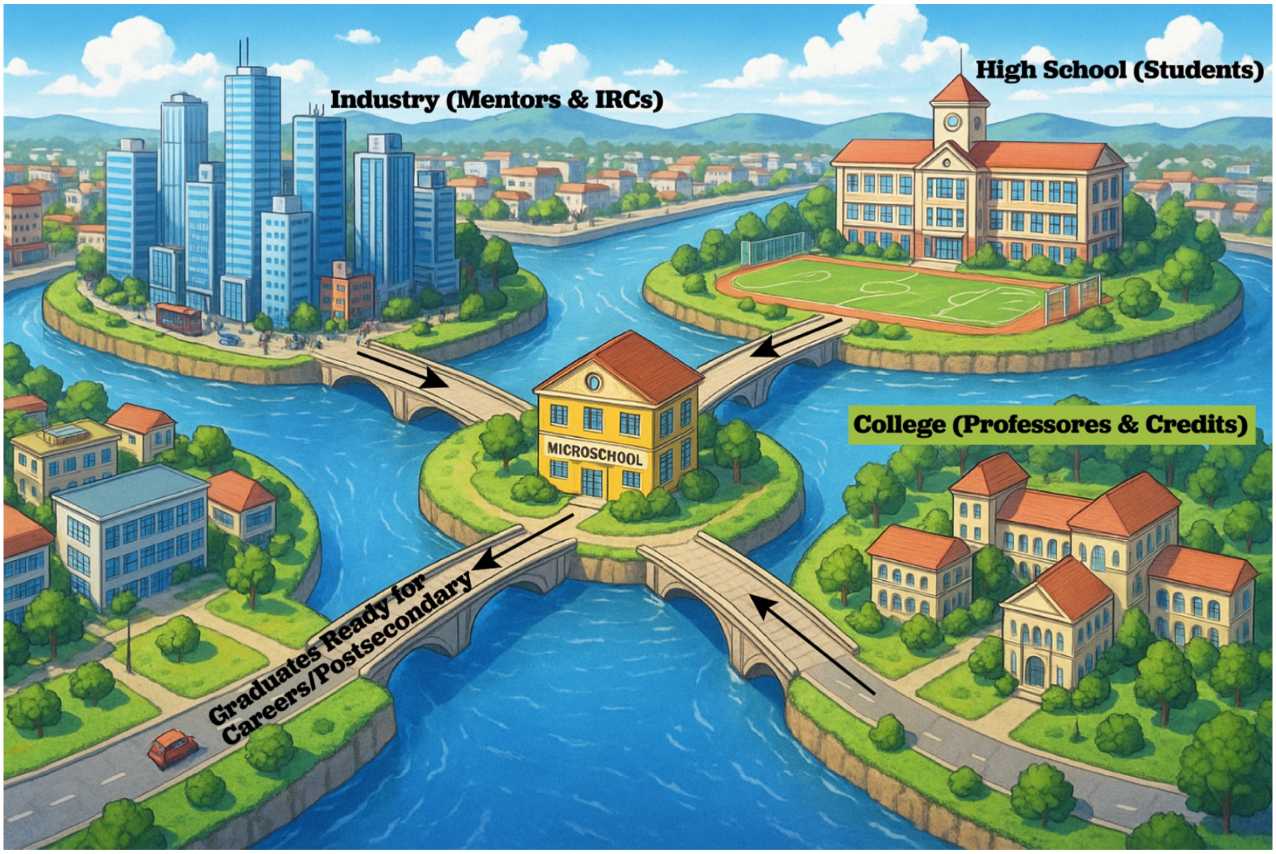

The Early IT Microschool Powered by PAST: Empirical Results

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Executive Summary

The Early IT Microschool powered by PAST Foundation provides an innovative educational model that bridges gaps between secondary and postsecondary education, formal and informal learning, and school and industry, giving high school students the opportunity to earn college credits, industry-recognized credentials, and direct admission to university IT programs in a uniquely student-centered environment. By dismantling traditional barriers, the program expands equitable access to information technology and computer science pathways for students from diverse backgrounds, effectively addressing pressing workforce shortages in critical tech fields. Empirical research demonstrates that strategies integrating problem-based learning, dual enrollment, and holistic advisory supports significantly improve student STEM affinity, belonging, and career focus, with robust evidence of technical competency and industry alignment as students earn CompTIA and leadership certifications. The study highlights policy implications for scaling similar microschool models to meet national needs for IT professionals

and recommends continued research into long-term student outcomes and culturally responsive adaptations to serve all communities effectively.

Research Context and Background

The Early IT Microschool powered by PAST expands access to information technology (IT) and computer science (CS) pathways by disrupting traditional structures that limit participation across social sectors. Building on the University of Cincinnati's Early IT initiative [6, 11, 25], the microschool blurs boundaries between formal and informal education, secondary and postsecondary education, and school and industry [cf. 20, 21]. This provides high school students the opportunity to simultaneously earn college credits, industry-recognized credentials (IRCs), and direct admission to university IT programs in an alternative learning environment, which supports them through student-centered learning, advisory, mentoring, and positive socioemotional support.

Thus, the program addresses two urgent challenges:

1. Exposing young people to IT/CS pathways that prepare them as qualified professionals. This is critical given severe US shortages in cybersecurity, data sciences, cloud computing, DevOps, AI/ML engineering, and information security [5, 15, 22].
2. Inequitable access to IT/CS opportunities for individuals from diverse social sectors [2, 10, 15, 19].

Traditional pipelines fail to meet workforce needs because they lack the required technical and problem-solving skills education needed to adapt rapidly to changing industry demands. Furthermore, many high school students in rural and urban districts lack access to advanced IT/CS courses, perpetuating opportunity gaps [4, 28]. The microschool integrates transferable dual-enrollment credits, marketable industry-recognized credentials (IRC) such as CompTIA A+ (first year), CompTIA Security+ (second year) and leadership (first year) certifications, problem-based and mastery-based learning, and holistic student supports [cf. 7, 20, 21]. These features accelerate progress, promote positive self-image, confidence, autonomy, and a future-oriented mindset. In addition, they reduce financial barriers and validate skills for higher education and employment [7, 8, 9, 12, 13, 26, 27, 30].

Partnership with the University of Cincinnati (UC) allows high school students to engage in rigorous, industry-aligned college coursework while maintaining secondary enrollment. Graduates leave with career-ready certifications, transferable credits, and guaranteed admission into UC's IT program [6]. Grounded in research on belonging, self-efficacy, and career development [7, 3, 14, 29], the PAST model strengthens identity, confidence, and persistence in STEM while providing verifiable proof of technical competence. By aligning psychosocial supports with professional preparation, the microschool creates an accelerated, unbiased pathway into high-demand IT and CS careers for everyone.

Methodology and Research Design

We employed a mixed-methods approach with pre- and post-survey design incorporating semi-quantitative measurement of student attitudes and career development status, plus qualitative data collection through focus groups to capture student experiences. We collected data on mitigating factors, including grade level and sociodemographic information. Multiple instruments assessed student outcomes including STEM affinity, STEM affinity status development, and sense of belonging and self-confidence within IT/CS disciplines.

STEM affinity was measured using single-item and composite measures encompassing belonging, self-confidence, and future-oriented mindset, with acceptable reliability (Standardized Cronbach's α > 0.6). STEM affinity status was evaluated using established frameworks distinguishing diffuse, foreclosed, moratorium, and achieved statuses with acceptable reliability (Standardized Cronbach's α > 0.6) [18, 24]. Diffuse status signals lack of interest in STEM careers, foreclosed indicates parent/authority decision acceptance, moratorium signifies current experimentation without decision, and achieved means experimentation and commitment to a STEM career path.

Survey results were subjected to Spearman's rank correlation to examine associations by calculating effect size and conducting a power analysis among STEM affinity variables, plus Fisher's Exact Tests to assess demographic differences in career status. All analyses were conducted using the following statistical software: *JMP* v.18 and *G*Power* v. 3.1. Spearman's rank correlation tests the size of an association between two variables, in other words how close increases or decreases in one variable are matched by the other. This test produces a rho value and a p-value. Rho values between about 0.65 and 0.8 indicate moderate correlation/effect size and values greater than about 0.8 indicated strong correlation/large effect size; negative values indicated that the variables change in opposite direction, that is to say an increase in one variable is associated with a decrease in the other. The p-value measures the chance of incorrectly concluding a difference (correlation) exists and when it does not (e.g., false positive); p-values below 0.05 indicate that there is a 95% chance that you are correctly concluding that a difference exists and a 5% chance you are incorrectly making this conclusion. Power analysis measures the possibility of incorrectly concluding that no difference (correlation) exists (e.g., false negative). The higher the power the less the possibility of concluding that no difference or correlation exists when it really does exist (e.g., a power = 0.90 indicates there is a 90% chance that the possibility of no difference or correlation has been correctly discarded). Fisher's Exact Tests calculates how strongly two qualitative variables are associated based on a data table that arrays one variable in rows and the other variable in columns, with cells showing the proportion or frequency for each specific combination of the test variables, when sample size is small.

Key Research Findings

STEM Affinity and Belonging Outcomes

This research provides compelling evidence that key strategies interact to positively influence STEM affinity, including self-concept, belonging, self-confidence, and future-oriented mindset. Analyses indicate moderate to large effect sizes (e.g., 0.654 to 0.828) and less than a 2.5% chance of either a false positive or false negative correlation among STEM affinity dimensions (Table 1). Self-perception of students as capable STEM learners correlated strongly with teacher recognition (large effect size, < 0.1% chance of a false positive and false negative) and peer recognition (moderate-large effect size, 0.5% chance of false positive, 0.3% change of false negative). Students' sense of belonging with STEM-identified peers strongly correlates with self-identification as a STEM person (moderate effect size, 1.6% chance of false positive, 2.5% chance of false negative). IT problem-solving confidence shows strong correlation with general STEM

Variable 1	Variable 2	Spearman Rho/Effect Size	p-value	Power
Self-perception as capable STEM learners	Teacher recognition	0.828	0.0009	0.999
Self-perception as capable STEM learners	Peer recognition	0.746	0.005	0.997
Students' sense of belonging with STEM-identified peers	Self-identification as a STEM person	0.676	0.016	0.975
IT problem-solving confidence	General STEM competency perceptions	0.769	0.0034	0.999
Peer recognition	IT problem-solving confidence	0.819	0.0011	0.999

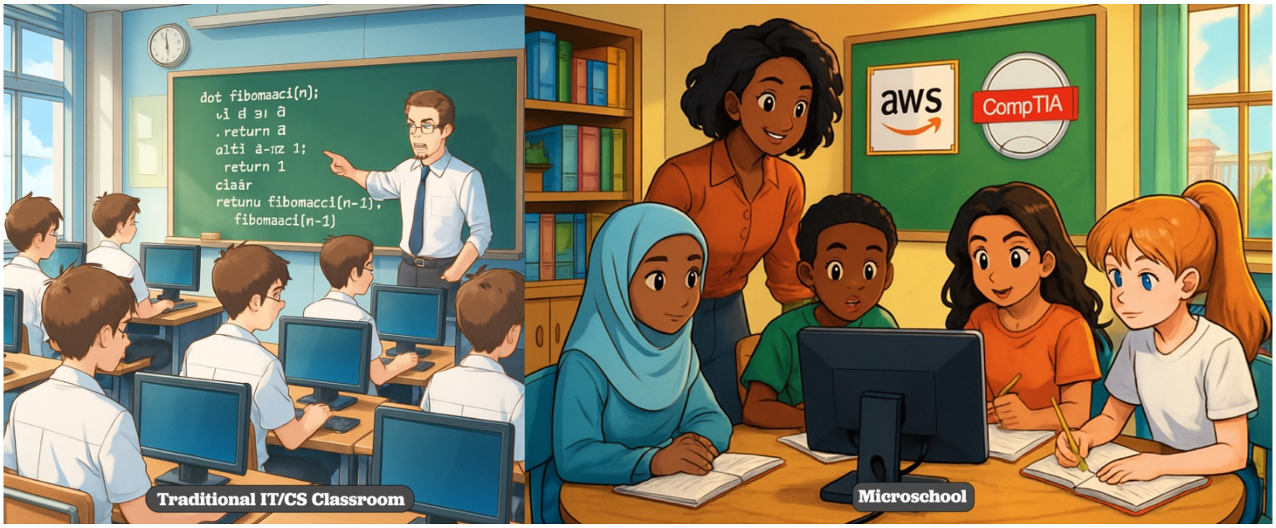
TABLE 1. Key Research Findings – Data

competency perceptions (moderate-large effect size, 0.34% chance of false positive, <0.1% chance of false negative), while peer recognition correlates with IT problem-solving confidence (large effect size, 0.11% chance of false positive, <0.1% chance of false negative).

Grade-level analyses show evidence that these strategies impact STEM affinity status. Post-survey responses concentrated primarily in achieved status, contrasting with pre-surveys where diffuse status dominated (Fisher's Exact Test: moderate-large effect size, < 0.1% chance of false positive and false negative). All 11th and 12th graders reported achieved career focus statuses post-survey, aligning with established research patterns showing transitions from diffuse/foreclosed towards achieved around 10th grade [24].

Qualitative Evidence of Impact

Focus group data provides supplementary evidence of program effectiveness, with student responses indicating engagement with collaborative learning and skill development recognition as key aspects of the microschool experience. Representative feedback includes appreciation for problem-based group work ("I like the labs done throughout the course, as they [required] a group effort in order to complete.") and increased self-confidence ("Looking at what I learned, and what I'm now capable of learning"). Responses suggest technical skill development and metacognitive awareness growth, supporting quantitative findings regarding collaborative learning environments and peer interaction importance in fostering STEM affinity development.

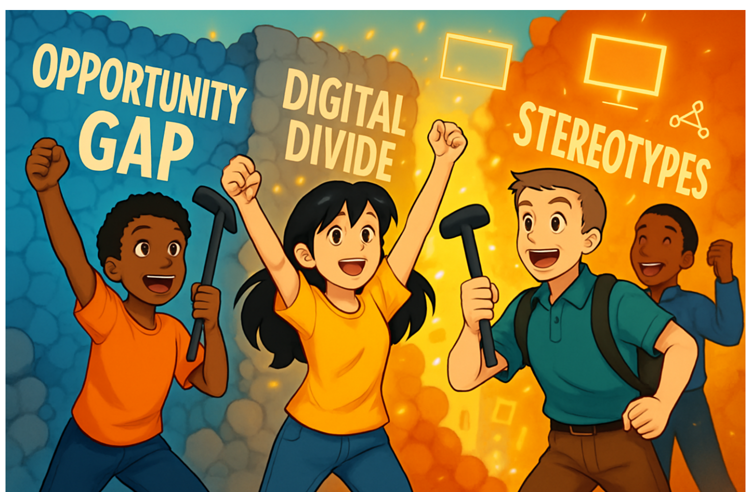


Traditional IT/CS Classroom (Left) vs. Microschool (Right).

Evidence of Effectiveness in Learning Outcomes

The first-year students, who participated in the study, earned CompTIA A+ and leadership certifications, providing verifiable evidence of learning outcomes and instructional effectiveness. These industry-recognized credentials validate technical and professional skills acquired through authentic problem-solving experiences [1, 13, 17]. By connecting learning activities to workforce readiness, IRCs enhance student attractiveness to employers and postsecondary institutions while demonstrating industry alignment. Successful credentialing indicates individual achievement and effective instructional methodology, meeting current technological demands.

Policy Implications



IT Microschools students knock down barriers to IT/CS degrees/careers.

Results demonstrate the PAST powered early college microschool model is an effective IT/CS education intervention achieved by disrupting traditional secondary–postsecondary, formal-informal, and school-industry boundaries, facilitating accelerated learning pathways while maintaining rigor and socioemotional and advisory support. Supporting expansion of early college microschool models integrating industry-recognized credentials with dual-enrollment credit opportunities, alongside culturally relevant instruction, could address shortfalls in skilled IT/CS professionals and unequal access to these professions. However, expansion requires substantial investment in teacher training and curriculum development to deliver college-level content in high school settings. Robust partnerships between secondary schools and higher education institutions—including systems for credit transfer, student support services, and pathway coordination—are critical for success [6, 9, 11, 25, 26]. The direct admission pathway component is particularly valuable for eliminating traditional barriers to postsecondary access.

Research and Evaluation Recommendations

Future research should incorporate longer-term tracking of student outcomes, including postsecondary enrollment patterns and career pathways. Current study limitations regarding enrollment changes highlight the need for robust tracking systems across institutional boundaries. Larger sample sizes are needed to confirm patterns. Multi-site implementation would strengthen evidence while providing insights into implementation variation across contexts. Additional research should examine cultural factors influencing differential outcomes across demographic groups, developing culturally responsive program modifications [7, 23]. Research should incorporate community and family perspectives on career development.

Study Limitations

The research acknowledges several limitations. Enrollment changes between surveys limit definitive causal claims about program impact. Small sample size constrains generalizability. The two-semester study period provided limited opportunity to observe longer-term developmental changes.

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