

REPLICATING THE COMMUNITY-ENGAGED EDUCATIONAL ECOSYSTEM: DIFFERENCES IN OUTCOMES ACROSS SUBGROUPS

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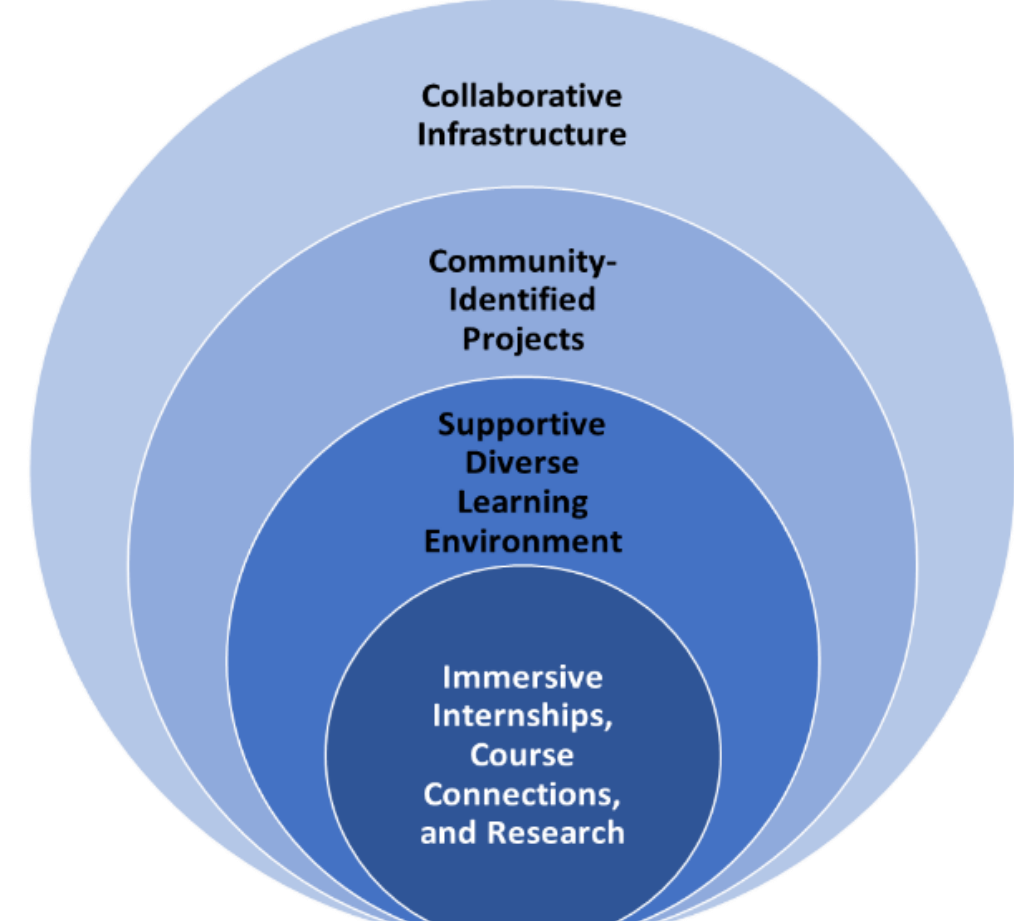
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NEED

STEM skills are increasingly important. With STEM jobs providing generally higher wages and having above average job growth, they are key to stabilizing and rebuilding our middle class. Despite this need, underrepresented minorities, women, first generation students, and low socio-economic status (SES) students still generally have disproportionately lower engagement and higher attrition in STEM fields. This is critical to both equity and our competitive advantage in the United States. This growing divide between people who can and cannot engage extends to communities. These challenges are compounded in many areas in the United States, particularly the Rust Belt or deindustrialized Midwest, because they struggle more than others to attract, develop, and retain the STEM skills in their workforce. Attraction, engagement, and retention in STEM is a national imperative, its importance within these regions is particularly acute in order to compete in the knowledge economy. The original pilot at University of Notre Dame in the South Bend Elkhart Region contributed to our understanding of how to build learning environments that support 1) student outcomes related to STEM attraction, motivation, and retention; 2) student outcomes related to place attachment; and 3) outcomes in the regional community; the first year of replication in Youngstown, Ohio and Louisville, Kentucky showed promising outcomes. This poster presents the findings from the first two years of replication across groups of interest.

ELEMENTS OF THE C-EEEM MODEL

The Community-Engaged Educational Ecosystem Model (C-EEEM) is a nested structure, with network-building and sustained collaborations forming the ‘**collaborative infrastructure**’ in which the **community-identified projects** are developed and delivered. Although an immersive internship, the model also includes course connections to long-term projects and independent research. The ongoing collaboration enables projects that are part of larger, complex community issues (e.g., urban sustainability). Replication sites create a **supportive and diverse learning environment** through steady network building for faculty and community mentors focused on a learning and contribution. At the center of the C-EEEM is the **Immersive internship**, with reliable, community-identified deliverables to partners. These projects create visible and tangible products that seed the expansion of partnerships, which provide ongoing learning opportunities for students as a virtuous cycle.



Community-Engaged Educational Ecosystem Hierarchy

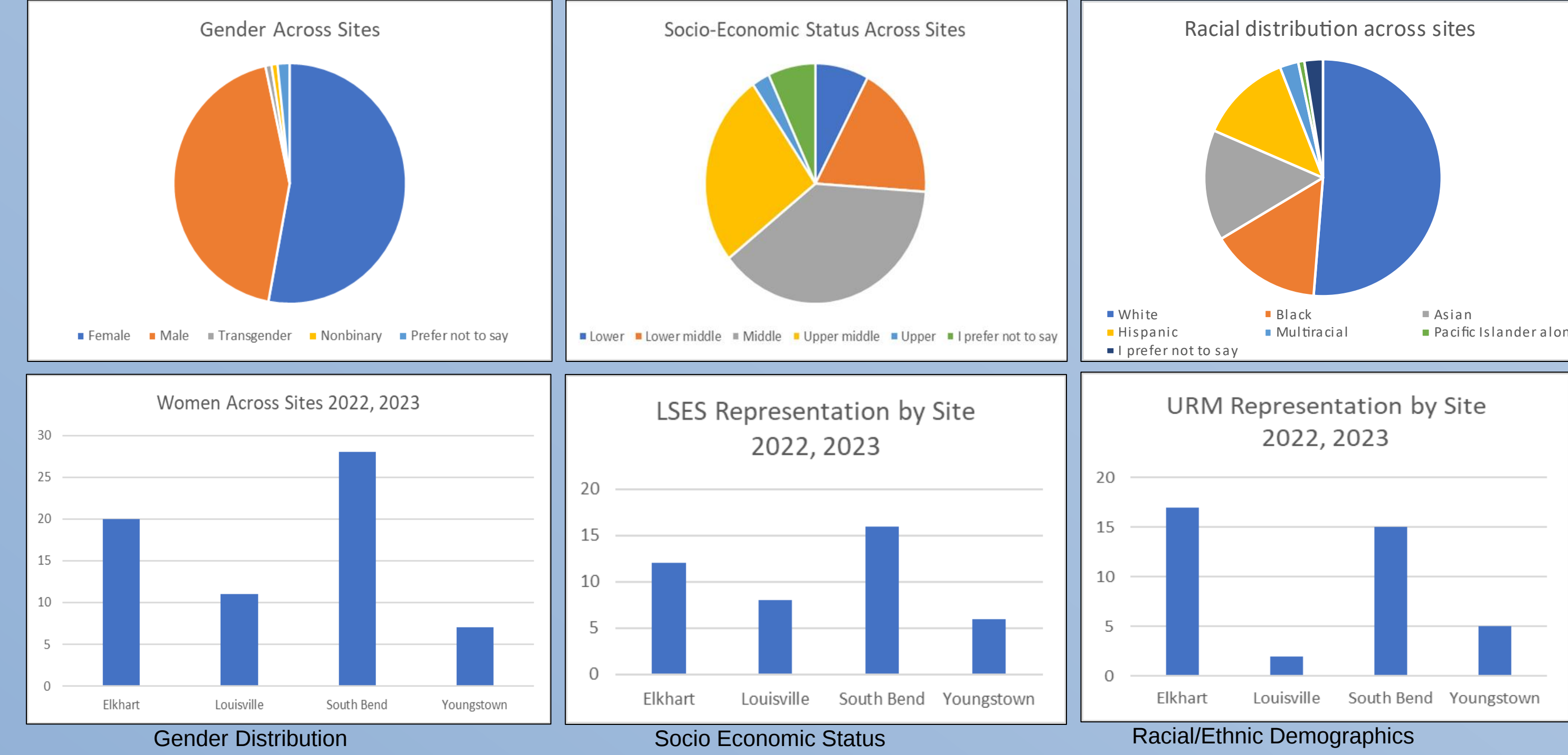
STUDENT OUTCOMES ACROSS SITES

To extend the first-year findings, this paper focuses on student outcomes across the same key constructs as examined in year one. These outcomes are related to the grant aims and the original findings from the pilot, which were grouped into the areas of interest –confidence and experience in STEM, problem-solving and teamwork skills, and contribution and attachment to the region. [1] Data presented includes analysis of the two years of aggregated data across all three sites, as well as analysis of the subgroups and individual site data. This allows for examining the differences – strengths and weaknesses of the program for particular subgroups or of the implementation at a particular site. In keeping with the findings from the pilot [1, 4, 5, 18], the C-EEEM has a greater impact on underrepresented groups (women, URM, LSES) despite showing statistically significant differences across the whole of the two years of interns.

METHODOLOGY

- University of Notre Dame Institutional Review Board (IRB) approved protocols for all three sites. Researchers delivered consent, assent, and parental consent approvals for participation through Qualtrics forms.
- Analysis presents aggregated data across all three sites from the first two years, as well as analysis of the subgroups and individual site data. Aggregation allows for statistical analysis of the internship effects on particular subgroups of interest to the grant.
- Data collection through retrospective-pre/post survey to address potential response shift bias, Likert-type scaling, with instrument focused on place attachment and experiential learning elements affecting STEM motivation and retention.
- Quantitative analysis with SPSS software (i.e., Paired -Samples T Tests, Cohen's D) and MS Excel for graphics.

DEMOGRAPHICS ACROSS SITES



DEMOGRAPHIC TWO-YEAR AGGREGATION

- High school students made up 23% of cohorts across sites.
- Gender *across* the three sites reflected the long-term aims of the grant greater female participation (55%). The pilot site disproportionately influenced numbers, but the replication sites improved female recruitment from year one.
- Across the three sites, 34% identified as lower middle income to lower income or lower socio-economic status (SES), which is nearly 10% higher than the first-year average alone.

OUTCOMES ACROSS SITES (2-YEAR)

STEM Confidence and Experience					
Question	TTEST	df	pvalue	Cohen's D	Effect Size
<i>I have identified, accessed, cleaned and/or analyzed data in addressing a real-world issue</i>	8.65	121	<0.001**	0.783	Medium
<i>I am comfortable collecting information and analyzing it.</i>	9.33	122	<0.001**	0.707	Medium
<i>I would do well in a field that uses technical skills.</i>	6.41	121	<0.001**	.508	Medium
<i>I feel confident that I could take things I learn and apply them to challenges in real-world situations.</i>	11.1	122	<0.001**	1.002	Large

Problem Solving and Teamwork Skills					
Question	TTEST	df	pvalue	Cohen's D	Effect Size
<i>I am comfortable speaking in front of groups about my work.</i>	8.58	115	<0.001**	0.796	Medium
<i>I enjoy solving open-ended problems that do not have a single solution.</i>	7.09	116	<0.001**	0.655	Medium
<i>I am confident that I can manage conflict or tensions when working on a team.</i>	4.52	120	<0.001**	0.411	Small
<i>I know how to apply design thinking to problem-solving in the real world.</i>	9.34	122	<0.001**	.842	Large
<i>I enjoy problem-solving with people with different perspectives.</i>	6.04	122	<0.001**	0.544	Medium

Contribution and Attachment to the Region					
Question	TTEST	df	pvalue	Cohen's D	Effect Size
<i>I feel a connection to the (PLACE) region.</i>	7.97	107	<0.001**	.766	Medium
<i>I can make meaningful contributions to society through STEM skills.</i>	5.01	118	<0.001**	0.459	Small
<i>I can imagine myself living in this region at some point after I graduate.</i>	6.07	117	<0.001**	0.559	Medium
<i>I understand how positive change happens in communities.</i>	9.42	121	<0.001**	0.853	Large
<i>My work will impact others</i>	7.00	122	<0.001**	0.631	Medium

OUTCOMES ACROSS DIFFERENT GROUPS

Women: STEM Confidence and Experience					
Question	TTEST	df	pvalue	Cohen's D	Effect Size
<i>I have identified, accessed, cleaned and/or analyzed data in addressing a real-world issue</i>	6.88	65	<0.001**	0.847	Large
<i>I am comfortable collecting information and analyzing it.</i>	6.64	66	<0.001**	0.811	Large
<i>I would do well in a field that uses technical skills.</i>	5.79	65	<0.001**	0.713	Medium
<i>I feel confident that I could take things I learn and apply them to challenges in real-world situations.</i>	8.99	66	<0.001**	1.10	Large

Women: Problem Solving and Teamwork Skills					
Question	TTEST	df	pvalue	Cohen's D	Effect Size
<i>I am comfortable speaking in front of groups about my work.</i>	7.94	60	<0.001**	1.02	Large
<i>I enjoy solving open-ended problems that do not have a single solution.</i>	5.92	62	<0.001**	0.745	Medium
<i>I am confident that I can manage conflict or tensions when working on a team.</i>	4.10	64	<0.001**	0.509	Medium
<i>I know how to apply design thinking to problem-solving in the real world.</i>	7.81	66	<0.001**	.955	Large
<i>I enjoy problem-solving with people with different perspectives.</i>	4.33	66	<0.001**	0.529	Medium

Women: Contribution and Attachment to the Region					
Question	TTEST	df	pvalue	Cohen's D	Effect Size
<i>I feel a connection to the (PLACE) region.</i>	5.52	59	<0.001**	.712	Medium
<i>I can make meaningful contributions to society through STEM skills.</i>	3.82	63	<0.001**	0.477	Small
<i>I can imagine myself living in this region at some point after I graduate.</i>	5.73	62	<0.001**	0.722	Medium
<i>I understand how positive change happens in communities.</i>	6.82	66	<0.001**	0.833	Medium
<i>My work will impact others</i>	5.77	66	<0.001**	0.750	Medium

OUTCOMES ACROSS DIFFERENT GROUPS KEY FINDINGS

High School: STEM Confidence and Experience					
Question	TTEST	df	pvalue	Cohen's D	Effect Size
<i>I have identified, accessed, cleaned and/or analyzed data in addressing a real-world issue</i>	6.08	27	<0.001**	1.148	Large
<i>I am comfortable collecting information and analyzing it.</i>	4.54	27	<0.001**	0.859	Large
<i>I would do well in a field that uses technical skills.</i>	3.68	27	<0.001**	0.696	Medium
<i>I feel confident that I could take things I learn and apply them to challenges in real-world situations.</i>	6.32	27	<0.001**	1.19	Large

High School: Problem Solving and Teamwork Skills					
Question	TTEST	df	pvalue	Cohen's D	Effect Size
<i>I am comfortable speaking in front of groups about my work.</i>	5.79	25	<0.001**	1.136	Large
<i>I enjoy solving open-ended problems that do not have a single solution.</i>	3.79	25	<0.001**	0.744	Medium
<i>I am confident that I can manage conflict or tensions when working on a team.</i>	3.05	27	0.003*	0.576	Medium
<i>I know how to apply design thinking to problem-solving in the real world.</i>	5.88	27	<0.001**	1.111	Large
<i>I enjoy problem-solving with people with different perspectives.</i>	3.79	25	0.001**	0.636	Medium

High School: Contribution and Attachment to the Region					
Question	TTEST	df	pvalue	Cohen's D	Effect Size
<i>I feel a connection to the (PLACE) region.</i>	4.44	24	<0.001**	.888	Large
<i>I can make meaningful contributions to society through STEM skills.</i>	3.01	26	0.003*	0.563	Medium
<i>I can imagine myself living in this region at some point after I graduate.</i>	1.98	27	0.029*	0.374	Small
<i>I understand how positive change happens in communities.</i>	6.81	27	<0.001**	1.287	Large
<i>My work will impact others</i>	5.39	27	<0.001**	1.018	Large

URM: STEM Confidence and Experience					
Question	TTEST	df	pvalue	Cohen's D	Effect Size
<i>I have identified, accessed, cleaned and/or analyzed data in addressing a real-world issue</i>	5.634	38	<0.001**	0.902	Large
<i>I am comfortable collecting information and analyzing it.</i>	5.03	38	<0.001**	0.805	Large
<i>I would do well in a field that uses technical skills.</i>	4.78	38	<0.001**	.766	Medium
<i>I feel confident that I could take things I learn and apply them to challenges in real-world situations.</i>	6.90	38	<0.001**	1.11	Large

URM: Problem Solving and Teamwork Skills					
Question	TTEST	df	pvalue	Cohen's D	Effect Size
<i>I am comfortable speaking in front of groups about my work.</i>	6.26	36	<0.001**	1.03	Large
<i>I enjoy solving open-ended problems that do not have a single solution.</i>	3.75	38	<0.001**	0.600	Medium
<i>I am confident that I can manage conflict or tensions when working on a team.</i>	3.95	38	<0.001**	0.633	Medium
<i>I know how to apply design thinking to problem-solving in the real world.</i>	6.02	38	<0.001**	0.963	Large
<i>I enjoy problem-solving with people with different perspectives.</i>	3.1	38	0.002*	0.496	Small

URM: Contribution and Attachment to the Region					
Question	TTEST	df	pvalue	Cohen's D	Effect Size
<i>I feel a connection to the (PLACE) region.</i>	5.30	36	<0.001**	.871	Large
<i>I can make meaningful contributions to society through STEM skills.</i>	3.20	37	0.001*	0.519	Medium
<i>I can imagine myself living in this region at some point after I graduate.</i>	4.84	37	<0.001**	0.786	Medium
<i>I understand how positive change happens in communities.</i>	5.56	38	<0.001**	0.890	Large
<i>My work will impact others</i>	4.56	38	<0.001**	0.730	Medium

LSES: STEM Confidence and Experience					
Question	TTEST	df	pvalue	Cohen's D	Effect Size
<i>I have identified, accessed, cleaned and/or analyzed data in addressing a real-world issue</i>	5.86	41	<0.001**	0.903	Large
<i>I am comfortable collecting information and analyzing it.</i>	3.82	41	<0.001**	0.590	Medium
<i>I would do well in a field that uses technical skills.</i>	4.43	41	<0.001**	0.683	Medium
<i>I feel confident that I could take things I learn and apply them to challenges in real-world situations.</i>	6.18	41	<0.001**	0.954	Large

LSES: Problem Solving and Teamwork Skills					
Question	TTEST	df	pvalue	Cohen's D	Effect Size
<i>I am comfortable speaking in front of groups about my work.</i>	6.27	40	<0.001**	0.979	Large
<i>I enjoy solving open-ended problems that do not have a single solution.</i>	3.71	40	<0.001**	0.58	Medium
<i>I am confident that I can manage conflict or tensions when working on a team.</i>	2.80	41	0.004*	0.432	Small
<i>I know how to apply design thinking to problem-solving in the real world.</i>	6.07	41	<0.001**	.937	Large
<i>I enjoy problem-solving with people with different perspectives.</i>	3.41	41	<0.001**	0.525	Medium

LSES: Contribution and Attachment to the Region					
Question	TTEST	df	pvalue	Cohen's D	Effect Size
<i>I feel a connection to the (PLACE) region.</i>	4.58	38	<0.001**	.733	Medium
<i>I can make meaningful contributions to society through STEM skills.</i>	3.03	39	0.002*	0.475	Small
<i>I can imagine myself living in this region at some point after I graduate.</i>	2.17	40	0.018*	0.339	Small
<i>I understand how positive change happens in communities.</i>	5.89	41	<0.001**	0.909	Large
<i>My work will impact others</i>	5.28	41	<0.001**	0.815	Medium

* denotes p<0.05, ** p<0.01, ***p<0.001

MOVING FORWARD

- The C-EEEM approach forwards building a regional educational ethos of STEM learning through project-based challenges that develop the local community. Despite the community and institutional contextual differences, two years of ourcomes show that model produce similar types of impacts on participating students. Ideally, each region will continue to build an educational culture whereby project-based learning and community-identified challenges are woven together and broader impacts as part of learning becomes the norm.
- If C-EEEM is to fulfill the aim of leveraging high impact practices for increased STEM participation by underrepresented groups and workforce development in deindustrialized areas, each site will identify networks and approaches that ensure a breadth of participation.
- Next steps include projects that are implemented across all three sites on common challenges, such as sustainability or affordable housing. This will build understanding of the influences of implementation differences and the contextual setting (culture, institutional assets, etc.) on student outcomes. This will help to inform recommended approaches to developing a C-EEEM within a particular community or institutional setting for future replications.



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