

NC State Rural Works!

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***RuralWorks!:* Engineering Internship Program**

Introduction

In this paper, we describe a summer internship program at NC State University that places undergraduate engineering students in 10-12 week work experiences in rural counties throughout the state. Initiated as part of the land-grant mission of the university, the program involves a collaborative partnership between the College of Engineering (COE), University Career and Development Center (CDC), and Industry Expansion Solutions (IES is the COE extension unit).

The College of Engineering *RuralWorks!* program began in the summer of 2018 with 4 students placed at 2 employers. From those modest beginnings the program has grown, and in summer 2025 included 152 students placed in 87 companies. While economic impact is not yet available for 2025, the economic impact for the companies hosting interns for 2024 was \$6,323,678.

This paper outlines the background and purpose of the program, describes the partnership structure, and reports on its impact on the students and companies involved in the program.

Background

The *RuralWorks!* program at NC State University was initiated in the 2017-2018 academic year by the university Office of Extension and Engagement to draw attention to, and address, issues associated with the urban-rural divide within the state. This divide, present in all US states to varying degrees, describes the difference in educational, health, economic, infrastructure, political, and other opportunities and outcomes that rural counties lack when compared to urban ones. Accordino[1] defines this divide as “characterized by stark differences in political and social attitudes that appear to be fueled, at least in part, by diverging economic fortunes.”

As the flagship engineering program in the state, NC State University’s College of Engineering enthusiastically supported this internship program, creating a unique partnership with the campus Career and Development Center (CDC) and Industry Expansion Solutions (IES) to provide such internship opportunities for our engineering students. Internships have long been important high impact educational experiences for engineering and other students[2], and thus forming this partnership to create COE rural work experiences was consistent with university and college strategic goals

Motivation and Program Goals

Motivating this program is NC State University’s mission to foster social, economic, and technological growth across the state. Goal 3 of the *2021-2030 Strategic Plan Goals* is to “Expand and advance our service to the citizens of the state and beyond—defining the standard for a 21st-century land-grant university.”[3] By connecting students with employers in rural communities, the program delivers immersive hands-on experiences important to students and their growth and the businesses that hire them. With the rural workforce in North Carolina shrinking[4], it’s more important than ever to connect graduates with career opportunities in non-urban regions of the state. Providing students with rural experiences exposes them to the potential and benefits of working in these communities. And even if they don’t end up living and working in rural areas, through the internships students have lived important experiences that

become part of their educational journey—influencing the way that they think about the world and the dynamic of rural versus non-rural areas of the state.

The goals of the *COE RuralWorks!* program are to:

- Provide high impact experiential learning experiences for students to apply classroom knowledge into the real world,
- Develop a talent pipeline that expose students to rewarding careers in rural areas,
- Support rural economic growth by embedding technical and managerial talent in small and mid-sized companies, and
- Advance NC State University’s land-grant mission by linking classroom learning with statewide impact.

The Partnership

As described briefly above, the *COE RuralWorks!* program was developed and is delivered through a strategic partnership of the College of Engineering (COE), University Career and Development Center (CDC), and Industry Expansion Solutions. Tables 1 and 2 give details on the background and roles of each of these units.

Table 1: COE *RuralWorks!* Partners Background

Partner	Background
College of Engineering	The College of Engineering at NC State University was formed in 1928 as part of the land grant mission of the NC State University. Today the college enrolls over 9,000 undergraduate students in 18 ABET accredited programs. Over 80% of the student population comes from in-state students.
Career Development Center	The Career Development Center at NC State University is the university's central career office with a mission to prepare and empower students to identify and pursue their career goals. The Career Development Center supports student development through career-related exploration and experiential learning programs.
Industry Extension Services	Industry Extension Services is the outreach and extension arm of the NC State University’s College of Engineering and administers the NIST Manufacturing Extension Partnership for North Carolina (NCMEP). IES supports North Carolina businesses by connecting them with industry experts and tailored resources to improve productivity, efficiency, quality, and profitability.

Table 2: COE *RuralWorks!* Partners Strategic Roles

Partner	Role in <i>COE RuralWorks!</i>
College of Engineering	- Promote awareness of the program to student body - Provide financial resources - Growing participation
Career Development Center	- Host job listing, student recruiting, interview process, and intern selection - Oversee program orientation, placement, and professional development processes - Measure student professional development (8 NACE competencies) - Measure student attitude surveys on rural experiences, etc.
Industrial Expansion Solutions	- Assist in creating internship placements through extensive state-wide network in the target geographic areas - Grow the number of internship opportunities over time, number of companies participating - Measure the impact of the internships on the companies that sponsor students (economic impact, other metrics, etc.)

Figure 1 provides a view of how the strengths from the three partners come together in this program. The College of Engineering has access to students in promoting the program and communicating with them and provides the needed financial resources. The Career Development Center's focus is on employment processes and the development of students as job seekers and effective future employees. And lastly, Industry Extension Services leverages the strength of their employee network to develop interest in internships at their clients and to assess the impact of those interns on the companies.

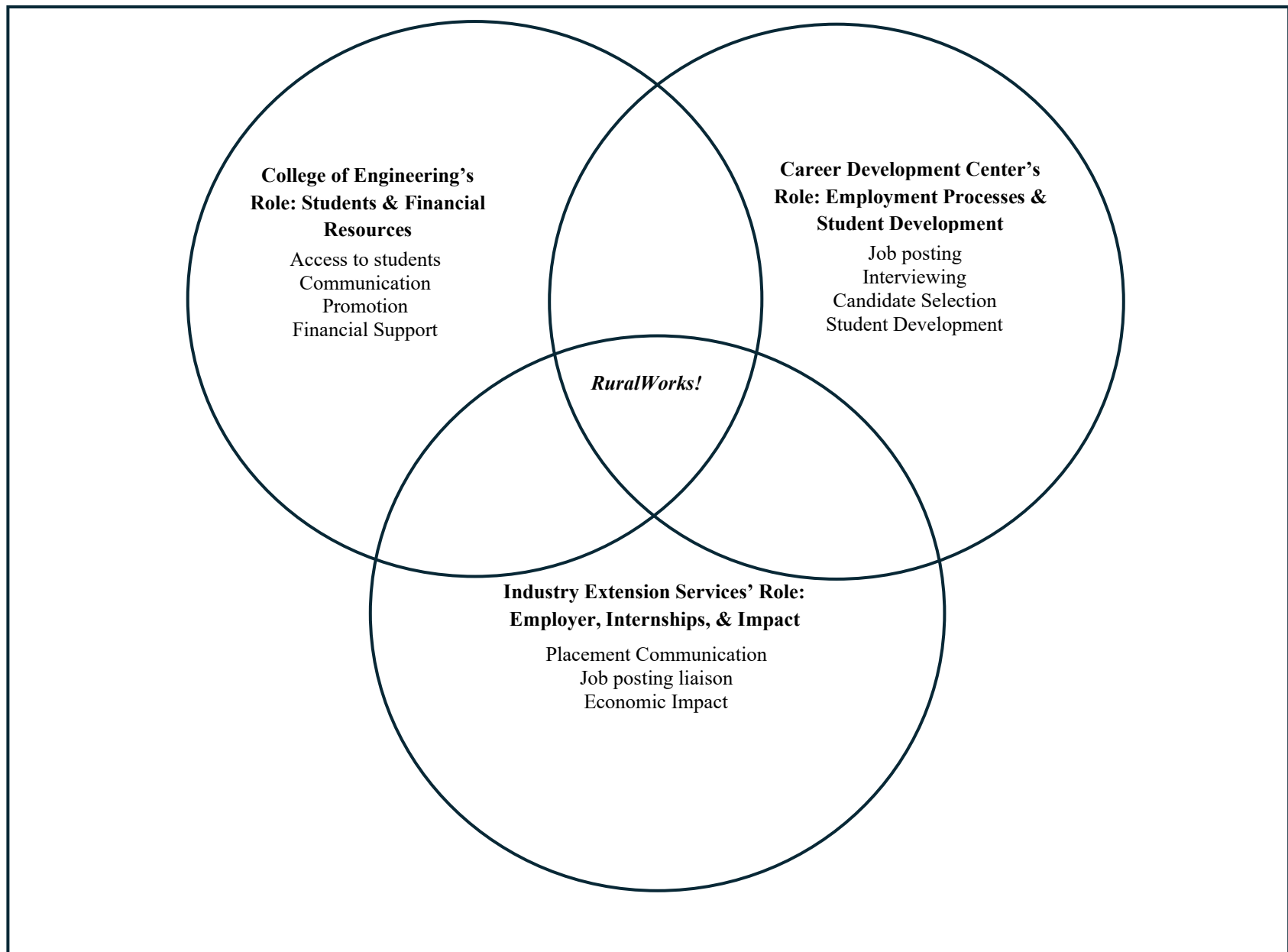


Figure 1: *RuralWorks!* Key Partners' Role

How the Program Works

RuralWorks! utilizes common employee placement phases as given in Table 3.

Table 3: *RuralWorks!* Program Phases

Phase	Activities	Timing
Recruiting Phase	Generating company and student interest in participating	Fall and early spring
Placement Phase	Matching students and companies	Early and late spring
Pre-Internship Phase	Orientation and pre-work surveys	Early May
Internship Phase	On-site visits and mentor connections	Early May to early August
Post-Internship Phase	Post-work surveys, follow-ups and feedbacks	August

Program Financing

An important aspect of the *RuralWorks!* program are the financial resources that the College of Engineering provides. Because the internship host sites are in rural communities, and thus often are small to medium manufacturers, they may not have the resources to pay competitive engineering wages compared to companies in urban areas. In addition, some smaller firms do not even have engineers on staff at all. Thus, an important element of the program is that the College of Engineering adds to the wages provided by the company to form an equivalent overall compensation for the student at \$25.00 per hour—where participating companies are required to pay a minimum of \$15 per hour. Details of the finances are given in Figures 2 below.

From Figure 2 you see that each student receives payroll wages from the company as well as participation and relocation stipends from the College of Engineering. Thus, a student working a standard 10-week internship will receive \$10,200 for the summer $[(40 \text{ hours})(10 \text{ weeks})(\$15/\text{hr}) + (40 \text{ hours/wk})(10 \text{ weeks})(\$10/\text{hr}) + (\$200 \text{ relocation})]$. Again, without the College of Engineering financial resources, participating rural companies would not be able to offer a competitive wage to compete for engineering students highly sought after by other companies who do have such resources.

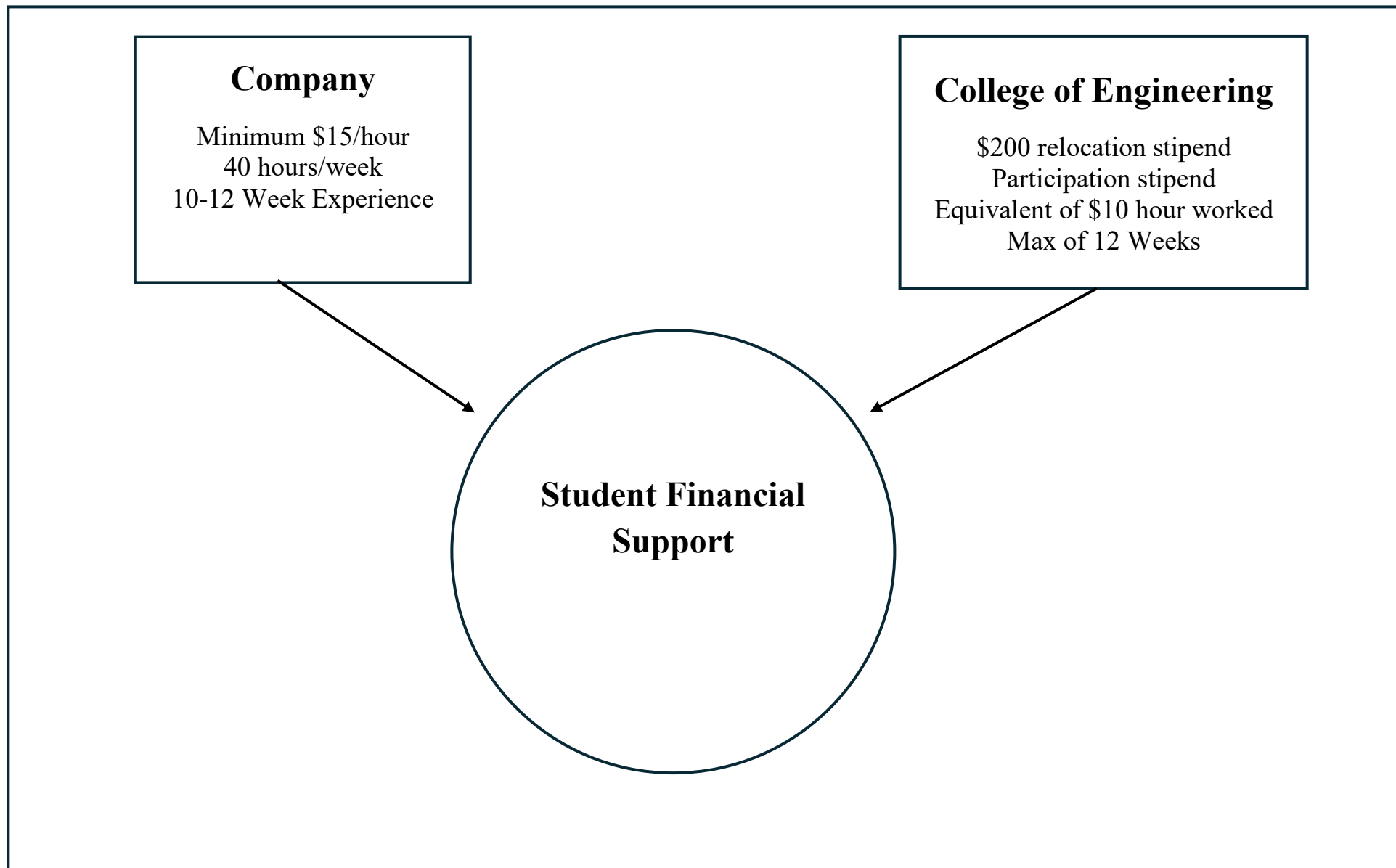


Figure 2: Financial and Employment Model

Program Outcomes

Consistent with COE *RuralWorks!* program goals and each partner's roles, measurable outcomes were developed for each of the strategic partners. These are given in Table 4 below along with respective assessment data/instruments.

Table 4: *RuralWorks!* Outcomes and Methods

Partner	Measurable Outcomes	Assessment
College of Engineering	Grow student participation	Program records
	Grow financial support to match program growth	Financial records
Career Development Center	Student growth related to the eight NACE Career Competencies	NACE pre/post survey
	Student articulation of knowledge, skills, and experiences	Critical Reflection assessment
Industry Extension Services	Generate economic impact on manufactures	NIST MEP customer survey
	Increase number of clients and client engagement	Client records

As mentioned previously, the COE *RuralWorks!* program was initiated in summer 2018 with four students placed at two companies. For purposes of sharing outcomes data and discussing the program as part of this paper, data for the past four years (2022-2025) are provided. This perspective eliminates the effects of both program startup and COVID.

College of Engineering Outcomes:

Grow student participation: Table 5 below lists the total number of internships and applications from students over the past five years. Both measures have increased per our goal, with the limiting factors being internship slots and financial resources. Ultimately our goal is to grow the program to 250 total internships per summer, and it appears that student demand exists to fill jobs if they are available. This outcome is being met.

Table 5: COE *RuralWorks!* Outcomes Data

Year	# Interns	# Applications
2022	61	-
2023	94	1749
2024	147	4265
2025	152	5075

Grow financial support to match program growth: Thus far the College of Engineering has been able to match resources with available internship slots generated by the Industry Extension Services representatives with their clients, along with those advanced by the Career Development Center through their contacts. Awareness of the program continues to grow along with client interest, and at the program goal size of 250 internships the college will need \$1 million plus in financial resources per year. At present this outcome is being met.

Career Development Center Outcomes:

Student growth related to the eight NACE Career Competencies: The *RuralWorks!* internship program is assessed yearly using a pre and post assessment focused on the 8 NACE Career Competencies. This assessment is intended to measure growth by asking students to “Please rate your level of experience with the following competencies:” and “Please rate your level of agreement with the following statements. My internship experience provided me the opportunity to develop my skills in the following competency” ranked on a scale from Strongly Disagree, Disagree, Neither Agree nor Disagree, Agree, and Strongly Agree.

This pre and post assessment is a self-assessment completed by the student. Results of the assessment are coded to a 1 to 5 Likert scale, for quantitative comparison. The results in Table 6 demonstrate that every year has seen growth between the pre assessment and post assessment.

Results shown are the average of all eight NACE competency scores combined. Along with increased scores, the percentage increase between the two assessments has grown from 7% in 2022 to 14% in 2024 and 13% in 2025. This increase coincides with updates by the Career Development Center to *RuralWorks!* orientation and increased one-on-one advising meetings offered by the Rural Outreach Coordinator to help students navigate their professional development. These data demonstrate that interns in the *RuralWorks!* Program have consistently reported growth in eight NACE competencies. At present this outcome is being met.

Table 6: NACE Competencies Student Assessment Results

Year	AVG Pre Competency Score	AVG Post Competency Score	% Increase	Internship Growth Rating
2022	3.7	3.93	7%	4.3
2023	3.54	3.83	8%	4.28
2024	3.5	3.98	14%	4.4
2025	3.59	4.04	13%	4.5

Student articulation of knowledge, skills, and experiences: Starting in 2025 *RuralWorks!* students were required to complete a critical reflection assignment through written submission or an in-person interview. For the quantitative rubric, a 1-3 standard scale (1=Novice, 2=Developing, 3= Competent) created by the NC State University Quality Enhancement Plan[5] for High Impact Experiences (HIE) was used to assess *RuralWorks!* student effectiveness in articulating their knowledge, skills, and experiences. Table 7 shows the 4 benchmark outcomes for HIE's at NC State University and the scores of 60 randomly selected *RuralWorks!* students who completed a critical reflection interview. While the target score across the rubric for HIE's is listed as a 2 across all benchmarks, 2.6 was chosen as the assessment benchmark to set an expectation of *RuralWorks!* students being beyond developing and at, or closer to the competent standard. The final overall average of the assessment interviews was 2.67, which exceeded our initial expected average of 2.6. These assessment results suggest that *RuralWorks!* effectively fosters reflection and learning aligned with NC State University's HIE outcomes. These results don't reflect trends over time or the encapsulation of all *RuralWorks!* students, but early results suggest this outcome is being met.

Qualitatively speaking, internship students reported:

- **Critical Hands-On Learning Opportunities:** Students emphasized that working at rural companies gave them more direct involvement in meaningful projects, allowing them to see the tangible impact of their work within the organization and community.
- **Understanding Rural Value in Global Commerce:** Many noted that their internships deepened their awareness of how rural communities contribute to global industries, highlighting the interconnectedness of local economies with the broader business world.
- **Technical Skill Growth:** Students frequently described expanding their technical abilities and learning to approach the industry in a more applied, holistic way beyond the experiences they have in the classroom.
- **Sense of Community:** Students often described their workplaces as close-knit and family-like, emphasizing how supportive environments contributed to both their personal comfort and professional growth.

- **Professionalism and Teamwork:** For many participants, this was their first experience working in a professional environment. They spoke about developing professional habits, understanding workplace expectations, and learning the importance of collaboration within a team.
- **Career Clarity and Fit:** A common theme was how the internship helped students reflect on their future goals and better understand the type of work and environments they hope to pursue. Many shared that the experience clarified what they value in a career and gave them direction for their next steps.

Table 7: Critical Reflection Assessment Results

Benchmark	Average	# of 3s	# of 2s	# of 1s	Number of Total Scores (each question was scored by two reviewers)
1A - Student articulates the value of the HIE.	2.88	105	15	0	120
1B - Student connects HIE to their personal growth.	2.50	65	50	5	120
2A - Student demonstrates analytical thinking (e.g., question assumptions, examine thought processes, consider alternative perspectives about their HIE)	2.61	77	39	4	120
2B - Student articulates the meaning they took away from the experience	2.70	87	30	3	120
Overall	2.67	334	134	12	480

Industrial Extension Services Outcomes:

Generate economic impact on manufactures: Per Table 4, this outcome is measured by the NIST Manufacturing Extension Partnership (MEP) survey instrument[6]. This survey is a standardized 15-question survey required for federal reporting purposes as part of the NIST MEP program. The survey is administered and submitted through an independent third-party provider and is subject to a structured verification process to ensure data reliability and is completed three to six months following the conclusion of an intern's employment. Using this tool, IES surveyed 141

RuralWorks! host manufacturing employers for the summers of 2021 and 2024, representing the participation of 222 engineering student interns.

For internal policy reasons, not all employers report economic impact data. Table 8 below summarizes economic impact data on internship hosts in 2021-2024 for reporting companies.

Table 8: IES NIST MEP *RuralWorks!* Economic Impact Data

Year	Employers surveyed	Program score	EI Sum	EI Avg	Jobs impacted
2021	23	9.6	\$1,281,717 ¹	\$128,171.70 ¹	25
2022	20	9.6	\$1,235,051 ²	\$102,920.92 ²	24
2023	41	9.5	\$4,806,600 ³	\$184,869.23 ³	84
2024	57	9.7	\$6,323,678 ⁴	\$191,626.60 ⁴	144

¹ Based on 10 responses. ² Based on 12 responses. ³ Based on 26 responses. ⁴ Based on 33 responses.

These engagements generated a cumulative economic impact of more than \$12,500,00.

Increase number of clients and client engagement: As the program matured, participation among rural employers expanded beyond established manufacturing hubs such as the Piedmont Triad to include economically challenged counties in eastern North Carolina. Variations in employer participation across rural regions can be strongly associated with the engagement and advocacy of IES Regional Managers, particularly where the program is aligned with their professional objectives and regional workforce development priorities.

Beyond measurable economic outcomes, the *RuralWorks!* program has strengthened IES's relationship capital with existing manufacturing clients and created a distinctive marketing and engagement opportunity at both the organizational and community levels. IES Regional Managers have leveraged the program to expand outreach and increase awareness of broader University initiatives by engaging new or previously hesitant manufacturers through the program's growing visibility and credibility. In addition, economic development partners across multiple communities have actively promoted the program in collaboration with the University, recognizing its value in connecting high-achieving engineering students with rural employers and increasing the likelihood that these students will pursue long-term employment in those regions following graduation.

Table 9: Number of Internships, Counties Represented, and Companies Engaged

Year	Interns	Counties	Companies
2022	61	27	37
2023	94	31	57
2024	147	39	83
2025	152	43	87

Discussion

Replicability: This program serves as a model for other land-grant universities looking to connect private industry with engineering students through summer internships. It can also be adapted by institutions to support other high-demand fields in rural areas, such as nursing or healthcare.

Scalability: Building on the success of the engineering internship model, NC State University has established a *RuralWorks!* initiative within the Poole College of Management to expand opportunities for students in business disciplines. After a pilot year of 1 internship in 2024 the program has already grown to 15 internship placements for 2026.

Sustainability: The program's cost-share model with industry partners ensures scalability while requiring minimal base funding, making it a financially sustainable solution for long-term impact.

Works Cited

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