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Career connectedness as a co-curricular approach for technology programs

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Abstract

Technology employers continue to report a gap between graduates' technical preparation and their professional readiness for workforce entry (NACE, 2024). In response to the limits of episodic career preparation, this paper presents a practice-based case study of TECH + BITS, a career-connected co-curricular approach developed across technology programs at a regional university over eighteen months. The program comprises two integrated layers: TECH (Technology Engagement for Career Horizons), organized through Special Interest Groups, community-of-practice infrastructure, career-connected extra credit, a speaker series, and identity-formation courses; and BITS (Business and Industry Technology Solutions), a faculty-supervised student consultancy through which teams deliver technology solutions for local organizations. We describe the design, implementation, and descriptive outcomes from its first eighteen months. These include a +0.42 gain in self-reported career readiness in a student experience survey (N = 64), computing employment for 14% of active participants, internships for 11%, and an institutional ranking of 8th nationally in the Spring 2026 National Cyber League Power Rankings among more than 500 institutions. The paper's contribution is practical and design-oriented: a replicable framework for making career readiness more cumulative, visible, and professionally legible in technology programs.

Keywords: career connectedness, communities of practice, experiential learning, information systems education, co-curricular

Introduction

The technology labor market is changing at a pace that conventional curricular revision struggles to match. The World Economic Forum (WEF, 2025) projects that 39% of existing job skills will be disrupted by 2030 and identifies analytical thinking and technological literacy among the most important competencies employers will require. At the same time, the National Association of Colleges and Employers (NACE, 2024) reports that fewer than half of hiring managers regard recent graduates as career ready, citing deficiencies not primarily in technical knowledge, but in professionalism, communication, and applied problem solving.

This gap is not easily resolved through curriculum alone. Courses can build technical competence, but they do not necessarily produce the forms of professional visibility that matter in the labor market: identity, network, experience, and credible artifacts of applied work. Career services, for their part, often provide

valuable but episodic interventions, including fairs, workshops, and advising appointments. Such supports matter, but they rarely function as a cumulative developmental system. They do not consistently compound across semesters, connect meaningfully to disciplinary learning, or generate outcomes that are legible to employers.

At our institution, the practical consequences of that disconnect became especially clear in Fall 2024. In a graduating capstone cohort of eight students, only one had begun an active job search. One was participating in Curricular Practical Training. None had engaged in professional networking beyond the classroom, and none had contributed to a technical initiative outside formal coursework. These students were not lacking in technical capacity. They were, rather, professionally underexposed and difficult for employers to see.

This paper presents our response to that problem: TECH + BITS, a career-connected co-curricular structure developed to move students from academic competence without professional visibility toward more visible, employer-relevant forms of readiness. TECH—Technology Engagement for Career Horizons—serves as the engagement layer, anchored in the ACM Student Chapter and organized through faculty-mentored Special Interest Groups (SIGs). BITS—Business and Industry Technology Solutions—constitutes the applied practice layer, through which student teams address real technology needs for local organizations. Together, these components create a developmental structure in which students do not merely acquire knowledge, but participate, contribute, lead, and produce evidence of readiness.

The program is grounded in Communities of Practice, Peer-Led Team Learning, Social Cognitive Career Theory, and Future Time Perspective. It also extends the prior work of Aydin & Alpay (2026), which articulated the initial theoretical rationale and reported early outcomes from TECH, while identifying BITS as a future direction. BITS is now fully operational. The present paper therefore offers a practice-based case study of TECH and BITS as an integrated career-connected approach, documenting its design logic, implementation across the first eighteen months, and descriptive outcomes and lessons from practice across both layers. The paper makes three contributions: it documents the design of an integrated career-connected approach for technology programs, reports descriptive outcomes from its first eighteen months of implementation, and derives practical implications for institutions seeking to make career readiness more cumulative, visible, and professionally legible. In doing so, the case also connects co-curricular design to longstanding concerns in the information systems field regarding the centrality of the IT artifact and the professional identity of the discipline (Benbasat & Zmud, 2003; Orlikowski & Iacono, 2001).

Background and Literature Review

This design is informed by four complementary frameworks: Communities of Practice, Peer-Led Team Learning, Social Cognitive Career Theory, and Future Time Perspective. Together, they suggest that students are more likely to persist and develop durable professional identities when they are embedded in participatory communities, supported by credible near-peers, and able to connect present work to future opportunity.

Communities of Practice (CoP) provide the broadest account of this process. Lave and Wenger (1991) and Wenger-Trayner and Wenger-Trayner (2015) argue that learning is not simply the acquisition of skill but movement into fuller participation in a shared domain of practice, through which students develop not only competence but identity. The Special Interest Groups function in this sense as communities of practice: students enter as newcomers and, over time, assume more central roles as contributors, mentors, and leaders.

Peer-Led Team Learning (PLTL) identifies one mechanism through which such participation can be organized. By positioning near-peers as facilitators, PLTL has been shown to strengthen engagement and persistence in STEM settings (Wilson & Varma-Nelson, 2016). Student-led SIG sessions, chapter officer roles, and BITS team leadership extend that logic into a broader developmental structure. Peer leadership is therefore not only pedagogically valuable but structurally important, expanding participation while reducing reliance on continuous faculty direction.

Social Cognitive Career Theory (SCCT) adds a more explicit account of career development, holding that self-efficacy, outcome expectations, and goals shape educational and vocational trajectories within a context of environmental supports and constraints (Lent et al., 1994). It is especially relevant here because access alone is insufficient: students are more likely to persist when they believe they can succeed, when outcomes are visible and credible, and when aspirations are translated into actionable goals. Authentic project work, alumni exposure, and structured goal-setting are intended to strengthen each of these dimensions.

Future Time Perspective (FTP) helps explain why those connections must be made explicit. FTP concerns the extent to which students perceive present effort as meaningfully related to future outcomes (Husman & Lens, 1999); when that relationship is weak, motivation and persistence tend to decline (Simons et al., 2004). Career-connected extra credit and BITS projects are designed to narrow that gap by making the relevance of current engagement to future opportunity more immediate and visible.

While these four frameworks originate primarily in education and career psychology, the program also invites interpretation through an information systems lens, since much of its operation is mediated by technology. Two perspectives are especially pertinent. First, the community-of-practice infrastructure—Canvas as a persistent repository and Microsoft Teams as a coordination environment—can be understood in terms of affordances (Leonardi, 2011): the same platforms afford different forms of participation, visibility, and continuity depending on how students and faculty take them up. The artifact requirement attached to career-connected activities is, in this sense, a deliberate attempt to actualize affordances for professional visibility rather than to assume they will emerge on their own. Second, the program as a whole can be read as a sociotechnical arrangement in which social structures (Special Interest Groups, peer leadership, client relationships) and technical structures (digital platforms, public-facing artifacts, competition environments) are mutually constitutive rather than separable (Orlikowski, 2000). This framing complements the educational theories by drawing attention to how the technical configuration of the program shapes, and is shaped by, the social practices it is intended to support.

Taken together, these frameworks do more than provide a conceptual backdrop; they describe the developmental logic of the program design itself. The central claim is not simply that the structure supports skill development, but that a peer-led, career-connected arrangement can support the more durable work of professional identity formation. In the analysis that follows, these frameworks are used both to justify the design and to interpret the descriptive patterns observed in implementation and outcomes.

Program Design and Implementation

Design Principles

Three principles governed the design of the program. First, it was conceived as systemic rather than episodic: career readiness was treated as the product of sustained, interlocking forms of engagement rather than isolated events. Second, it was designed to be student-led rather than faculty-dependent: a scalable model could not rely on continuous faculty intervention for its daily operation. Third, it prioritized visible

artifacts over invisible effort: each form of engagement was expected to produce evidence that students could present to employers in concrete and credible ways. The overall architecture of the program, including its two principal layers and their relationship to externally visible outcomes, is summarized in Figure 1. Table 1 summarizes the design principles and principal mechanisms through which that approach was operationalized.

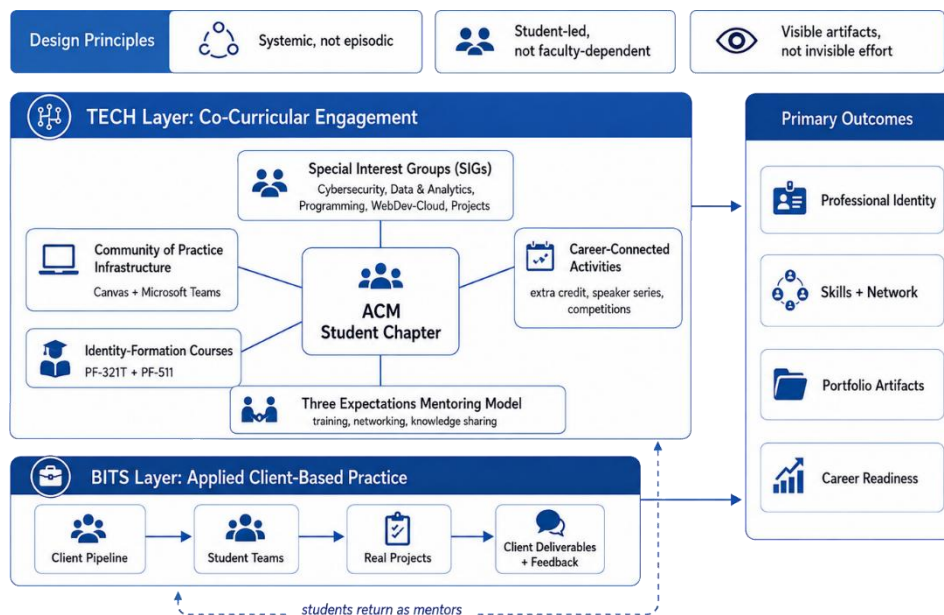


Figure 1. Program architecture: Design Structure, Core Components, and External Connections

The TECH Layer: Co-Curricular Engagement

TECH serves as the co-curricular engagement layer of the model and is organized through the institution's ACM Student Chapter. It was developed to address the distance between technical coursework and professional readiness by creating a set of connected mechanisms through which participation could accumulate across a student's program. Rather than treating career preparation as a set of optional adjuncts, TECH was structured to make professional development continuous, social, and visible.

The ACM Student Chapter functions as the organizational backbone of this layer, organized across five Special Interest Groups—Cybersecurity, Data & Analytics, Programming, WebDev-Cloud, and a cross-functional projects group—and supported by four faculty mentors (see Table 2 for membership and project counts). The structure is intentionally developmental: students enter as peripheral participants and, through contribution and leadership, move toward fuller participation in a community of practice. The Cybersecurity SIG's student-led Security+ preparation initiative, which emerged from within the SIG rather than through faculty direction, illustrates this dynamic.

This community-of-practice arrangement is reinforced through digital infrastructure designed to sustain continuity beyond individual meetings. Canvas functions as a persistent repository for recorded sessions, shared resources, and reflective artifacts, while Microsoft Teams supports real-time coordination organized by SIG and project group in a manner that mirrors professional technology environments. As of Spring 2026, this infrastructure had supported 82 documented engagements and more than 49,000 page views.

A second mechanism is the career-connected extra credit system, which incentivizes professional engagement across event-based, co-curricular, and competitive activities such as meetups, OhioX and AWS

user group events, certifications, portfolio projects, hackathons, National Cyber League participation, and DataFest. Students may earn up to 50 points per semester (equivalent to ½ letter grade in a single course), with point values scaled to the effort and intensity of each activity. The central design feature, however, lies in the artifact requirement: each activity must produce a public-facing output, such as a LinkedIn post, blog entry, or video reflection, translating participation into visible professional capital rather than private effort (see Table 2 for reach and completion figures).

Table 1. Design Principles, Program Mechanisms, and Intended Outcomes

Design Principle	Program Mechanism	Intended Outcome
Systemic rather than episodic	ACM Student Chapter organized through Special Interest Groups; Community of Practice infrastructure (Canvas and Microsoft Teams); recurring speaker series; identity-formation courses; career-connected extra credit; BITS applied project layer	Sustained, cumulative engagement across the student lifecycle rather than one-time participation
Student-led rather than faculty-dependent	SIG leadership roles; peer mentoring; student-led sessions; Security+ preparation initiative; student project leadership within BITS	Scalable participation, distributed leadership, and developmental progression from newcomer to mentor
Visible artifacts rather than invisible effort	Public-facing outputs tied to extra credit activities (e.g., LinkedIn posts, blog entries, video reflections); portfolio projects; client deliverables through BITS; presentations and technical write-ups	Professionally legible evidence of readiness for employers and external stakeholders
Career-connectedness embedded across the program	PF-321T; PF-511; speaker series; certifications; competitions; BITS client work	Stronger connection between coursework, co-curricular participation, and future professional trajectories
Authentic work rather than simulated preparation alone	BITS client engagements; DataFest; National Cyber League participation; portfolio-based and project-based activity	Applied confidence, externally visible performance, and experience under conditions approximating professional practice

The Tech Speaker Series extends that visibility by connecting students directly with regional industry professionals. Fourteen monthly sessions have been held, with cumulative attendance exceeding 400 students. These sessions are supplemented by participation in three OhioX events, five CYPeer events, and three AWS user group events coordinated through the chapter, thereby widening students' access to external professional networks.

Two courses anchor the academic dimension of TECH. PF-321T (Professional Foundations) focuses on professional identity formation through fully practice-based activities. Following redesign, course evaluations showed gains across several measures, including recommendation rates, connection to professional experience, positivity about the field, and engagement with practical activities. PF-511 (Technology Career Foundations and Professional Networking) formalizes career development as an elective course. Twelve students enrolled in Spring 2025. The course can also address a major-area transfer credit gap, thereby embedding career readiness more directly into degree progression rather than positioning it solely as optional enrichment.

A final pedagogical element is the “three expectations” mentoring model, which organizes student development around professional habits: daily technical development (certifications, practice platforms, or applied projects), professional networking (meetups, online communities, LinkedIn, and industry interaction), and public knowledge sharing (blog posts, technical writing, or presentations). The purpose of this framework is to align everyday behavior with the longer arc of professional identity formation.

The BITS Layer: Applied Client-Based Practice

BITS (Business and Industry Technology Solutions) serves as the applied practice layer of the program. In BITS, student teams address real technology problems for local organizations under faculty supervision. The structure is intentionally client-facing: deliverables, timelines, and accountability are real, and students are expected to produce work that is useful beyond the classroom.

The client arrangement is designed to balance access and sustainability. Nonprofits and government entities are served on a pro bono basis, while small businesses and private organizations are invited to make a voluntary, tax-deductible gift to the institution. This approach lowers barriers for mission-driven organizations while creating a viable pathway for private-sector participation. Recruitment efforts focus on nonprofits, alumni organizations, and local business networks.

The project portfolio illustrates the applied range of the approach. Completed projects include an AI-based PDF Explanation of Benefits extraction tool for a local dental practice, a Power Automate and SharePoint archiving system for the institution, and a market research and data visualization project for a local religious organization, with a university-branded student blog and portfolio site in progress through the WebDev-Cloud SIG. These projects give students client-facing experience and portfolio artifacts that are authentic and externally legible.

Developmental Pathway

Taken together, TECH and BITS were designed as a coherent developmental pathway rather than parallel initiatives. The progression begins with PF-321T and professional identity formation, continues through the broader TECH engagement environment and PF-511, where students build skills, networks, and career visibility, and reaches its most applied stage in BITS and the capstone, where students produce authentic client work and portfolio evidence. The intended endpoint is not merely program completion, but a graduate who is job-ready in a more visible and verifiable sense—equipped with artifacts, relationships, and experiences that make readiness legible to employers. Figure 2 summarizes this pathway and the relationship among its principal stages, mechanisms, and outcomes.

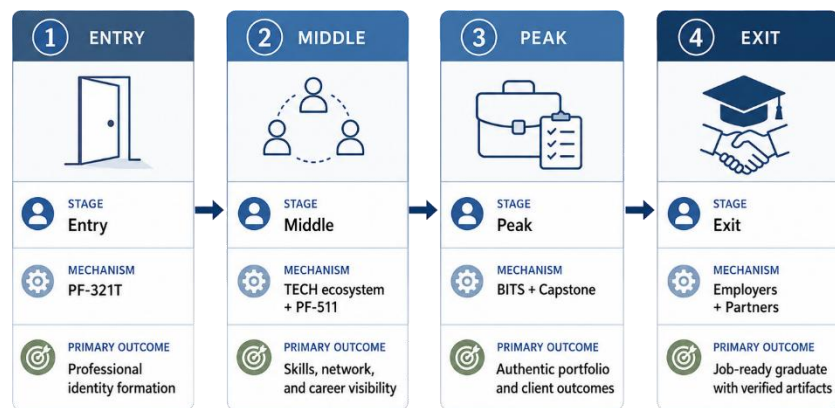


Figure 2. Student Pathway in the TECH + BITS structure: Stages, Mechanisms, and Primary Outcomes

Data Sources and Descriptive Approach

This paper is presented as a practice-based case study of a career-connected co-curricular program in an authentic institutional setting. The purpose is not to isolate causal variables but to document how the approach was developed, describe its implementation, and examine descriptive evidence from its first eighteen months. The orientation is toward institutional learning and analytic insight rather than causal inference.

The analysis draws on five sources of evidence. First, a Student Experience Survey (N = 64) was administered in early May 2026 through Canvas and ACM Teams. Co-developed by the authors as a local instrument for program evaluation, it comprised 13 items spanning awareness and participation, barriers, career-connected outcomes, career readiness, tangible progress, and open-ended feedback, and combined Likert, single- and multiple-choice, and open-response formats. It included a retrospective before-and-after self-assessment of career readiness and items on concrete outcomes such as résumé and LinkedIn development, certification progress, and employment or internship attainment. Results are analyzed descriptively rather than inferentially. Second, a prior MWDSI 2026 survey (N = 24), reported in Aydin and Alpay (2026), provided longitudinal context through Likert-scale items aligned with ABET student learning outcomes. Third, participation and engagement metrics were drawn from Canvas analytics, ACM chapter records, and Microsoft Teams activity logs. Fourth, competition outcomes were drawn from the National Cyber League institutional Power Rankings. Fifth, BITS project outcomes were documented through client deliverables, faculty evaluations, and client feedback.

The findings reported here should be interpreted within the limits of the design (see Study Limitations): participation is voluntary and self-selected, survey data are self-reported, and because the paper examines a single institutional case, its contribution is best understood as analytic rather than statistical generalization.

Descriptive Outcomes

Table 2 consolidates the principal descriptive indicators across the five categories of evidence, along with the basis for each calculation, before each is discussed in turn.

Table 2. Summary of Descriptive Outcomes (First Eighteen Months)

Category	Indicator	Result	Definition / Basis	Source
Participation & reach	ACM chapter membership (total / active)	358 / 190	"Active" is logged activity within the past month	Chapter records
	Special Interest Groups / concurrent projects	5 / 16	Count of SIGs and projects underway as of Spring 2026	Chapter records
	Community-of-practice infrastructure	82 documented engagements; 49,000+ page views	Cumulative count of recorded sessions, shared resources, and reflective artifacts; cumulative	Canvas / Teams analytics

Category	Indicator	Result	Definition / Basis	Source
			Canvas/Teams page views	
	Career-connected extra credit reach	180 unique students; 24 completions	Unique students targeted for extra-credit opportunities; count of documented completed activities	Canvas analytics
	Extra-credit active engagement rate	13%	Completions ÷ unique students reached	Canvas analytics
	Tech Speaker Series	14 sessions; 400+ cumulative attendance	Count of monthly sessions held; sum of attendance across sessions	Chapter records
Student development (Survey, N = 64)	Active participation	35 of 64 (55%)	Respondents self-identifying as having participated in one or more career-connected activities	Student Experience Survey
	Career readiness (retrospective)	2.58 → 3.00 (+0.42)	Mean retrospective self-rating, before vs. after, 5-point scale, among respondents providing both ratings	Student Experience Survey
	Confidence / articulate skills / connection to goals / recommendation intent	3.79 / 3.65 / 3.96 / 4.23	Mean Likert ratings (5-point scale) on individual survey items	Student Experience Survey
	Résumé and LinkedIn created or improved	35% each	Share of respondents reporting the outcome	Student Experience Survey
	Applied for job/internship/co-op; certification progress	23% each	Share of respondents reporting the outcome	Student Experience Survey
	Computing employment / internship or co-op completed	14% / 11%	Share of respondents reporting the outcome	Student Experience Survey
Course-embedded (PF-321T)	Practical activity engagement	+18 pts	Percentage-point change between pre-redesign (Spring 2025) and post-redesign (Fall 2026) course evaluation administrations	Course evaluations
	Recommendation rate / professional-experience connection / positivity about field	87% / 89.4% / 87.2%	Post-redesign values; gains of +8 / +7 / +20.6 pts over pre-redesign baseline	Course evaluations

Category	Indicator	Result	Definition / Basis	Source
Competition	NCL Spring 2026 Power Rankings	8th of 500+ institutions	Institutional placement from aggregated individual student scores	Cyber Skyline (2026)
	DataFest experience / NPS / would participate again	4.1 of 5 / 9.4 of 10 / 90%	Mean post-event experience rating; net promoter score; share indicating willingness to return	Post-event survey
Applied client (BITS)	Projects completed / in progress	3 / 1	Count of client engagements reaching delivery vs. still active	Project records, faculty evaluation

Participation, Reach, and Program Uptake

Across its first eighteen months, the program achieved substantial institutional reach, as summarized in Table 2. In the context of an institution enrolling approximately 1,200 technology students, 98% of whom are online-only, and serving a substantial adult learner population, this level of voluntary participation is notable. Taken together, these indicators suggest that the program operated at more than a pilot scale, with participation distributed across multiple points of entry and sustained through recurring structures rather than isolated events, a pattern consistent with the program's underlying design.

Student Development and Perceived Career Readiness

Survey findings also suggest positive developmental outcomes among participating students. Of the 64 respondents to the Student Experience Survey, 35 (55%) reported active participation in one or more career-connected activities, while 45% reported limited or no prior participation. Among respondents providing both ratings, retrospective self-assessment of career readiness increased from a mean of 2.58 to 3.00 on a 5-point scale, representing a gain of +0.42.

Related survey items further clarify the character of that change (Table 2), with recommendation intent the highest-rated item. These findings do not establish causal effects, but they do suggest that students experienced the program as relevant to their professional development and increasingly connected to their career trajectories.

Reported outcomes were also concrete. Beyond résumé, LinkedIn, application, and certification activity (Table 2), 14% of active participants reported securing computing employment and 11% reported completing an internship or co-op placement.

The survey also identified several barriers to participation. Work, family, or personal obligations were reported by 62% of respondents, scheduling conflicts by 50%, and lack of awareness by 44%. The last of these is especially important, because it suggests that some nonparticipation reflects a structural communication problem rather than simple disinterest. In a student population shaped by adult responsibilities and constrained time, access and visibility remain design challenges in their own right.

Open-ended responses added texture to these barriers. Several respondents pointed to the need for more accessible, better-scaffolded entry points for less experienced students, for whom some activities can appear intimidating. Others expressed strong interest in more hands-on, career-proximate experiences, including internships, applied projects, and certification-aligned learning. Taken together, these comments suggest

that the central implementation challenges concern visibility, accessibility, and the degree to which opportunities are experienced as navigable and institutionally supported, rather than motivation alone.

Student comments reinforce these patterns. One respondent wrote that participation in the Spring 2026 National Cyber League “has brought me closer to other students and given me the biggest boost to my cybersecurity career goals.” Another emphasized the value of mentoring others in cloud software engineering within a chapter community marked by diverse backgrounds and experiences. Read together, these responses suggest that students experienced the program not simply as supplemental activity, but as a setting for belonging, growth, and professional formation.

Course-Embedded Developmental Outcomes

Evidence from the academic layer points in a similar direction. Course evaluation data from PF-321T showed consistent improvement following redesign within the broader ecosystem, with gains in practical activity engagement, recommendation rate, connection to professional experience, and positivity about the field (Table 2).

These outcomes should be interpreted with appropriate caution, since they do not isolate the effects of any single program component. Even so, they are consistent with the broader program design, particularly its emphasis on practice-based activity, professional identity formation, and the explicit connection between coursework and future professional life.

Prior survey data reported in Aydin and Alpay (2026) provide additional context. Using a 5-point Likert scale aligned with ABET student learning outcomes, that earlier survey found strong self-reported outcomes among students with active ecosystem engagement in teamwork (4.8), problem solving (4.7), communication (4.6), and ethics (4.5). These findings are best understood as contextual rather than confirmatory, but they help situate the present results within a longer developmental trajectory.

Competition and Challenge-Based Outcomes

Competition- and challenge-based experiences provided a more externally legible set of outcomes. In the Spring 2026 National Cyber League (NCL) Power Rankings, the institution placed 8th nationally among more than 500 colleges and universities. Because the rankings aggregate individual student performance into an institutional score, NCL provides one of the clearest externally benchmarked indicators in the present model. Although the result does not establish causality, it indicates that sustained, peer-led preparation can support nationally competitive cybersecurity performance even in a smaller institutional setting.

DataFest offered a related but distinct form of challenge-based participation. The Spring 2026 event engaged 23 participants, 7 mentors, and 6 judges, and follow-up responses were positive (Table 2). Ninety percent strongly agreed that DataFest improved their career readiness or strengthened their connection to real-world data work. One student described the event as “working under pressure with large raw data in a group of strangers under a tight deadline,” adding that it was “as real world as it gets.”

Considered together, these activities suggest that competition and structured challenge played an important role in the design, translating preparation into visible performance under conditions that approximated professional demands and making student capability more legible both to participants and to external audiences.

Applied Client Outcomes

The applied layer produced a further category of outcomes through client-facing work. The completed projects generated direct client feedback that speaks to the perceived usefulness and credibility of the student work.

An executive director of one participating organization described the first project output as “truly impressive” and “way more than I expected this early in the process.” The dental practice client commented on the AI demonstration by noting that “it is impressive to see that AI can read the EOB PDF file.” A client associated with the Archive Automation project observed that the work would have “a significant impact” on local archival processes and might also influence similar systems in other repositories.

These comments are necessarily limited as evaluative evidence, but they remain important. They indicate that external partners experienced the work as credible, useful, and consequential beyond the classroom. That is important because the central claim of the approach is not only that students should learn, but that they should produce artifacts and outcomes that are visible and meaningful in professional contexts. The BITS results suggest that this aspect of the model was beginning to function as intended.

Discussion

Developmental Reinforcement Across the Ecosystem

The most important operational insight from the first eighteen months is that the model appears to function as a reinforcing system rather than a set of discrete activities, in which participation in one layer increases the likelihood and value of participation in others. Students who enter through a SIG encounter peers who have already completed BITS projects or assumed leadership roles, making later stages of the pathway more visible; students who complete applied projects often return as mentors, strengthening the peer-led structure; and the speaker series links local participation to external employers and practitioners. At the same time, the open-ended responses suggest that reinforcing systems do not automatically solve the problem of entry: if opportunities remain insufficiently visible or appear accessible only to already confident students, the developmental advantages may remain unevenly distributed.

This reinforcing quality is analytically important because it distinguishes a coherent developmental system from a collection of programs. A career fair or workshop may produce a useful but isolated interaction. The model described here, by contrast, appears to generate repeated, connected, and cumulative forms of engagement across a student’s progression through the program. Its practical significance lies not only in the number of opportunities available, but in the way those opportunities begin to reinforce one another over time. Framed sociotechnically, this reinforcement is not purely social: the digital infrastructure, public-facing artifacts, and competition platforms are themselves part of what makes participation visible and therefore self-reinforcing, illustrating how the technical and social elements of the ecosystem operate together rather than independently.

Authentic Work and Professional Confidence

The BITS findings also suggest that client-facing work may produce a different form of development than course-based simulation alone. Students work within conditions of genuine accountability—client expectations, deliverable timelines, and organizational consequence—that test developing competence against real stakes rather than hypothetical ones.

From the perspective of Social Cognitive Career Theory, this distinction is consequential: self-efficacy is strengthened through successful engagement with meaningful tasks under conditions that approximate

actual practice. The completed BITS projects each involved real organizational needs rather than simulated scenarios, and client feedback indicates the work was experienced as useful and credible. The student response to DataFest points in the same direction. Across both settings, authentic work served not simply as application, but as a mechanism for converting technical learning into more durable professional confidence.

Student Leadership and Program Scalability

A further implication of the model concerns scalability. As students assume responsibility for facilitation, mentoring, and project leadership, the program becomes less dependent on continuous faculty management without becoming faculty-absent. The faculty role shifts from direct delivery toward strategic mentorship, design stewardship, and quality oversight. That is an important structural distinction. The point is not merely to reduce faculty effort, but to position faculty involvement where it is most consequential.

This dynamic is visible in the Cybersecurity SIG's independently launched Security+ preparation initiative, which enrolled 26 students across 14 sessions without faculty initiation. The example suggests that students were not merely participating in a prebuilt structure but beginning to extend and reproduce it themselves. Student leadership thus functions not only as a pedagogical good but as an operational advantage, increasing capacity and continuity and making the model more sustainable over time.

AI-Era Workforce Preparation

The model also has implications for workforce preparation in an AI-shaped labor market. The ecosystem addresses AI readiness directly through extra-credit pathways and BITS projects that require students to build, evaluate, and use AI-assisted solutions in applied contexts, where consequences are real enough to require judgment about tools, outputs, and limitations rather than abstract exposure alone.

The approach also supports capacities likely to remain important even as tools change. The ecosystem repeatedly places students in settings that require analytical thinking, collaborative problem solving, communication, professional judgment, and the ability to make technical work legible to others—capacities that make technical competence usable in organizational life and that are difficult to cultivate through episodic interventions alone. AI-era readiness may therefore depend less on isolated exposure to emerging tools than on sustained participation in arrangements that connect technical development, applied work, and professional identity formation over time.

Taken together, these patterns suggest that the value of the model lies less in any single activity than in the way its components reinforce one another, pointing to the importance of coherence, sequence, and reinforcement in career-connected program design.

Implications for Practice, Research, and Policy

Implications for Practice

One practical implication of this case is that institutions seeking to strengthen career readiness may not need large budgets or extensive new staffing to begin. The core elements of the approach described here—a SIG-organized student chapter, a dual-platform community-of-practice infrastructure, career-connected extra credit with artifact requirements, a recurring speaker series, and a client-facing applied project layer—can be developed incrementally using existing institutional resources. The larger requirement is less financial than organizational: the approach depends on coherence, continuity, and a willingness to treat career-connected development as a structured part of the student experience rather than as a peripheral service.

It is also useful to distinguish which elements of the approach are likely to transfer and which are bound to the local context. The transferable core appears to lie in the design principles rather than in their specific instantiation: organizing co-curricular engagement as a community of practice, attaching public-facing artifacts to participation, distributing leadership to near-peers, and incorporating a client-facing applied layer are arrangements that do not depend on this institution's particular size, mission, or platform choices. By contrast, several features reflect local conditions and would require adaptation elsewhere—among them the predominantly online, adult-learner population that shaped scheduling and communication decisions, the specific SIG composition aligned with regional employer demand, the ACM Student Chapter as the organizing vehicle, and the pro bono and gift-based client model calibrated to local nonprofit and business networks. Institutions with residential populations, different disciplinary mixes, or distinct partnership ecosystems might preserve the underlying principles while implementing them through different structures. Framed this way, the case is best read not as a template to be copied, but as a set of design commitments whose specific expression should be expected to vary across settings.

The open-ended responses also suggest several refinements for implementation. Communication cannot be treated as incidental: students repeatedly reported being unaware of opportunities or uncertain how to begin, pointing to the need for systematic onboarding, clearer semester-by-semester opportunity maps, and repeated multi-channel communication. Institutions serving adult learners should treat schedule flexibility—later meeting times, asynchronous options, and remote participation—as central rather than peripheral, and should provide more intentionally scaffolded entry points for less-prepared students who may experience peer-led communities as intimidating.

Several design conditions reinforce these refinements. The model depends on faculty serving primarily as mentors and stewards rather than as managers of every activity; on visible artifacts as the output standard for participation, which shifts its logic from attendance toward contribution and professional legibility; and on a reliable client pipeline of nonprofits, alumni, and community partners capable of generating meaningful applied work. Visible institutional support and recognition are necessary if student-led structures are to remain sustainable over time.

Implications for Research

For researchers, the case points toward several next steps. Longitudinal study of career outcomes—placement, time to employment, internship conversion, and employer assessments of readiness—would clarify how sustained participation relates to post-graduation outcomes. Multi-institutional replication across institutions differing in size, modality, mission, and student population would help identify which aspects of the model are robust and which require local adaptation.

There is also a need for stronger comparative and measurement frameworks. Mapping program outcomes to established competency models, including NACE career readiness competencies, would support clearer cross-institutional comparison and more disciplined assessment. Future research might also investigate which mechanisms within such approaches—peer leadership, artifact production, authentic client work, or identity-focused coursework—appear most consequential under different conditions.

Implications for Policy

At the policy level, this case suggests that highly intentional co-curricular engagement should not be treated merely as enrichment. In professionally oriented fields, practices such as identity-formation courses, career-connected artifact production, and client-facing applied work may function as integral components of professional formation. Institutions that continue to classify them as optional add-ons risk producing graduates whose technical preparation is real but whose readiness remains difficult for employers to see.

Study Limitations

Several limitations should shape the interpretation of these findings. First, the case is drawn from a single regional university with a distinctive student population, including a substantial number of working adults in an online-first environment; as discussed above, transferability would require replication across other settings.

Second, participation in the program is voluntary and therefore subject to self-selection. Students who engage in TECH and BITS may differ in motivation, confidence, available time, or career orientation from those who do not. The descriptive outcomes reported here therefore should not be interpreted as evidence of program efficacy in a causal sense.

Third, several of the reported outcomes rely on self-reported survey data. Measures such as career readiness, confidence, employment, and internship attainment reflect student perception and disclosure rather than independent verification. These findings remain useful as indicators of participant experience, but they should be read within those constraints.

Fourth, the BITS project portfolio remains relatively small. Three completed projects and one project in development provide promising evidence of feasibility and applied value, but they do not yet permit strong claims about the distinct contribution of the client-facing layer to long-term career outcomes.

Conclusion

Career connectedness is better understood not as a supplemental service but as a structured institutional environment that shapes how students engage with learning, peers, and professional practice across their program. In the present case, when peer-led participation, sustained communities of practice, explicit professional habits, and authentic client work were organized as connected rather than separate experiences, students appeared to develop not only technical competence but a stronger sense of professional identity.

The descriptive outcomes reported here are methodologically modest but practically meaningful. An 8th-place national ranking in the Spring 2026 NCL Power Rankings, a +0.42 gain in self-reported career readiness across 64 respondents, and credible client-facing deliverables through BITS together suggest that a regional university need not possess research-intensive resources or a large career budget to create professionally consequential opportunities. What matters more is the coherence of the design and the extent to which participation produces visible, cumulative, and externally legible development.

As institutions seek scalable approaches to workforce preparation, this case suggests that career connectedness may be most effective when it is organized as an ongoing institutional structure rather than treated as an occasional intervention. Under those conditions, students do not merely prepare for professional life at the end of a program; they begin to encounter it, test it, and make aspects of it visible while they are still moving through it.

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