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The Role of Place Attachment and Situated Sustainability Meaning-Making in Enhancing Student Civic-Mindedness: A Campus Farm Example

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Abstract

This research explores the role that place attachment and place meaning towards an urban farm play in predicting undergraduate students' civic-mindedness, an important factor in sustainability and social change. In 2017 and 2018, three STEM courses at a private university in the Midwest incorporated a local urban farm as a physical and conceptual context for teaching course content and sustainability concepts. Each course included a four to six-week long place-based experiential learning (PBEL) module aimed at enhancing undergraduate STEM student learning outcomes, particularly place attachment, situated sustainability meaning-making (SSMM), and civic-mindedness. End-of-course place attachment, SSMM, and civic-mindedness survey data were collected from students involved in these courses and combined with institutionally provided demographic information. Place attachment and SSMM surveys, along with the course in which the students participated, were statistically significant predictors of students' civic-mindedness score.

Keywords

Place-based, experiential learning, civic-mindedness, place attachment, place meaning, farm, sustainability

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Introduction

A well-functioning democracy requires citizens to be informed on civic issues and to be willing to contribute to the careful addressing of global, national, and local needs and problems (Wandersman & Florin, 2000). To be civically engaged means that citizens are participating in the life of their community to improve conditions for others (Adler & Goggin, 2005). In the workforce, civic-minded employees have been recognized, especially within the science, technology, engineering, and math (STEM) fields, as being a critical part of 21st century learning and vital to the global economy (Bringle & Steinberg, 2010; Casner-Lotto & Barrington, 2006; Gould, et al. 2011; Torney-Purta et al., 2015). While there have been concerns that higher education had become the focal point of workforce development at the detriment to its civic mission (Moment, 2012; Musil & Hampshire, 2012), recent work has focused more on addressing national needs related to governance (Chan, 2016). Much of this ongoing and unfinished work in building civics has been implemented through service and community-engaged learning.

This paper details findings from a research project focused on the development of—and relationship between —civic-mindedness, place attachment, and place meaning among undergraduate STEM majors who participated in STEM courses at a private, teaching university in a large, U.S. Midwestern city. For the purpose of this research, a course is a credit bearing class taking place over the course of semester in which students enroll. Specifically, over the course of two years, civic-mindedness and place attachment and place meaning data were collected from students in a 200-level Biology course, a 400-level Biology course, and a 200-level Environmental Studies course. Each of these courses integrated a 4-6-week place-based experiential learning (PBEL) module into class activities which engaged either the university's campus farm or another local, urban farm (Angstmann et al., 2019). Specifically, each course used the farm(s) as a place for undergraduates to conduct discipline-specific research projects related to sustainability (e.g., collect soil and arthropod samples, conduct interviews, and/or practice participant observation). In these modules, students were also expected to reflect upon and discuss the realities of the larger global industrial food system and the relevance of local diversified urban agriculture to local sustainability and food justice efforts. In this context, the authors of this paper explore how, and the extent to which, student civic mindedness is affected by courses designed and implemented to foster attachment and meaning ascribed to a locally relevant place from personal, sustainability, and disciplinarily relevant perspectives.

Theoretical Framework: Experiential Learning

This research project is undergirded by experiential learning theory. Building upon Dewey's (1998) principles of continuity and interaction, experiences are shaped by the experiential continua of individual students and the interactions occurring between each student—with their own complex experiential history—and the many subjects/objects to which students must relate

within a given environment. Ideally, by designing educative experiences that connect students to a shared "social enterprise" (Dewey, 1998), experiential learning approaches may demonstrate democratic values of participation and partnerships, as well as provide opportunities for students to witness and reflect on the observable impacts of these civic engagements (Bringle & Steinberg, 2010; Gould et al., 2011; Kirlin, 2003). For experiential learning, building a deep awareness of learning experiences as well as using experientially-constructed skills to expand one's experiential capacity and knowledge are important objectives of experiential learning (Kolb, 2014).

For this project, experiential learning is framed by Kolb's (2014) work where a topic is iteratively explored through concrete experiences, which are reflected upon to identify questions or problems of interest. These are then tested through the collection of data which are then reinterpreted with newly acquired knowledge to refine and expand our lines of inquiry. Through this iterative process students learn to adapt their knowledge to the context of the environment in which the concrete experience is occurring (Kolb & Kolb, 2012).

Community Engaged Experiential Learning

Generally speaking, experiential learning has been widely used in education in study abroad programs (Passarelli, 2016), teacher professional development (Blair, 2016; Girvan et al., 2016), community development (Rogers et al., 2019), international business (Eckhaus et al., 2017), and scientific process skills (Alkan, 2016) to name but a few. For the purposes of this study on the role of place attachment and place meaning to student civic-mindedness, service learning and community-engaged learning are the most salient forms of experiential learning to examine.

Service learning and community-engaged learning have been widely explored as pedagogies for developing civic-mindedness in students (Bringle & Steinberg, 2010; Hatcher, 2011; Steinberg et al., 2011). From these cited studies—which are primarily focused on service learning—a conceptual framework was developed for the integration of three dimensions essential for a civically-minded college graduate. These dimensions were defined as *identity* (self-awareness, self-understanding, self-concept), *educational experiences* (academic knowledge and skills formed through formal and informal education), and *civic experiences* (community involvement) (Steinberg et al., 2011). This literature asserts that through community involvement, students will develop and enhance their civic-mindedness through increased knowledge, beliefs, and desire to act.

Multiple studies looking at the relationship between service learning and the development of civic-mindedness have yielded positive results. In a study by Palombaro et al. (2017), a cohort of thirty-nine physical therapy students, who participated in several community engagement programs and service-learning courses over three years, showed statistically significant increases in their civic-mindedness. Likewise, twelve communications students involved in a service-learning program developed enhanced civic-mindedness during the course of their studies (O'Hara, 2001). On the other hand, finding mixed results in the impacts of service-learning programs on college students, two studies of multiple service-learning programs (Hunter & Brisbin, 2000; Kirlin, 2003) showed increased cognitive and attitudinal measures but not an overall increase for civic-mindedness. What these publications do not share is the effectiveness

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of the service learning pedagogies being implemented and if they include a physical or conceptual place with which students can meaningfully connect their own identities and civic-experiences to local and global phenomenon (Gruenewald, 2003).

Place-based Experiential Learning

The places chosen for the intervention in this study were local, diversified urban farms, because PBEL pedagogies have been shown to enhance student content knowledge, course engagement, critical thinking skills, and civic-mindedness, especially when situated in school gardens (Athman & Monroe, 2004; Ernst & Monroe, 2006; Gruenewald, 2003; Poulsen, 2017; Sobel, 2004). Urban farms are also an ideal place due to the ability to demonstrate the role organic foods play in environmental and social justice systems (Martin et al., 2016) as well as their impacts to socio-economic conditions (Artmann & Sartison, 2018). However, very little research has looked at the role of attachment to a place and the meaning given to that place in these student learning outcomes.

Place-based learning emerges from the local context in which it is situated; it is multidisciplinary and experiential; it encourages learning beyond the career-ready skills needed to navigate the workforce; it connects place with self and community (Woodhouse & Knapp, 2000). More specifically, it uses what is familiar, connects science to other fields, provides a local context with global connections (Semken et al., 2017), and increases environmental awareness and connectedness to the place (Dolan, 2016). Place is not just an environment, location, or space in which experiential learning occurs. It is a contextualized location that includes the history, culture, environment, people, politics, and economy to which students create attachments and ascribe meaning through personal reflection (Kolb & Kolb, 2006). For this research, concepts of place attachment and place meaning were considered and analyzed in the context of local, diversified urban farms as place (Kudryavtsev et al., 2012; Semken & Freeman, 2008; Semken et al., 2009; Stedman, 2002, 2003c). In agreement with Solin (2010) and Koushik (2016), we believe place attachment and place meaning are aids to, but not an absolute summation of, a diverse and integrated phenomenon that is defined as *sense of place*.

Place Attachment and Place Meaning

While a significant amount of the literature has worked to define place attachment and its many nuances, it has often been criticized for being muddled (Trentelman, 2009, p. 196) and static (Hintz, 2015). However, there are good reasons as to why different meanings have evolved. Arguably, part of the haziness associated with place attachment could be directly connected to the many ways in which place has been conceptualized. Low and Altman (1992) assert that the concept of "place" concerns the environmental settings to which people are emotionally and culturally attached. On the other hand, Patterson and Williams (2005) focused on exploring indicators that provide insight on the extent to which a place is important, is useful for achieving goals, and is supportive of oneself. Additionally, in their synthesis of the place literature, Scannell and Gifford (2010) constructed a tripartite framework for place, which included: 1) the meaning(s) individuals attribute to the physical world; 2) a process including the cognitive,

affective, and behavioral aspects; and 3) the physical representation of the place. While Hintz (2015) presented this relationship as more dynamic and interrelated.

In this study, place attachment has been operationalized (in the survey described below) as comprising two dimensions: *place dependence* and *place identity* (Williams & Vaske, 2003). *Place dependence* measures the functional attachment to the setting as well as how the setting serves goal achievement (Jorgensen & Stedman, 2001, p. 234) through the settings' attributes (Jorgensen & Stedman, 2001; Stokols & Shumaker, 1981; Vaske & Kobrin, 2001; Williams & Vaske, 2003). *Place identity*, on the other hand, is defined as an emotional attachment and a reflection of self-identity (Proshansky et al., 1983; Vaske & Kobrin, 2001; Williams & Vaske, 2003). In other words, place identity is a sense of self formed through one's engagement within the particular places one visits (Williams & Patterson, 1999). Place attachment—the conceptual unification of *place dependence* and *place identity*—has been found to be more significant with individuals who have spent more time in the place or have control of the place (Brown et al., 2003). A different study found that one's sense of place can strengthen social capital and motivate individuals to participate in their community (Manzo & Perkins, 2006). Hartig et al. (2001) found that students' fascination towards a place is a predictor of ecological behavior and the space can provide emotional and cognitive support through an escape from daily stresses. Within these studies and others, individual demographic information and its impacts on the forming of place attachment have not been widely studied and what findings there are, have been inconsistent (Scannell & Gifford, 2017).

Place meaning draws upon the symbolic meaning of a physical environment or place (Kudryavtsev et al., 2012; Stedman, 2003a, 2003c). Place meaning is bound to the context of the place itself (Semken et al., 2009) and is constructed from both the physical characteristics and attributes of the place and the perceived social, environmental, economic, or political role of the place in society. For this study, place meaning refers specifically to the situated meanings associated with the *physical characteristics and attributes* of urban agriculture, as well as the role urban farms play in supporting the three pillars of sustainability: environmental, economic, and social (Purvis et al., 2019). Hence, place meaning is concerned with what we have called situated sustainability meaning-making (SSMM), which is the name of our survey instrument discussed below. We actualized place meaning in the survey, emphasizing the physical characteristics and environmental aspects of place because a place's natural setting was deemed more pertinent to pro-environmental behaviors (Kudryavtsev et al., 2012; Scannell & Gifford, 2010; Stedman, 2003b).

Research Questions

Based upon the research on sense of place and civic-mindedness (Bringle & Steinberg, 2010; Gosselin et al., 2016; Levine, 2003; Poulsen, 2017), we hypothesized that by providing local, place-based experiences for students to critically engage with scientific processes and content (Bramble, 2005), such students might form attachments and meanings to place, which could in turn inspire civic responsibility and action, both locally and globally. In this paper, we explore the extent to which using a PBEL framework could serve as an effective approach to empower civic responsibility for that place and, by extension, society as a whole.

Our study is guided by the following research questions:

1. Do student demographic characteristics (course, gender, race/ethnicity, major, student level, and GPA) predict their Civic Mindedness Score?
2. To what extent does the place attachment and place meaning a student has for a local urban farm impact their Civic Mindedness Score?

Methods

Three participating faculty/course coordinators developed 4-6-week modules that integrated the campus farm or other small-scale diversified local farms in the city. A PBEL pedagogical framework (Angstmann et al., 2019), based upon a review of the literature and designed by the program team to facilitate the development of sense of place within participating students, guided the faculty in the development of their module. The three courses involved in this research were from Biology (a 200-level and 400-level course) and Environmental Studies (200-level course). Each course had one section per year during the same semester, except the 200-level Biology course which had three sections per year in the fall semester. Two of the three 200-level Biology sections were taught by a different instructor within and between each semester, except one section that the course coordinator—who designed the module—taught all three semesters. Students within the courses came from multiple majors though the majority were from within each course's primary focus of study.

Course instructors used the PBEL pedagogical framework to propose a module to the project team (Angstmann et al., 2019). The project team, as well as the program's advisory board, reviewed the proposals and made suggestions to the instructors until a final agreed upon plan was created for each course. Each module had six core requirements that each course was to meet (Angstmann et al., 2019):

1. An introductory lesson that included a farm sensory reflection, a food diary and personal environmental impact exercise, and an in-class introductory activity that contextualized sustainability aspects (i.e., environmental, social, and economic) of the global, industrial versus local, diversified food systems and challenged students to consider their personal role in these systems.
2. A minimum of 4 hours on the host farm to establish a contextualized sustainability setting for students to learn.
3. A real-world, discipline-relevant research question or topic for which students were to collect and present data (qualitative or quantitative).
4. A real-world application that connects student research to enhancing farm production or food system knowledge through farmer conversations and class discussions.
5. A plan for debriefing of students at the end of the module (i.e., bring group back to main point of the research and module, reflective questioning on what was learned, how the

learning helps the local food system, and how their acquired knowledge inspires them to change their own interaction with the food system).

6. A presentation that communicates research outcomes and their impact to sustainability in the local Indianapolis food system.

An example of an in-class introductory activity was watching the movie FRESH, a documentary that explores farmers and businesses in the U.S. who are trying to change how the food system operates. Specifically, the movie investigates the transformation of the agriculture system into an industrial model, and some of the environmental and health issues related to this transformation. It then provides a different vision for what the future of our food systems and planet could become (Joanes, 2009).

Each course's sustainability-focused research questions are detailed below:

- 200-Level Biology Research Project: How does the biological activity of soils (soil respiration) and arthropod diversity differ in habitats of varying degradation (campus farm, nearby prairie, nearby forested sites, and turf grass intramural fields).
- 400-Level Biology Research Project: How does temperature, moisture, and soil organic matter content affect rates of soil respiration, soil carbon (C) storage, or ecosystem C exchange in different natural and manmade habitats?
- 200-Level Environmental Studies Research Project: How do local farmers view the importance of (transforming) policies, practices, and perceptions of food production and consumption for the establishment of viable and sustainable local food economies?

Survey Instruments

To measure students' civic mindedness, the Civic-Minded Graduate (CMG) survey (Steinberg et al., 2011) was used. This survey was originally designed as a unidimensional scale but with four primary domains focused on knowledge, skills, dispositions, and behavioral intentions. The knowledge domain had three subscales that include volunteer opportunities, academic knowledge and technical skills, and contemporary social issues. The skills domain had three sub-scales that include communication and listening, diversity, and consensus building. The dispositions domain also had three sub-scales that include valuing community engagement, self-efficacy, and social trustee of knowledge. Behavioral intentions had no sub-scales but focused on the individual's stated intention to be personally involved in community service in the future.

To measure students' place attachment, the place attachment survey (Williams & Vaske, 2003) was utilized. This survey had three sections where each section used the same 12 questions that are defined by the overall place attachment as well as two dimensions of *place identity* and *place dependence* (Williams & Vaske, 2003). The first section of twelve questions measured a student's attachment to their university, the second section the place the student calls home (this could be their university), and the third section the local urban farm with which they interacted. For this paper, we focused only upon the section with twelve questions examining the students' overall place attachment to the urban farm.

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To measure place-meaning, a survey called the Situated Sustainability Meaning-Making (SSMM) survey was specifically developed for this project's urban farm localities with its foundations built upon relevant literature for place meaning scales (Kudryavtsev et al., 2012; Stedman, 2002, 2003a; Young, 1999). The survey was created to capture students' perceptions of local urban farms and involved twenty Likert scale questions based upon sustainability's core concepts of economic, social, and ecological, with a primary focus upon the physical characteristics and ecological roles ascribed to the place.

Data Collection

Data for this research were collected over two years, depending upon the frequency of course offering (Table 1). Members of the research team—without the instructor present—spoke with the students at the start of the semester about the instructional intervention and associated data collection on student learning outcomes. Students completed consent forms if they were willing to participate. Students were told their entire class would receive extra credit if 80% of the class participated in to maintain anonymity. During class, one week before the end of the semester, a member of the research team revisited each class, reminding students of the research, surveys, and the extra credit. An email was sent the evening of the same day to the consenting students using the Qualtrics survey email distribution tool (Qualtrics, 2019). A follow-up reminder email was sent five and seven days later. Instructors were provided updates on status of percent completion to share with students and maximize the number of completed surveys.

Classroom observations occurred in courses when the PBEL lessons were being implemented. These observations were generally done by a member of the research team, however, members of our advisory board also conducted at least one observation per semester to provide them with more insight into what was being conducted in the courses. Observations were conducted using a modified protocol using the pedagogical framework developed to guide course development (Angstmann et al., 2019).

Table 1. Data Collection Times by Course.

Course	Data Collection
200-Level Biology Course	Fall 2017, Fall 2018
400-Level Biology Course	Fall 2018
200-Level Environmental Studies Course	Fall 2017, Fall 2018

Statistical Analysis

Mean score replacement (Roth, 1994) was used to fill in missing values for questions. In the fall of 2017, mean score replacement was used on seven different cells consisting of six individuals and six questions. This constituted less than 5% of the total responses by question or total

questions and is thus appropriate for this type of replacement (Downey & King, 1998). All data analysis was run using SPSS (v26).

Results

Participants

Data for all three surveys were collected from a total of 105 students over the two years of the program. Student demographics (e.g., gender, academic level such as first-, second-, third- or fourth-year, and race/ethnicity as defined by non-minority (white or Asian) and minority can be found in Table 2 while GPA data can be found in Table 3.

Table 2. Gender, Academic Level, and Minority Status by Course and Overall

	Gender		Academic Level				Minority	
	M	F	1	2	3	4	NM	M
200-Level Biology	13	43	1	35	13	7	50	6
400-Level Biology	6	4	0	1	3	6	9	1
200-Level Environmental Studies	11	28	11	10	12	6	33	6
Total	30	75	12	46	28	19	92	13

Table 3. GPA by Course, Year, and Treatment Type.

	Treatment Total			
	Min	Max	Mean	SD
200-Level Biology	2.79	4.00	3.5754	.31179
400-Level Biology	2.93	3.88	3.5472	.33506
200-Level Environmental Studies	2.13	4.00	3.3269	.49951
Total	2.13	4.00	3.4804	.40794

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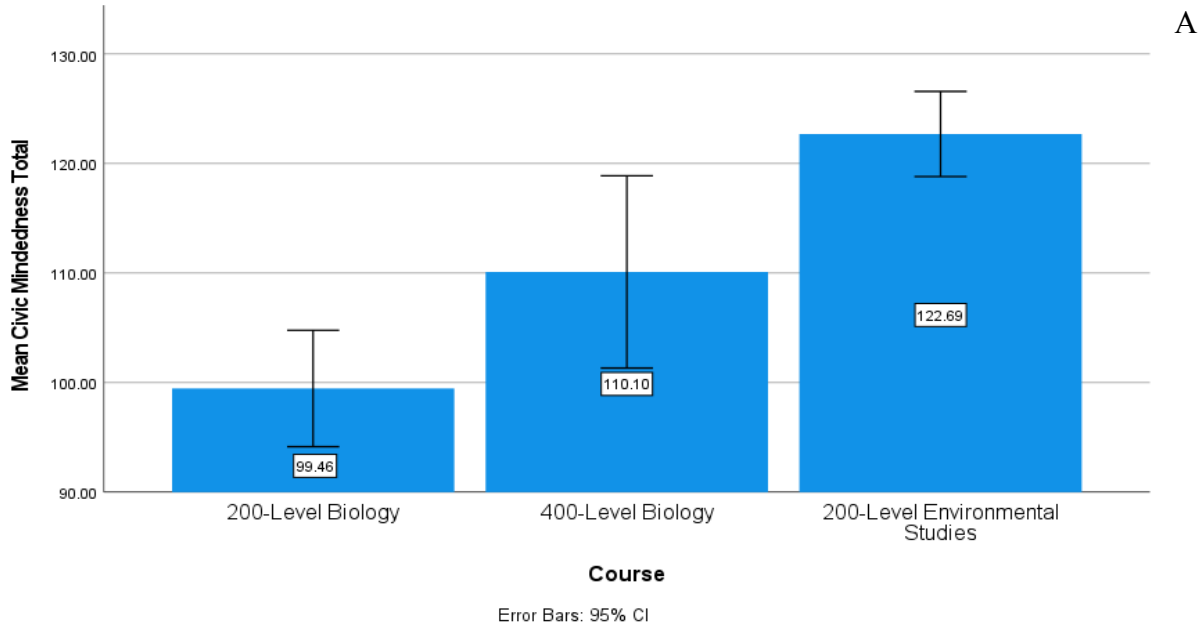
Analysis

Cronbach's Coefficient Alpha was run on the CMG survey (α=.962), place attachment (PA) survey (α=.964), and SSMM survey (α=.935). All three surveys had acceptable internal reliability (Taber, 2018). To understand the differences by course within CMG scores, we examined the mean score and 95% confidence interval. As shown in Figure 1, the environmental studies course had the highest CMG with a small overlap between its 95% confidence interval and that of the 400-level Biology course. The 200-level Biology course had the lowest mean score. Courses were numbered so that the lowest CMG class (200-level biology) was 1 and the highest (200-level environmental studies) was 3 in the model.

Figure 1. Civic Mindedness Scores and 95% Confidence Interval by Course.



stepwise multiple linear regression was used to evaluate the effect of PA, SSMM, the course, student's cumulative GPA, gender, and student level on CMG score. A correlation analysis for the dependent variable and potential independent variables is provided in Table 4. Four of the six independent variables were significantly correlated to the dependent variable and all statistically significant correlations between independent variables were small. Gender and student level were not significantly correlated and showed no linear relationship with CMG score.

Table 4. Inter-Correlations of Dependent and Independent Variables

	PM	PA	Level	GPA	Gender	Course
CMG	.486**	.551**	-0.42	-.252**	.009	.551***
SSMM		.237*	.045	.136	-.023	.254**
PA			.033	-.196*	.081	.295**
Level				.165	.036	-.047
GPA					-.094	-.283**
Gender						.064

*p<.05, **p<.01, *p<.001

The data used met the assumptions for this analysis including homoscedasticity, no multicollinearity, and no significant outliers (Berry, 1993). The model summaries from this regression can be found in Table 5. Model 1, consisting of the constant and PA, had an R^2=.304; Model 2, consisting of the constant, PA and course, had an R^2=.469; and Model 3, the final model consisting of the constant, PA, Course, and SSMM had an R^2 =.554. These results suggest that the combination of the final independent variables (place attachment, SSMM, and course) can predict 55.4% of the variation in student CMG scores.

Table 5. Summary of Stepwise Multiple Linear Regression.

Model	R	R^2	Adjust R^2	Std error of estimate	R^2 Change	F Change
1[a]	.551	.304	.297	16.61805	.304	45.001
2[b]	.685	.469	.459	14.58195	.165	31.772
3[c]	.744	.554	.541	13.43720	.084	19.120

a. IV: (Constant, Place Attachment), b. IV: (Constant, Place Attachment, Course), c. IV: (Constant, Place Attachment, Course, Situated Sustainability Meaning-Making)

Table 6 provides the coefficient results from the stepwise regression models. The final model, Model 3, with independent variables of place attachment score, course, and SSMM had a regression equation of:

$$CMG= (.594)(\text{Place Attachment}) + (7.657)(\text{Course Number}) + (.643)(SSMM).$$

Table 6. Stepwise Multiple Regression Analysis Coefficient Results

Model		Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.	95% Conf Int B	
		B	Std. Error				Lower	Upper
1[a]	(Constant)	78.959	4.778		16.527	.000	69.484	88.434
	Place Attachment	.880	.131	.551	6.708	.000	.620	1.140
2[b]	(Constant)	60.394	5.331		11.328	.000	49.820	70.968
	Place Attachment	.680	.120	.426	5.646	.000	.441	.919
	Course	8.955	1.589	.425	5.637	.000	5.804	12.106
3[c]	(Constant)	11.946	12.120		.986	.327	-12.098	35.989
	Place Attachment	.594	.113	.372	5.267	.000	.370	.817
	Course	7.657	1.494	.364	5.126	.000	4.693	10.620
	SSMM	.643	.147	.305	4.373	.000	.351	.935

a. IV: (Constant, Place Attachment), b. IV: (Constant, Place Attachment, Course), c. IV: (Constant, Place Attachment, Course, SSMM)

Discussion

Limitations of the Study

While two of our three courses had an N greater than 30, the 400-level Biology course did not. This potentially impacts our final models as it relates to course. The larger 95% confidence interval for the CMG score for the 400-level Biology course demonstrates this potential issue. Our model did not specifically account for the quality of the instruction or how the PBEL

module was implemented beyond accounting for the course in which the student participated. This study also did not account for a student's previous sustainability knowledge/literacy or the student's past relationship to a farm of any type.

The Role of Demographics

There is a dearth of literature around the role of demographics as a predictor of civic mindedness. Our regression models found that the demographics (gender, grade point average (GPA), year in school) were not statistically significant predictors of an individual's civic mindedness. There is the possibility that one or more of the demographic characteristics might have influenced place attachment in the model, we did not investigate this, nor did it exceed the impact of place attachment in the broader model. Existing scholarship in this area has provided some focus on the role of demographics impacting place attachment, but these findings have been varied and inconsistent (Scannell & Gifford, 2017). However, the stepwise regression suggests that the greater concept of place attachment is still a better predictor than the demographic characteristics themselves in predicting civic mindedness.

The Course

Our findings suggest that course content/activities matter in the development of civic mindedness. As of yet, it is not clear if it is the activities being utilized in the course, the instructor's disposition, the students who are taking the course, the topic of the course, a combination of these four, or some other unknown(s) that are impacting the course level outcomes. In the case of our research, based upon the classroom observations, we were not surprised that students in the 200-Level Environmental Studies course had the overall largest civic mindedness scores. While this course had a wide array of majors, and several students who took the course because they felt it would be an easy science elective, the course was able to naturally interweave the farm and its role in the food supply chain throughout the course. Very rarely did a class meeting occur where the instructor did not link the topic of the conversation back to the impact on or role of industrial farms and diversified farms. This provided students with an ongoing reference to their farm experiences and provided a link to their experiential learning opportunities.

The 400-level Biology course also demonstrated significant integration of the farm into the course by placing the farm within the context of the course and relating the farm back to relevant work in the field. As implemented, the 200-level Biology course's PBEL module created less integration of content and farm, though this varied slightly by instructor. This is likely because as an early-degree required course, the faculty are tasked with teaching a broad swath of biology topics. With that said, when we first were exploring the data, we found that our models had more significant results when data were grouped by course (including multiple sections as one course) than when courses were grouped by section or section and course.

Since course is a significant predictor of civic-mindedness, how the instructor implements the PBEL module, or integrates the urban farm into their course, could have a significant impact on CMG, place attachment, and SSMM outcomes. Additionally, it could

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suggest that such outcomes are impacted by differences between disciplines. For example, disciplinary values and enculturation may impact instructor flexibility and comfort in teaching (Neumann, 2001) through sustained engagement with ideas and skill sets associated with civics, ethics, or other things perceived as "softer" (e.g., emotion). Different approaches to inquiry (Healey & Jenkins, 2009), as well as different commitments required for disciplinary specialization, may impact the flexibility and openness with which a social scientist (i.e., environmental studies) versus a natural scientist (i.e., biology) approaches issues involving civics and emotional attachments.

Sense of Place: Place Attachment and Place Meaning

Our findings show that the building of sense of place, as defined by place attachment and place meaning, in university students had a positive influence on their civic mindedness. As with the farms involved in this study, Poulsen (2017) found that urban community farms closely align with civic farms, which at their core, have an orientation towards serving their local communities and are an integral part of the community where they reside (Lyson & Guptill, 2004). The campus farm's orientation toward service may account for part of this civic-mindedness change. Additionally, the role of place attachment and its impact on civic mindedness has been explored, to some extent, in the literature. Using photovoice, Estrella and Kelly (2017) found that the social environment of the place for teenagers inspired them to become more involved in their community. Another study by Stefniak et al., (2017) found that building sense of place through history increased students' place attachment leading to increased civic mindedness as measured by the individual's civic behavioral intentions. Our work supports their findings but also expands upon it by broadening it to include the sustainability meanings ascribed to a place as well as investigating the role of course and student demographics.

Conclusion and Future Directions

Our study demonstrated that place attachment, place meaning (i.e., SSMM), and course were statistically significant predictors of civic-mindedness in students involved in courses using sustainability-focused PBEL situated on an urban farm. While our model showed that these variables strongly predicted CMG scores, it also did not find students' demographic information to have significant predictive value. Future work needs to examine the relationship between place attachment, SSMM, and civic-mindedness on a wider array of courses in more disciplines.

Additionally, the role of course, be it the content, instructional methods, fidelity to implementation, or students choosing to take the course needs to be further researched to determine what is driving course-level differences in CMG scores. To support this, more qualitative data from interviews, focus groups or open-ended questions should be collected to further explain the impacts of place and the course on students' civic-mindedness. Because of the urban farm's relationship to the environment, incorporating some form of environmental literacy or understanding could provide more insight on the forming of civic-mindedness as well as the impact of place. Finally, future research should incorporate the voice of instructors regarding the

impact of the course and instruction on students, especially as it relates to community involvement.

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