learning while delivering valuable services to a community partner.

Alongside these approaches, there is a need for new organizational and pedagogical models that overcome the barriers of limited time and financial resources for students and faculty and limited access to community partners. The quest is for lean and scalable organizational models that can seamlessly integrate virtual and in-person engagement, in-class and community-based activities, and involve faculty and students in different ways with different degrees of engagement. A balance between delivering self-determined community impact and developing students’ engagement-related learning outcomes that encourages deeper engagement is essential. At Penn State, we are testing various models to determine how to get every single one of our 80,000 undergraduate students across 24 campuses—a diverse student population ranging from freshmen through adult learners, online distance learners through returning military veterans on campus—to graduate with an engaged scholarship experience by 2020. This monumental goal, reflected by other comparable

institutions, cannot be achieved via a singular approach or definition of engagement; rather, we need a multiplicity of organizational, operational, and pedagogical models that meet the needs of students, faculty, departments, and colleges with varying priorities and buy-in for community engagement.

One potential program architecture is the Engagement Ecosystem (EE) model that focuses on carving out projects from impact-focused community engagement programs in the United States and abroad and integrating them into classes that do not have an engagement component. An impact-focused community engagement program is a program where students work shoulder-to-shoulder with diverse partners to develop, incubate, and launch self-sustaining projects identified by community partners. This article delves into the architecture, logistics, and mechanics of the EE model. A case study of the EE model, from the spring 2015 semester, is presented with results and discussion of the assessment approach in terms of impact on students and faculty. This article is of particular interest to universities striving to expand their engagement opportunities in a lean fashion without overwhelming community partners.

The Engagement Ecosystem Model

Similar to other large land-grant universities, Penn State has countless opportunities for students and faculty to engage with the world outside of the university through a wide assortment of majors, minors, and certificates; over 200 study abroad programs; and research and engagement centers with diverse thematic and geographical foci. Despite countless opportunities to engage with communities, many faculty and students do not get involved. Over a three-year period, Penn State’s Service Learning-Student Engagement Task Force (2012) identified several factors that contribute to students and faculty members not participating:

(1) Students want to partake in community engagement efforts but struggle to integrate them into their busy schedules, cannot afford travel-based experiences, or find out about such opportunities too late in their academic career.

(2) Many faculty members are interested in starting community engagement programs but don’t know how to proceed and get institutional buy-in. Established programs with regularly offered courses and engagement experiences often do not have sustainable revenue models to sup-

port faculty and student travel which compromises their ability to recruit students year-after-year, and lower student numbers further hurt program sustainability. This results in many programs shutting down after a few years when the faculty get burned-out. Community relationships often get frayed when this happens.

(3) Numerous faculty members want to play a role in community engagement but do not have the desire, time, or experience to directly engage with communities. Rather, they would like to work on meaningful projects that are mediated by reliable and more experienced faculty or staff members with strong community partnerships.

How can we integrate different kinds and levels of faculty and student interest across the engagement continuum that spans from learning about engagement to stand-alone short-term experiences to long-term impact-focused collaborations? The EE model engages students early in their college career while building pipelines into impact-focused programs. Experienced consultants help faculty members embed meaningful projects into existing courses to form engagement ecosystems: networks of students, faculty, courses, and communities working together on compelling socially relevant projects around a common theme. Depending on the nature of their course, their personal preferences, and departmental buy-in, faculty participate in this ecosystem in different ways. Courses involved at low and medium degrees of engagement tend to focus on lower-division students and serve as pipelines for the high degree and impact-focused courses and programs. While a small group of students travel and work directly with communities to address problems around this theme via the impact-focused program, six courses work on projects that directly help the impact-focused courses, and another twenty courses can offer students an exciting learning experience directly related to the community project. Students that do not physically travel can have their “minds travel” by working on projects that are based in different cultural and geographical contexts.

This innovative ecosystem model has been validated before with a single professor teaching two courses but engaging over 800 students in 12 other courses in engagement experiences (Mehta, Brannon, Zappe, Colledge, & Zhao, 2010). To test its ability to strengthen students’ engagement-related competencies in a lean and sustainable manner, engagement ecosystems can be built using these five tenets:

(1) Participating in the ecosystem is elective.

(2) The ecosystem has broad themes that are relevant across the university. Having broad themes such as water, digital music, and geriatric care make it easy to get buy-in and develop projects for courses across multiple colleges. Ecosystem themes emerge organically based on societal relevance, community demands, and alignment of the ecosystem’s theme with faculty members’ courses and research interests.

(3) The ecosystem is built around an impact-focused community engagement program to bring realism to the projects and ensure that the collective efforts lead to self-determined and sustainable short-term and long-term impacts for community partners. The impact-focused program can have a local or global focus but must espouse the core principles of engagement: it must be responsive to, respectful of, and accessible to community partners.

(4) Faculty and support staff work with participating professors to carve out projects related to the overarching theme. The degree of engagement should be tailored to the flexibility of the course so that projects within the ecosystem fall on a spectrum of engagement (Figure 1) with opportunities for students to engage at a low to high degree with both travel and non-travel-based experiences (Table 1). For more introductory courses with a strict schedule of content, lower degree projects are implemented that entail a lower percentage of the course grade as well as lower impact and relevancy for the high impact program, with the primary objective to enhance student learning. For courses with more freedom in the curriculum, larger projects worth a larger portion of the final grade, and tighter coupling with the impact-focused program are implemented.

(5) Courses involved need to have a project component, which opens the door to integrating projects where students take their class-specific knowledge and apply it to a problem presented to them that relates to the theme and is defined and driven by real needs of the impact-focused program. To be successful in the course, students must understand theme-related content and meld this knowledge with their own findings to reinforce the class-specific learning outcomes while gaining additional competencies in engagement-related learning outcomes.

Figure 1. Ecosystem Engagement Spectrum

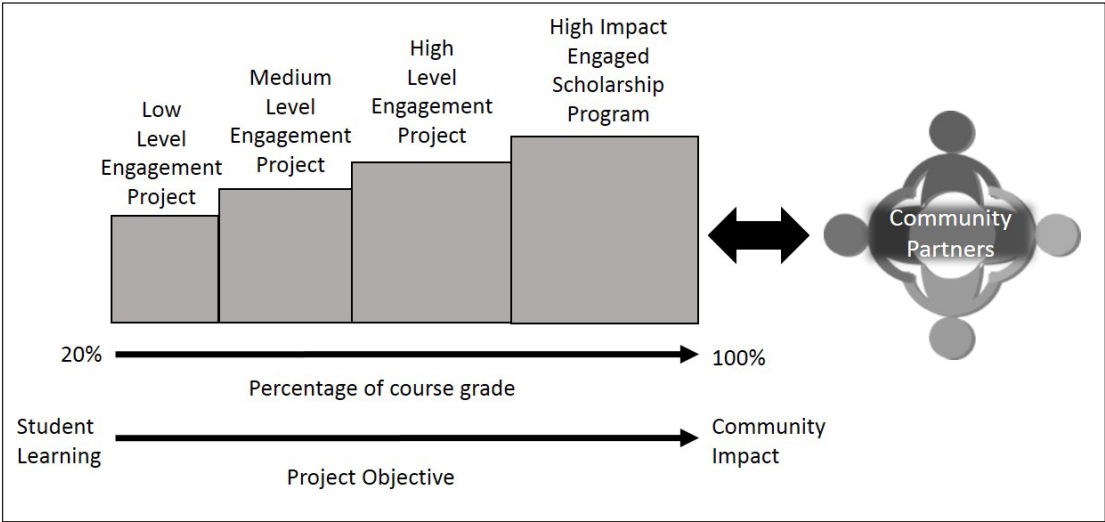


Table 1. Degrees of Engagement

Impact-Focused	University members and community members work shoulder to shoulder on projects relevant to one or more community partners. Objective is completely geared toward community impact with student learning as a natural byproduct.
High	Students complete projects that are directly relevant to an impact-focused program. Specific project is carved out of the program to be developed by a course directly focused on that topic to bring in necessary expertise.
Medium	Students complete projects that can be useful to impact-focused program but are geared more toward enhancing student learning and stimulating excitement about being partly involved in the program.
Low	Students complete projects that are relevant to impact-focused program and are geared solely toward enhancing student learning and stimulating excitement about getting involved in the program.

Spring 2015 Pilot Case Study: HESE Ecosystem

To illustrate how the EE model can be implemented, we present a pilot case study with an ecosystem built around Penn State’s Humanitarian Engineering and Social Entrepreneurship (HESE) program. The HESE program engages about 50 students every semester in the rigorous research, design, field-testing, and launch of technology-based social enterprises in resource-constrained environments. HESE ventures are multi-year endeavors that have emerged organically from engagement with developing communities in countries including Kenya, Mozambique, and Sierra Leone. Faculty-led multi-year ventures provide students with immersive frameworks for learning, research, and entrepreneurial engagement, while advancing ventures towards large-scale dissemination. HESE ventures include affordable greenhouses, telemedicine systems and low-cost diagnostics to screen for diabetes and urinary tract infections. For the engagement ecosystem pilot, the greenhouse and test strip

venture teams identified sub-projects to integrate into courses in the ecosystem. Additionally, themes relevant to HESE, including international development and design for low-resource contexts, were integrated into courses in the ecosystem.

A recent graduate was hired by Penn State’s Council on Engaged Scholarship as a research and coordination assistant—i.e. an ecosystem manager—to help build and manage ecosystems. Personal networks and campus-wide listservs were leveraged to identify faculty members with an interest in aligning their course projects with the HESE ecosystem. Lower level general education courses were particularly targeted to get freshmen and sophomores involved. Once interested professors were identified, the ecosystem manager and the director of HESE met to discuss the content of the interested professor’s course(s) and how a HESE-related project could be integrated into the course.

After the initial meeting, projects were developed through emails and further meetings

between the professors, the ecosystem manager, and the HESE director. Once professors approved the project and assigned it to their students, the ecosystem manager provided additional resources for the courses. A website was created to provide a background of the HESE program and its philosophy, the operational context (geographical and cultural), content of the HESE courses, and specific information about the ventures. For courses that required a significant amount of background in the content of the HESE courses, an introductory seminar course on Design for Developing Communities (EDSGN 453 – see Table 2) was streamed live and made available on-demand for all students. To answer specific questions about HESE and projects as well as get students excited about their projects and role in the ecosystem, the ecosystem manager, as well as the HESE director and students directly involved in HESE ventures, visited the courses on an as-needed basis. The ecosystem manager answered additional questions from both professors and students in the ecosystem via email throughout the semester.

Figure 2 shows the breakdown of the degrees of engagement at which courses were engaged and Table 2 provides detail on the specific projects given to courses in the HESE ecosystem.

Preliminary Assessment of Engagement Ecosystem Model

To assess the efficacy of the EE model for scaling engagement, we assessed the impact of the activities on the students’ self-reports related to one or more of four engagement-related learning outcomes: multicultural awareness, civic responsibility, ethical decision-making, and systems thinking. We were specifically interested in whether students in the non-travel-based courses would have similar learning outcomes as those students who participated in the travel-based impact-focused program. Specifically:

(1) Would the students in the ecosystem overall significantly improve in any of the learning outcomes from pre-test to post-test?

(2) Would the students in the lower-intensive pipeline courses generate any significant learning outcomes from pre-test to post-test?

(3) Which courses were most successful in building student competencies in the engagement-related learning outcomes? What were their effect sizes?

Participants and Procedure

The preliminary assessment targeted a total enrollment of 1,165 students in the ecosystem from 14 courses instructed by 15 faculty members. Due to the varying course objectives and time that could be devoted to an assessment, each course instructor chose the learning outcomes that best fit with their course’s project and which survey would be most appropriate for assessment. Table 3 displays the learning outcomes assessed in different courses. For this initial pilot, a control group was not used because the courses did not have several sections and splitting the classes in two would have presented additional difficulties for the professors.

The instructor administered the paper-and-pencil surveys to students at the beginning and end of the course. Students’ participation was voluntary. Response rates on pre-test and post-test were 82.5% and 52.5% respectively (see Table 3). The response rate declined dramatically because four instructors did not involve their students in the post-test due to time and curriculum issues. Further explanations of the drop-out rate from pre- to post-survey are in the Discussion section. Table 4 displays students’ demographic information.

Figure 2. HESE Pilot Ecosystem: Student Metrics

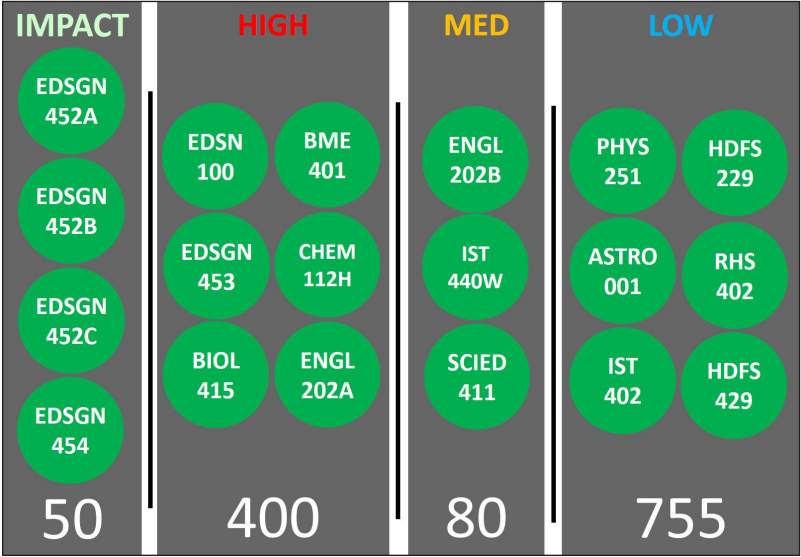


Table 2. Course Projects in Engagement Ecosystem

Course Name	Student Project Description	Course Enrollment	Course Grade %	Degree
HESE Teams				
EDSGN 452A	Worked on research, design, testing, commercialization, business model, and implementation of greenhouse venture	17	100	Impact-Focused
EDSGN 452B	Worked on research, design, testing, commercialization, business model & implementation of test strips venture	12	100	Impact-Focused
EDSGN 452C	Developed new ventures around telemedicine systems and biomedical devices	17	100	Impact-Focused
EDSGN 454	Traveled to project sites for 3 weeks to field-test technologies, implement business models, & gather data for research projects, working closely with community partners.	26	100	Impact-Focused
EDSGN 453	Learned about humanitarian engineering, user-centered design for affordability, and social entrepreneurship	51	100	High
Greenhouses / Food Security				
EDSGN 100	Developed design solutions to keep greenhouse material sturdy at corners	96	40	High
BIOL 415	Created brochures on best management practices of pest management for greenhouses	45	35	High
ENGL 202A	Created grant proposals, literature reviews, and brochures for greenhouses	46	50	High
ENGL 202B	Made videos on greenhouses for HESE teams to show to smallholder farmers, donors, and students	48	30	Medium
ASTRO 001	Created brochures about motion of sun as it relates to the placement of greenhouses	152	20	Low
Test Strips / Global Health				
EDSGN 100	Developed design solutions for administering test strips to patients	64	40	High
CHEM 112H	Solved problems around speeds and sensitivities of the test strips, and stabilities of the tests to field conditions	32	45	High
IST 440W	Improved simple health equipment to collect basic data alongside the test strips	29	30	Medium
SCIED 411	Designed & tested a short lesson on urinary tract infections	4	30	Medium
IST 402	Interviewed former test strip team member to learn about emerging issues with technology	5	20	Low
HESE Topics				
BME 401	Provided specific design insights based on simulations and prototyping pertaining to the biomedical devices being designed by the HESE teams.	67	50	High
HDFS 429	Wrote paper about risk and resiliency of children in Sierra Leone after the civil war & Ebola outbreak	79	20	Low
PHYS 251	Completed activities on physics in low resource contexts (i.e. reflective solar water heaters and origami microscopes)	250	20	Low
HDFS 229	Guest lectures on toys in developing countries versus the US and their role in infant and child development	164	20	Low
RHS 402	Completed outside learning activities and presented on RHS topics in countries that HESE works in	45	20	Low
Abbreviations EDSGN 452A – Greenhouse Team EDSGN 452B – Test Strip Team EDSGN 452C – Other Project Teams EDSGN 454 – Field Experience EDSGN 453 – Seminar EDSGN 100 – Introduction to Engineering Design BIOL 415 – Ecotoxicology ENGL 202A – Writing in the Social Sciences ENGL 202B – Writing in the Humanities ASTRO 001 – Astronomical Universe CHEM 112H – Honors Chemical Principles II IST 440W – Information Sciences and Technical Problem Solving SCIED 411 – Teaching Secondary Science				

Table 3. Number of Surveys Collected and Learning Outcomes Assessed on Pre- and Post-Tests

Degree	Course	Registered	Surveys Returned			Learning Outcomes			
			Pre	Post	Pre-Post Matched ^a	MA	CR	EDM	ST
Impact-Focused	HESE	45	39	34	27	✓	✓	✓	post
High	EDSGN 100	160	155	109	76	✓		✓	
	BME 401	67	65	72	59			✓	
	BIOL 415	45	39	41	31			✓	
	CHEM 112H	32	27	18	11		✓		
	ENGL 202A	46	24	29	14	✓	✓		
Medium	ENGL 202B	48	41	39	27		✓		
	SCIED 411	4	3	--	--	pre	pre	pre	
Low	PHYS 251	250	209	--	--	✓	pre		
	ASTRO 001	152	120	63	37		✓		
	RHS 402	45	20	--	--				
	HDFS 229	164	129	142	113	✓			
	HDFS 429	79	68	65	48				✓
	IST 402	28	22	--	--	pre	pre	pre	
Totals		1165	961	612	443				
Key MA – Multicultural Awareness CR – Civic Responsibility EDM – Ethical Decision-Making ST – Systems Thinking									

Measures

The engagement-related learning outcomes assessed were drawn from the Association of American Colleges and Universities (AAC&U) essential learning outcomes. We employed VALUE rubrics developed by the AAC&U as a foundation to develop assessment tools such as rubrics and self-report surveys for multicultural awareness, civic responsibility, ethical decision-making, and systems thinking. In this preliminary assessment, we only used the self-report

surveys. Survey items were written based on rubric descriptions or were adapted based on existing scales or concepts in literature (Caban, 2010; Frank, 2004; Kuusisto, Tirri, & Rissanen, 2012); Olney & Grande, 1995; Simonis, 2009). Table 5 demonstrates example items from the four scales. Students rated each item on a four-point Likert-type scale that ranges from 1 (strongly disagree) to 4 (strongly agree) or from 1 (never) to 4 (often). An average score across the items represents a student's score on that learning outcome. Data

Table 4. Demographic Information of the Sample in Pre-test and Post-test

	Demographic Variable		Pre-test		Post-test			Demographic Variable		Pre-test		Post-test	
		N	%	N	%			N	%	N	%		
Gender	Female	527	54.8	373	60.6	Race	American Indian/Alaskan Native	4	0.4	2	0.3		
	Male	420	43.7	230	37.6		Asian	114	11.9	67	11.0		
	Transgender	1	0.1	1	0.2		Black/African American	49	5.1	24	3.9		
	Missing	13	1.4	8	1.3		Native Hawaiians and Pacific Islander	3	0.3	3	0.5		
	First Year	306	31.8	239	39.1		White	705	73.4	473	77.3		
Class standing	Sophomore	152	15.8	74	12.1	Hispanic or Latino	Other	33	3.4	19	3.1		
	Junior	327	34.0	183	29.9		Missing	53	5.5	24	3.9		
	Senior	143	14.9	98	16.0		Yes	60	62	572	93.5		
	Super senior	21	2.2	10	1.6		No	885	92.1	32	5.2		
	Missing	12	1.3	8	1.3		Missing	16	1.7	8	1.3		
College	Agricultural Sciences							45	4.7	12	2.0		
	Arts and Architecture							12	1.3	7	1.1		
	Business							18	1.9	13	2.1		
	Communications							30	3.1	24	3.9		
	Earth and Mineral Sciences							13	1.4	5	0.8		
	Education							75	7.8	64	10.5		
	Engineering							232	24.1	191	31.2		
	Health and Human Development							170	17.7	113	18.5		
	Information Sciences and Technology							22	2.3	4	0.7		
	Eberly Science							154	16.0	60	9.8		
	Liberal Arts							75	7.8	54	8.8		
	Nursing							13	1.4	11	1.8		
	Undetermined							38	4.0	26	4.3		
	Missing							64	6.7	28	4.6		
	International	Yes							52	5.4	38	6.2	
No							897	93.3	567	92.7			
Missing							12	1.3	7	1.1			

supported the unidimensional structure of the four scales with all Cronbach's α values greater than 0.80 (Table 5).

In addition to using the self-report surveys to assess student learning outcomes, we designed a faculty survey to gather instructors' feedback. The survey included 13 short answer questions covering topics such as perceived benefits and costs of incorporating engagement activities into the curriculum, reflection on collaboration and communication, and satisfaction with and future in-

volvement in community engagement. The online survey was emailed to the course instructors at the end of the semester.

Data Analysis

We used paired t-tests to examine whether students had significant gains across the semester. However, since more than one t-test was conducted, the p-values of the later tests were adjusted by dividing 0.05 by the number of tests conducted to avoid inflation of Type I error. Since signifi-

Table 5. Definitions, Example Items, and Internal Consistencies of the Four Scales

Scale	Expected Learning Outcomes	# of Items	Example Item	Cronbach's α	
				Pre	Post
Multicultural Awareness	To demonstrate sensitivity toward human differences and apply diverse perspectives to complex subjects.	12	I am sensitive to the feelings of culturally different others.	.825	.809
Civic Responsibility	To identify civic identity and to demonstrate an ability to work collaboratively and effectively within community contexts to achieve a civic aim.	12	I think that people with more social resources should help people with needs.	.861	.854
Ethical Decision-Making	To develop a sense of personal integrity and clarify personal values, and to apply knowledge and abilities to solve societal problems in ethical ways.	14	I try to consider another person's position when I face a conflict situation.	.832	.861
Systems Thinking	To use a variety of inquiry strategies incorporating multiple views to make value judgments, solve problems, answer questions, and generate new understandings.	18	I examine how different parts of a system may influence each other.	.857	.885

Table 6. Descriptive Statistics of Four Learning Outcome Scores by Engagement Degree

Learning Outcome	Engagement Degree	N ^a	Pre	Post
Multicultural Awareness	Impact-focused	27	3.33 (0.404)	3.40 (0.342)
	High	90	3.03 (0.386)	3.10 (0.321)
	Low	147	3.09 (0.380)	3.14 (0.355)
	Total	264	3.09 (0.392)	3.15 (0.351)
Civic Responsibility	Impact-focused	27	3.41 (0.395)	3.36 (0.330)
	High	25	3.13 (0.320)	3.12 (0.348)
	Medium	27	3.02 (0.482)	3.08 (0.431)
	Low	37	3.07 (0.350)	3.02 (0.429)
	Total	116	3.15 (0.411)	3.14 (0.408)
Ethical Decision-Making	Impact-focused	27	3.33 (0.370)	3.40 (0.388)
	High	165	3.24 (0.315)	3.28 (0.379)
	Total	192	3.25 (0.324)	3.30 (0.382)
Systems Thinking	Low	48	3.32 (0.332)	3.33 (0.355)
	Total	48	3.32 (0.332)	3.33 (0.355)

Note. ^a Only cases that responded to both pre- and post-tests are included. Not all learning outcomes were assessed in all engagement levels. Standard deviations are in parentheses.

cance testing depends on sample sizes, we also calculated effect sizes indicated by Cohen's *d* on each learning outcome generated by different courses. Effect size measures the standardized magnitude of relationships between variables. The conventional thresholds to interpret Cohen's *d* are small (0.2), medium (0.5) and large (0.8).

Results

Since we only assessed systems thinking in one non-travel-based course, we did not have enough data for analysis, though its descriptive statistics are summarized along with the other three learning outcomes in Table 6.

Multicultural Awareness

Students from five courses participated in the multicultural awareness assessment on both pre- and post-tests. The five courses included one impact-focused course and four non-travel-based ecosystem courses. 264 cases had matched responses on pre- and post-tests. Students from the five courses overall had significantly higher multicultural awareness score on the post-test (*M*=3.15, *SD*=0.351) compared to the pre-test (*M*=3.09, *SD*=0.392), *t* (263) = 2.936, *p*=.004<.05. On average, students in the ecosystem improved multicultural awareness after one semester.

We were especially interested in whether the four non-travel-based ecosystem courses led to similar learning outcomes as the impact-focused program. The four ecosystem courses had significant gains in multicultural awareness scores across the semester, *t* (236) = 2.634, *p*=.009. The effect size (Cohen's *d*=0.17) was comparable to that of the impact-focused course (Cohen's *d*=0.19). When examining individual course data, we found that three out of the four non-travel-based cours-

es generated effect sizes similar to the impact-focused program (Table 7). One non-travel-based course (i.e., HDFS 229) achieved a statistically significant post-pre gain in multicultural awareness, *t* (109) = 2.235, *p*=.027.

Civic Responsibility

Students from five courses participated in the civic responsibility assessment on both pre- and post-tests. The five courses included one impact-focused course and four non-travel-based ecosystem courses. 116 students had matched responses on pre- and post-tests. Students overall had no significant gains in civic responsibility scores, *t* (115) = 0.493, *p*=.623. None of the courses had significant gains in civic responsibility scores, all *p*>.10, and the effect sizes ranged from none to small.

Ethical Decision-Making

Students from one impact-focused course and three non-travel-based ecosystem courses participated in the ethical decision-making assessment on both pre- and post-tests with 264 cases' responses matched. Students overall had marginally significant higher scores on the post-test (*M*=3.30, *SD*=0.382) compared to the pre-test (*M*=3.25, *SD*=0.324), *t* (191) = 1.878, *p*=.062. The non-travel-based ecosystem courses as a whole failed to lead a significant increase in the ethical decision-making score. However, students from two out of the three non-travel-based courses improved their ethical decision-making scores over the semester. For BME401, *t* (58) = 2.254, *p*=.028, Cohen's *d*=0.25. For BIOL415, *t* (30) = 2.329, *p*=.027, Cohen's *d*=0.46. The effect sizes of these two pipeline courses were even larger than that of the impact-focused program (Cohen's *d*=0.18) (Table 7).

Table 7. Effect Sizes on Multicultural Awareness and Ethical Decision-Making by Course

Multicultural Awareness				Ethical Decision-Making			
Course	Pre	Post	Cohen's <i>d</i>	Course	Pre	Post	Cohen's <i>d</i>
ENGL 202A	3.12 (.269)	3.20 (.201)	0.35	BIOL 415	3.22 (.307)	3.38 (.371)	0.46
HDFS 229	3.06 (.384)	3.14 (.353)	0.23	BME 401	3.28 (.325)	3.36 (.343)	0.25
HESE ^a	3.33 (.404)	3.40 (.342)	0.19	HESE ^a	3.33 (.370)	3.40 (.388)	0.18
EDSGN 100	3.02 (.403)	3.08 (.336)	0.17	EDSGN 100	3.22 (.313)	3.18 (.390)	-0.11
ASTRO 001	3.16 (.360)	3.13 (.365)	-0.08	--	--	--	--
Note. ^a HESE is serving as a reference. Standard deviations are in parentheses.							

Faculty Feedback

During meetings with the ecosystem manager, five of the fourteen professors of non-travel-based courses expressed interest in traveling to the countries where the projects in their courses were set in order to gain a better understanding of the context. Four of the fifteen instructors returned the faculty surveys. The instructors perceived that the engaged component enhanced student learning, e.g., “broadening my students’ understanding of biology and its application,” and stimulated multicultural and global awareness, e.g., “providing a way for our students to learn about different cultures...to enable our students to be global citizens and to be prepared to tackle global problems.” Professors also appreciated how the engagement projects aroused students’ interests and emotions, e.g., “many of them were quite interested to learn”; “the students enjoyed the projects.... most of them were very proud of their work”; “students get an intuitive understanding as well as mental awareness. I find that people learn better when positive emotions are involved.” Considering the nature of these engagement projects, it was not surprising that the students faced challenges as indicated by one instructor, “The biggest challenge is the number of unknowns at the start of the project....The freshmen don’t quite know how to deal with unknowns, so it was a struggle.” But it turned out to be encouraging, with one professor saying, “However, in the end, I think most of them were very proud of their work.” All four instructors indicated satisfaction with their experiences and future commitment.

The instructors valued the assistance they received from the ecosystem manager and HESE director, such as project templates (e.g., “Most helpful were my meetings with [them] to develop the engagement project...and providing me with the brochure template.” “The three engaged adventure activities created by the pilot committee were a good start.”) and guest speaker support (e.g., “I appreciated having [them] come to my class and talk.” “[The ecosystem manager] was helpful at the end when our students presented their work.”) One instructor pointed out the need for refining the process to integrate the engaged projects into the curriculum: “One of [the engagement activities] couldn’t be implemented this semester since the adventure was too distinct from the course activity it would have been embedded in, though I am going to revise the course activity for fall to make it fit better.” Other instructors felt the need to en-

hance collaboration, e.g. “I think a bit more on the big picture and expectations for the students would have been nice to delve a bit deeper into.” “I’d like to learn more about what other faculty are doing.”

Discussion

The preliminary assessment results indicate that the students in the engagement ecosystem improved multicultural awareness and ethical decision-making over a semester. The results were consistent with previous findings that students increased multicultural awareness/competence (Dunlap, 1998; Einfeld & Collins, 2008) and ethical reasoning (Donahue, 1999; Leming, 2001) through getting involved in community engagement. More interesting is the question of whether the non-travel-based ecosystem courses would expand opportunities for more students to achieve engagement-related learning outcomes. Our results show that students in some ecosystem courses had significant gains in multicultural awareness and ethical decision-making over a semester, and these courses generated effect sizes comparable to the travel-based impact-focused program.

Zooming into individual engagement ecosystem courses, the effectiveness of building competencies in each learning outcome depended on factors such as faculty preparation, curriculum focus, and assessment sensitivity. Three out of the four non-travel-based courses generated effect sizes in multicultural awareness comparable to the impact-focused program. The only course that was ineffective in achieving the outcome was a large introductory course with fluctuant attendance. Less emphasis on a multicultural issue in the curriculum and high dropout rate for the post-assessment might explain the results.

The BIOL 415 course had the largest effect size for ethical decision-making. The result might be explained by faculty preparation since the instructor attended workshops on teaching ethics while incorporating the engagement projects in her course. The BME 401 course also generated an effect size in ethical decision-making comparable to the impact-focused program. This instructor had incorporated non-travel-based engagement experiences in the curriculum for several years.

Students failed to show any gains in civic responsibility. Several factors may explain these results. Most importantly, civic responsibility was never discussed as an explicit topic in any of these courses including the impact-focused courses. It is also possible that students do not necessarily have

the vocabulary to self-report their improvements. Finally, it is possible that our assessment tool might not be sensitive enough to detect the pre-post change. Only two ecosystem courses (CHEM 112H & ENGL 202B) showed small effect sizes (Cohen's $d = 0.20$ and 0.17 respectively). The slight gains might be explained by dispersing the projects across a semester-long timeline.

Lessons Learned: Areas for Improvement

Can we integrate different kinds and levels of interest in community engagement amongst students, faculty members, and their administrators so that their collective impact is much larger than the individual efforts? Yes, but the model needs a significant amount of fine-tuning. In order to make this model more effective, we need to improve faculty preparation and support, faculty and student buy-in, coordination logistics, and assessment strategy.

Faculty Preparation and Support

As seen with BIOL 415 and BME 401, faculty preparation in understanding the concepts and appropriate vocabulary as well as being able to seamlessly relate class content with the projects leads to improved results for students. This understanding and ability will grow with experience but can be accelerated through faculty workshops, one on one support from pedagogy experts, and lateral knowledge sharing between professors in the ecosystem.

The projects that stretched across the semester as opposed to those completed over several weeks had students thinking about the context and problems over a longer time period, which seems to have led to higher gains. First time around, faculty members wanted to do a shorter project but now they are excited about longer projects, which will likely further improve outcomes. Therefore, this model needs to be set up as a multi-semester effort to help faculty gradually step out of their comfort zones and find the right kind and level of engagement that works for their class and leads to stronger and sustainable student outcomes.

Several professors backed out of the pilot upon not receiving support from their course coordinators and department heads. This problem arose from junior faculty who were eager to try something new but were encouraged to get more experience before changing their course from the common framework. Fourteen faculty members were ultimately recruited for non-travel-based course projects and eleven were teaching faculty – this model provides

an opportunity to engage non-tenure-track faculty further. The ecosystem manager can leverage several interests to recruit a wider range of faculty members: offering guest speakers (either themselves or experts on the ecosystem themes) to fill classes where the professor may have a conference and offering recognition, through university news forums, awards, newsletters, etc.

Faculty and Student Buy-In

During class visits, the ecosystem manager observed that some courses were generally more excited than others about their project. Faculty feedback further indicates that this was a result of (1) the course being a required course for a major where the students genuinely cared about the material versus a general elective the students just had to get through and pass, and (2) how passionately the project was presented to them. The ecosystem manager must ensure that the students see a clear connection between their projects and the real world community partners. There was significantly more interest from students when they could see that their project was an essential part of a real project and HESE students as well as community members were leaning on their efforts to accomplish something significant. The key to making this model work and for the students to give it their very best was this sense of community; it wasn't about a grade anymore. Sharing past stories and pictures and keeping them posted on field updates further reinforced this sense of community and belonging.

Do the projects serve to get the students involved further in the high impact program? The ecosystem manager observed that participating in the pilot made students and professors excited about getting further involved in community engagement programs, raised awareness about the high impact program, and produced directly useful deliverables for the high impact program. While we know that a few students were inspired by and decided to partake in more engaged courses and programs, we need more data over a longer time horizon to assess the outcome of students actually joining high impact programs as a result of participating in a course in the ecosystem pipeline.

Coordination Logistics

The ecosystem manager spent six to thirty hours to set up each course and provide support throughout the semester. While the ecosystem manager can help establish and support at least three ecosystems per semester, they need to have a

source of information and credibility from each program that an ecosystem is built around. While the director of HESE acted as this source for the pilot, for future ecosystems, an accessible, knowledgeable, and passionate ecosystem ambassador should be used to minimize the time needed from an already busy faculty member running an impact-focused program. An ecosystem ambassador should be a student, faculty, or staff representative from the impact-focused program who is well-informed of and experienced with the program, and able to stimulate the interest of the students in the ecosystem courses.

Assessment Strategy

Our preliminary assessment has limitations in its design including not having a control group to eliminate maturity as a confounding factor. To validate the impact of the engagement ecosystem, in the next phase, we will compare courses in an ecosystem with matched courses without engagement experiences. The high student dropout rate from courses as well as some professors' difficulties fitting the post-survey into the tight schedule in the last week of the semester was another problematic issue, leading to fewer matched pre-post cases.

Developing sensitive but easy-to-administer assessment tools is challenging. Most faculty members had trouble integrating one survey, let alone four subscale surveys, due to time constraints in their course. Using self-report surveys to compare the impact-focused program and the non-travel-based courses was limited because skills and competencies are best assessed using direct measures, such as rubrics. In the future, we will apply rubrics to assess students' projects to get qualitative information of engagement-related learning outcomes.

Future Expansion

Due to the promise of the EE model to be a lean and scalable strategy for getting more students involved in engagement opportunities, we will continue to test and refine the model. In the next round of implementation, the ecosystem manager will build from the lessons learned to improve upon preparing and supporting faculty, getting students excited about their projects, coordinating the ecosystems effectively and efficiently, and making simple and accurate assessment tools. It will take several years of dedicated and persistent effort for the EE model to reach the majority of university students. The plan is for the ecosystems to form organically as faculty and students get further drawn in to the culture of engagement at the university. The ecosystem manager needs to gradually develop relationships with

professors, departments, and centers in every college and campus of the university, throughout Pennsylvania as well as the online community.

The EE model helps impact-focused programs emerge, stabilize, and scale by developing an ecosystem of courses around them. Two departments have expressed interest in building ecosystems around their research themes of sustainability, the natural world, and geriatric care. Similarly, two campuses have expressed interest in building ecosystems around themes of local interest: livable cities, solar ecology, and materials for humanity. As more ecosystems emerge, the ecosystem manager will search for ways to include more diversity in the ecosystems, bringing in students from various cultural and economic backgrounds, while ensuring that the collective efforts of thousands of students is reflected in the ultimate community impact.

Conclusion

The EE model has provided opportunities for students and faculty to engage at a variety of different degrees through travel and non-travel-based experiences embedded into existing courses. This approach of providing faculty-specific scaffolding to engage more faculty is not a one-semester effort but rather a gradual, yet determined approach to build over time. For Fall 2015, we already have ten new professors in addition to previously-engaged professors involved; over 1,300 students will be involved in the HESE ecosystem. In addition to an ecosystem around HESE, we have two additional ecosystems starting to emerge in Fall 2015, with five more planned in Spring 2016. For universities challenged with a dearth of potential partners, this is a great way to engage without overwhelming the community. Ongoing assessment is expected to provide more insights into the efficacy of the model and the desired levels of achievement for the cross-section of the students in colleges throughout the university and will help to determine whether the less intensive, non-travel-based levels of engagement can build pipelines into impact-focused programs.

The EE model is just one of many approaches and pedagogical models that Penn State is piloting to scale engagement opportunities. Other approaches include showcasing engagement opportunities to large general education courses that are relevant to their course content, sparking interest in engaged scholarship through delivering flipped classroom modules to cancelled classes on engagement-related topics such as sustainable development and an entrepreneurial mindset, and promoting engaged scholarship through a student ambassador group. It

is important that all of these efforts are happening concurrently with the EE model in order to meet the varying needs of faculty and students and achieve Penn State's 2020 goal.

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