PURM
Perspectives on Undergraduate Research & Mentoring

Beyond Career Skills: Student Reflections on their Development through Undergraduate Research

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Introduction

Current students face mounting challenges in higher education and the workforce. Public skepticism about the value of a college degree continues to grow, while employers expect graduates to arrive with transferable skills that extend beyond technical knowledge. Many employers are questioning whether new graduates are adequately prepared (Finley, 2021; NACE, 2024). At the same time, data show that students primarily pursue college for career preparation, placing institutions under increasing pressure to demonstrate outcomes directly tied to employability (Clayton & Torpey-Saboe, 2021).

Undergraduate research experiences (UREs) have become one response to these pressures. A growing body of scholarship demonstrates the academic and professional benefits of research engagement (Lopatto, 2004; Kuh 2008; Powell & Barton, 2026). However, despite this promising evidence, existing assessments of undergraduate research outcomes are designed around institutional priorities or standardized competency frameworks. These tools may capture broad trends, but they often fail to illuminate the nuances of how students themselves interpret their experiences or articulate growth. The purpose of this study is to examine how students describe the impact of undergraduate research experiences on their personal and professional development, responding to a gap in existing assessments that often rely on standardized frameworks rather than students' written accounts of growth.

Literature Review

Students are facing unprecedented challenges including the shifting public perceptions that question the value of a college degree. This includes navigating an evolving trend favoring skills-based hiring (Chan, 2024), and the broad integration of generative artificial intelligence (GenAI) in the workplace. The net result is a discouragingly competitive job market for recent graduates and increased pressure on higher education to demonstrate return on investment. Surveys continue to reveal a diminishing belief in the overall value of higher education (Brenan, 2023; Jones, 2024), as well as employers' doubts about the career preparedness of college graduates (Hart Research Associates, 2015; NACE, 2024; Clayton & Torpey-Saboe, 2021). Employers now regard communication, teamwork, critical thinking, and professionalism as key skills in the workforce. However, they frequently see these skills as underdeveloped in recent graduates (Finley, 2021; NACE, 2023).

Student anxieties over future employment are compounded by rising tuition, increasing debt burdens, inconsistent federal support, and escalating political polarization, which challenge equity and inclusion initiatives (Forward Pathway, 2024). These pressures contribute to the 22% of first-year students who do not return for their second year (Hanson, 2025). Many recent graduates report being unprepared for both entry into the workforce (Fitzwater et al., 2023) and readiness to engage with GenAI. Despite growing employer expectations for GenAI proficiency, only 55% of graduates report confidence in using these tools (Cengage, 2024; Microsoft Corporation & LinkedIn, 2024). In response to these dynamics, adaptability has emerged as a critical workforce competency (Handshake & Society for Human Resource Management, 2024). Given that 87% of students cite career preparation or skill acquisition as their primary motivation for pursuing higher education (Clayton & Torpey-Saboe, 2021), institutions are under increasing scrutiny to deliver experiences that foster career readiness and demonstrable outcomes.

In response to these overlapping challenges, colleges and universities are increasingly positioning themselves as places to develop career readiness. Undergraduate research experiences (UREs) have emerged as a prominent strategy to address this need, with the Council on Undergraduate Research (CUR) advocating expanded investment in these programs (Mekolichick, 2021).

UREs characterized by intensive mentorship, experiential learning, and sustained classroom engagement have been associated with developing transferable skills such as critical thinking and communication, while also improving student confidence, retention, persistence, and graduation rates (Hensel & Paul, 2012; Kuh, 2008; Lopatto, 2004; Russell, et al., 2007; Seymour, et al., 2004). As a result, employers acknowledge the significance of UREs, with 85% indicating a higher likelihood of hiring a candidate possessing such experiences (Finley, 2021). UREs are often linked to growth in career readiness skills, with communication and critical thinking among the most commonly reported outcomes (Osborn & Karukstis, 2009). In an analysis of graduating seniors' reflections on UREs, Burt et al. (2024) found that career & self-development and communication were the most frequently mentioned competencies. The current study employs the term undergraduate research to align with established field literature, serving as a shortened form of the broader concept of undergraduate research, scholarship, and creative inquiry as legitimate scholarly research forms (Council on Undergraduate Research, n.d.).

The Missing Student Voice

Given the investment in and expansion of UREs, there is a lack of assessment data regarding the efficacy of UREs in fostering career readiness skills, especially beyond STEM disciplines (MacDonald et al., 2025). CUR has increasingly used the NACE Career Readiness Competencies to define and assess students' ability to enter and thrive within the modern workforce (Mekolichick, 2023; NACE, 2023). A recent scoping review concluded that the current literature on this topic was insufficient for national needs (MacDonald et al., 2025). Although there was a general lack of studies covering multiple disciplines and competencies, career and self-development, communication, and critical thinking were found across various fields (McClure, et al., 2020; Kistner, et al., 2021).

Moreover, despite strong evidence linking undergraduate research to career readiness, most assessments evaluate outcomes through external frameworks. This creates a gap in understanding how students themselves articulate their growth. Finley and McNair (2013) argued that documenting high-impact practices should include open-ended reflections that reveal evolving identities, not just competencies. Similarly, Brownell and Swaner (2010) found that students often described integrative growth that crossed multiple competency areas, suggesting that rigid frameworks may oversimplify the developmental process.

In this study, personal development refers to students' reflective growth and self-directed planning that helps them evaluate their learning and performance, take increasing responsibility for their education, and set goals that shape future academic and career paths (Quality Assurance Agency for Higher Education, 2009). Professional development is an ongoing, internally motivated process through which individuals build knowledge and skills related to their professional roles, responsibilities, and work environments through both formal and informal learning (Frederiksen, 2016; Smith, 2010). Because both types of development involve internal meaning-making, they are not always well captured by assessment methods that categorize growth into predefined competency areas, such as the NACE Career Readiness Competencies and similar competency-based rubrics used in institutional evaluation (Mekolichick, 2023; NACE, 2023). Prior URE outcome research has often relied on structured surveys that identify important patterns but may overlook how students articulate confidence, belonging, and direction in their own words (Lopatto, 2004; Russell et al., 2007; Seymour et al., 2004; Newell & Ulrich, 2022; Burt et al., 2024).

Capturing these voices is methodologically important and essential for equity, as students from different backgrounds may describe and value their growth in ways that differ from standardized frameworks. The present study addresses this gap by analyzing open-ended reflections that preserve students' language and meaning-making processes. The analysis is guided by the following research question:

RQ1: How do students describe the impact of undergraduate research on their personal and professional development?

Methods

Research Design

To preserve student voice, this study used inductive qualitative content analysis to derive themes directly from students' reflections rather than applying predetermined categories. This analysis used the constant comparative method to support iterative coding and the refinement of emergent ideas (Braun & Clarke, 2006; Charmaz, 2006). This approach was well suited to examining how students describe their development, both in ways that align with and extend beyond established career readiness frameworks.

Data Collection

Between 2021 and 2023, a total of 186 written reflections were collected through a university-wide initiative recognizing undergraduate research as part of graduation. Students, as part of their application for the research scholar diploma distinction in their area of research, are asked to reflect on their development. The applications are completed before graduation, and all participants in the study were in their final semester before degree completion. Approximately 5% of graduates earned the distinction during the study period. Student participants represented 37 majors and had completed at least two semesters of mentored undergraduate research. The pool broadly represented the student body: 43% of reflections came from our college of science and technology, 23% from the humanities and behavior sciences, 26% from professional degree programs, and 8% from the visual and performing arts, 73% were from female participants (based on institutional sex assignment), 30% were first-generation college students, 33% received Pell Grants, and 22% identified as students of color. Each graduating senior responded to the following prompt: *"Please provide a written reflection that addresses how the experience has impacted your intellectual and professional growth."* Reflections ranged from 33 to 353 words (M = 139 words). The open-ended nature of the prompt allowed students to frame their experiences in their own words, aligning with the study's focus on student voice and self-directed meaning-making.

Data Analysis

All three researchers independently conducted line-by-line coding of the reflections to identify discrete meaning units. A meaning unit was defined as a phrase or statement that expressed a single concept related to student development, regardless of sentence or paragraph boundaries. When multiple ideas appeared in a passage, the passage was divided into segments so that each unit could be coded to its most appropriate theme.

Codes were refined through iterative comparison across reflections. Theme names and descriptions remained close to student language, reflecting the emphasis on emergent meaning rather than researcher-imposed labels. When segments addressed multiple concepts, the most prominent theme was applied based on the primary focus of the text. Each distinct insight within a reflection was coded separately, even when addressing similar topics.

Throughout the process, the coders met regularly to discuss coding decisions, refine theme definitions, and resolve disagreements through consensus. Analytic memos documented the evolution of codes and themes, creating an audit trail of the analysis. The coding process continued until thematic saturation was achieved.

Trustworthiness

This study employed strategies consistent with qualitative research standards to ensure analytic rigor. Analytic memos documented the development of themes and researcher reflections throughout the process (Ayre & McCaffery, 2022). Peer debriefing with colleagues supported dependability and strengthened credibility by inviting external review of interpretations (Stahl & King, 2020). Because reflections were anonymous, member checking was not possible; instead, the analysis remained grounded in participants' language to preserve their voice. These practices align with Lincoln and Guba's (1985) framework of trustworthiness, which emphasizes credibility, transferability, dependability, and confirmability. Together, they provided a rigorous foundation appropriate to qualitative inquiry in place of interrater reliability.

Results

Five overarching themes emerged from the analysis of 186 student reflections that captured how undergraduates made sense of their research experiences: Theme 1: Growing Confident, Comfortable, and Capable; Theme 2: Learning Techniques, Processes, and Problem-Solving; Theme 3: Communicating Ideas to Various Audiences; Theme 4: Collaboration with Mentors, Peers, and Communities; Theme 5: Realizing Potential and Career Clarification. These themes reflect both the concrete skills students reported developing and the broader identity shifts they described.

Theme 1: Growing Confident and Capable

Students frequently wrote about gaining confidence in themselves as learners and researchers. Reflections emphasized overcoming initial uncertainty, developing independence, and recognizing growth through persistence. For many students, research became a proving ground for testing their own limits and standards. They realized abilities they had not previously recognized in their coursework. One student explained, *"As a teacher, this experience allowed me to grow in many unexpected ways. The most exponential growth was my flexibility… When teaching in any way, you must be flexible, but teaching through online platforms adds another level to that necessity."* In this example, the research experience fostered confidence that extended beyond the project itself, helping the student develop professional adaptability that carried into their teaching practice.

Other students described the confidence that came from taking charge of a research project and trusting their judgment. As one reflection put it, *"The research I did was extremely important to my personal and professional career. Through research I built laboratory skills and learned how to think*

critically for myself. I took charge of my project and found ways to motivate myself and work towards a goal in ways that I would have never been able to do before."

Several students connected confidence as an outcome of their experience directly to the process of overcoming mistakes. One wrote, *"I have realized that a project like this requires you to do things you have never had to do, which leads to mistakes. By learning from mistakes, I know what to expect in the future as well as what is expected of me and how to overcome a variety of problems that only this type of opportunity offers."* This reflection demonstrates that UREs build confidence through developing resilience, helping students recover from setbacks and transform those experiences into learning opportunities

Several students described their research experiences in transformative terms. One participant reflected, *"I personally believe that being a part of this research group has been the best thing I have done during my college career, and it has helped me grow intellectually and professionally beyond what I thought I could be."* Students also linked their increased confidence to renewed academic motivation and clarity of purpose. As one shared, *"Being part of this program has impacted my intellectual growth by revitalizing my love for my major and ideal future career choice."* Another echoed this sentiment, noting, *"Before starting research, I was very unsure about myself as a chemist…however, in doing research for the past three years, I have grown so much confidence in myself in and out of the lab."*

Other reflections highlight the positively influential impact research had on the development of their personal and professional identities; their projects were opportunities they initially thought were beyond their capabilities. One student described research as, *"an experience that I never would've dreamed I would get in my Undergraduate Degree."* Upon completing their projects, they gained confidence in themselves, as demonstrated by another student, *"My lab involvement helped me grow in confidence in my abilities… I used to have a bad case of Imposter Syndrome in my research and intern roles, but now I feel capable in my abilities and that I belong to those roles for a reason."* Undergraduate research can also provide underserved students the opportunity for identity growth and empowerment, as shown by this student, *"I gained a lot of confidence as a woman in science. I was very shy when I began college, but I feel that these experiences allowed me to find my voice."*

Theme 2: Learning Techniques, Processes, and Problem-Solving

Students wrote extensively about developing both technical research abilities and new ways of thinking that extended beyond learning to design studies and analyze data. Many described a shift in how they approached problems by becoming more curious, more willing to ask questions, and more comfortable working through complex details. Students came to see themselves as capable of contributing to scholarly conversations, approaching problems with intellectual curiosity, and persevering through uncertainty. In their accounts, research was not simply about procedures but about cultivating a mindset of inquiry that they carried into future academic and professional goals.

Other participants described developing scholarly practices through their research experiences. One wrote, *"Through attending research conferences, professional seminars, and consulting active art historians, I have further developed skills in critical analysis of research…"* This academic development helped students navigate disciplinary conversations and master academic language. Another reflection explained, *"My experience in student research gave me the chance to study key educational concepts in-depth and interact with them in a more meaningful way. Educational terms and jargon…were unfamiliar and unclear to me when beginning this research. Through reading literature for my research, these concepts became clear and understood."*

Other reflections discussed their growing understanding and mastery of the research process itself. One reflection noted, *"It's helped me understand the research process, from initially asking a question and doing background research to designing and doing an experiment..."*
For many students, laboratory experiences stood out as a turning point. A student emphasized, *"With the laboratory techniques and skills that I have acquired in the research lab, I am more responsible, organized, meticulous, and confident in my abilities as a scientist. Prior to being actively involved in research, I was less aware of the time, effort, and flexibility it takes to develop a research project and carry it out. I also realized that the time and effort put into a project does not necessarily guarantee results; part of my experience as an undergraduate researcher required me to be optimistic and open to trying new methods to find solutions to unexpected problems."*

Other reflections revealed the transformative impact of UREs, turning early apprehension toward conducting academic research into excitement for what can be accomplished. One student admitted, *"Before my research and internship involvement, I was not comfortable with the idea of conducting or analyzing research. Now, I am passionate about it! I want to be involved in all I can and break ground in psychological concepts."* Others tied their new skills directly to continued research experiences. As one wrote, "*I have mastered laboratory skills that will help me perform research during my doctoral studies. I have also learned how to troubleshoot problems that have risen throughout my research."* Another added, *"During the course of this project, my research skills have improved drastically. Given that I am going into law school where I will have to do a ton of research, having a good handle on how to do good research is an amazing skill."*

Some students highlighted the scope of their accomplishments with emotion and pride, reflecting on research milestones they had not thought possible. One reflected, *"This experience has opened my eyes to research and has allowed me to conduct my own literature review study. I never thought that I would be able to conduct my own literature review and potentially publish the article in my undergraduate career."* Another expressed enthusiasm for the ongoing process: *"I love research. I love going into the field, collecting data, learning new techniques or fine tuning the skills I have already acquired."* Others pointed to specific technical proficiencies: *"I have gained the skill in writing research proposals, titles, abstracts, and the overall report. I have also gained the skill of searching for, identifying, and referencing peer reviewed journal articles."*

Theme 3: Communicating Ideas to Audiences

Students consistently described their URE as a space where they learned to communicate ideas more effectively, whether through formal presentations, poster sessions, or day-to-day conversations with peers and mentors. For many, public speaking was initially intimidating but became one of the clearest areas of growth. These reflections show that the act of presenting research pushed students beyond their comfort zones, requiring them to refine both confidence and clarity. What began as an intimidating requirement often became a marker of growth, with communication framed as central to their development as emerging professionals.

One student reflected simply, *"I got first-hand experience in presenting at statewide and national conferences, and competing in a research competition, all as a sophomore."* Others expanded on this idea, noting that participation in academic events required them to collaborate across disciplines and adapt their language for new audiences. As one participant wrote, *"Research also provided an opportunity for self-sufficiency and furthering my communication skills through presentations and collaboration with researchers of different academic backgrounds."*

Several students highlighted the shift from nervousness to confidence. One admitted, *"Presentations in front of my peers and professors no longer make me want to hide in a corner. I am more confident in myself, but am also aware that I don't know everything."* Another described presenting a poster as

a daunting task: *"...I felt nervous every time I did it. But, I felt rewarded that my voice and the voice of my colleagues were heard."*
Students also reflected on the cumulative effect of presenting in public forums, noting, *"I have also presented our research and findings at many public events which has strengthened my public speaking skills as well as my ability to communicate science to broad audiences and professionals from varying fields of study."*

Researchers mentioned gaining written communication skills, as demonstrated by one reflection, *"I have gained the skill in writing research proposals, titles, abstracts, and the overall report." Or another saying, "The last major skill that I have gained is analytical writing...This skill is of huge value to me personally because oftentimes in the workplace this is the style of writing that is utilized to communicate information."*

Finally, several students underscored that presenting research was not just about polishing delivery skills, but about developing a professional identity. One participant summarized this connection: *"...This has allowed me to expand my knowledge in such a way that has helped me grow as a student as well as a researcher. It has also helped me learn how to speak on an academic and professional level."* Students were able to articulate and directly relate their gained communication skills to their careers, as explained, *"Before this program, my anxiety would often get in the way of presenting something as simple as a PowerPoint in classes of only ten people. Now that I have presented my work and answered questions confidently...Considering my teaching goals, learning how to present concisely and clearly will help me there as well."*

Theme 4: Collaboration with Mentors, Peers, and Communities

Mentorship and collaboration emerged as a central dimension of student learning, defined not only by the practical guidance students received but also by the emotional connections they formed with faculty and peers. These relationships were often described as transformative and influential in shaping how students viewed themselves as new members of scholarly and professional communities.

Several reflections highlighted the role of faculty mentors and professional networks. One student shared, *"My professional skills were broadened through presentations and networking with numerous faculty members and other student researchers."* Another recalled, *"During these experiences, I heard and saw many different researchers who I engaged with and made professional connections with."* For these students, mentorship obtained through their UREs meant access to networks, role models, and opportunities that extended beyond typical classroom experiences.

Students discussed how peer collaboration taught them practical teamwork skills and revealed the true benefits of shared effort. One student reflected, *"As far as professional growth, it has taught me how to operate as part of a team on group projects... Being part of this group has provided me with valuable experience...It has also shown me that sometimes working as part of a group can make a task easier than attempting to complete the whole task individually."* In this example, collaboration was framed as both a challenge and a resource, which taught adaptability in new formats while reinforcing the value of shared responsibility.

Other participants described how collaborative experiences deepened their sense of belonging. One wrote, *"I think without the challenges research provided me with I would not be as outgoing and connected with the community."* Another captured the social dimension more simply: *"I have been exposed to countless awesome people, a supportive community, and a 'fan base.'"*

Mentorship also carried an emotional weight that students described as pivotal to their development. One student emphasized extreme gratitude, *"I really feel grateful to be able to see the value and wisdom that comes from being in a mentorship relationship with faculty and people that I look up to in my field."* Another echoed this sense of transformation, explaining, *"My mentors have contributed greatly to my success and understanding in this world of learning. I have gained confidence in myself through exercising my cognitive abilities and independence as a student researcher."*

Theme 5: Realizing Potential and Career Clarification

Students frequently connected their research experiences to future ambitions. Reflections described how projects clarified career interests, prepared them for graduate or professional programs, and in some cases reshaped long-term goals entirely. Research was often framed not only as preparation for specific careers but also as a turning point in how students imagined their futures.

For some participants, research strengthened their sense of professional identity and marketability. For example, one student explained, *"Through this club, I created instructional material to train club members and underclassmen for Cybersecurity CTF competitions, as well as participated in the competitions myself. This has had a direct impact on my ability in interviews and my marketability as a cyber security professional."* Others tied these experiences to transferable skills: *"My research experience made me a better student leader and how to better serve my community."*

Several students described the UREs as moments when their career aspirations became clear. A student in the arts reflected, *"...Giving a talk about my work made me want to pursue it even more. I feel vehemently more confident in my work now and my ability to pursue it farther into the future."* Another student recounted a shift from one career path to another: *"I believe that this project allowed me to realize the full potential within this field of work. Growing up I had the main goal of going to medical school... Until I began to really run with this project. This project opened up my eyes to a whole new world of opportunities and is a big reason I have enrolled in a chemistry PhD program."*

Other reflections highlighted the alignment between undergraduate research and graduate or professional training. One student wrote, *"Undergraduate research has given me a variety of skills that I will take into graduate school and a future career."* Another emphasized clinical preparation: *"This research experience has been a tremendous influence on my confirmation to pursue physical therapy. I was fortunate to have the opportunity to work with my faculty mentor on a potential intervention I could implement clinically in the future."*

Students also stressed how research exposed them to opportunities they had not imagined possible. As one explained, *"Through my research projects, especially the bat and woodrat research, I have had many opportunities I never would have imagined I would have access to as an undergraduate."* For others, the value lay in mentorship and artistic development: *"This project—and my faculty mentor—taught me things that I would never have gotten the chance to learn inside the normal classroom setting. Going through the compositional and arrangement process from the perspective of a pianist and percussionist was incredibly valuable to my perspective as a musician."*

One student's reflection does an excellent job of capturing how UREs shape career decisions: *"Doing this research has helped me figure out what I want to do once I graduate."* For many undergraduates, research evolved beyond coursework. It helped them connect their developing skills and relationships to a clearer professional direction.

Discussion

This study examined how undergraduates describe the impact of UREs on their personal and professional growth. From 186 reflections representing 37 majors, five themes emerged from the analysis: growing confident, comfortable, and capable; learning techniques, processes, and problem-solving; communicating ideas to various audiences; collaboration with mentors, peers, and communities; and realizing potential and career clarification. Taken together, these themes show that undergraduate research supports development well beyond technical skills by shaping identity, resilience, and readiness for future opportunities. The identified themes from the content analysis were consistent with previous studies that focused on STEM students at the end of their third year (Ward, et al., 2003) as well as alumni with significant work experience (Newell & Ulrich, 2022). Themes consistent across both our study and the literature include skill development, increased independence and confidence, increased desire to attend graduate school, ability to work within a team, and increased communication skills. The findings reinforce earlier work on UREs while adding depth by centering student voices.

Growing Confident, Comfortable, and Capable

The first theme demonstrates how UREs contribute to the kind of growth colleges are meant to promote. Many undergraduates begin with modest expectations, often thinking of themselves only as students who can complete assignments and earn grades. Research experiences disrupt that pattern by putting students in situations that demand initiative, problem-solving, and persistence. Within that space, the URE becomes a proving ground where students test new skills and begin to see themselves as capable contributors rather than passive participants.

This process is rarely smooth, and the difficulties are often what make it meaningful. Struggles and mistakes turn into part of the learning curve. That shift matters because it reflects a deeper change in perspective: students begin to treat setbacks as signs of progress instead of failure. This mindset has value well beyond the classroom, since most professional environments are unpredictable and require resilience. In that sense, the confidence developed through UREs is not only a sign of academic maturity but also preparation for the kinds of judgment calls expected in the workplace.

The language students used also sheds light on this transition. Describing their work as messy or admitting to mistakes points to a growing comfort with the realities of learning and adapting. It also shows they were starting to pick up the vocabulary of professional life, where iteration and adaptability are part of the culture. Framing their experiences in these terms suggests that UREs help students practice talking about themselves in ways that align with professional identity.

Learning Techniques, Processes, and Problem-solving

Building on that foundation, research and problem-solving emerged as another important dimension of development. UREs encouraged habits of inquiry that pushed students beyond basic procedures and into intellectual independence. The move from passive learner to active investigator signals a reorientation toward curiosity, persistence, and the ability to make sense of uncertainty.

The implications reach directly into career preparation. When students learn to define problems, evaluate evidence, and generate solutions, they are rehearsing behaviors that employers prize in fast-changing environments. Confidence may give them the courage to face uncertainty, but research skills provide methods to navigate it. The two complement each other, linking academic growth with employability.

Research experiences also echo workplace practice. Reviewing literature mirrors synthesizing reports, crafting research questions parallels problem definition in professional settings, and following methodology aligns with compliance and policy standards. Data collection and analysis

highlight persistence and rigor, while applying findings connects to the professional responsibility of situating one's work in a broader context. These parallels suggest that UREs provide not only academic training but also an early rehearsal for professional practice.

Communicating Ideas to Various Audiences

The URE illustrates how sharing findings is often as important as generating them, whether through formal presentations, teamwork, or discussions with mentors. These activities required students to step out of the role of learner and communicate as professionals. In that way, UREs positioned communication as central to growth rather than a byproduct of research.

These skills carry directly into workplace settings. Presenting findings in an academic setting anticipates pitching ideas, responding to proposals, or explaining strategies to supervisors. Collaboration within research teams mirrors the dynamics of cross-departmental work. Just as students had to master new analytic techniques, professionals are continually expected to adapt to systems, policies, and training demands. Communication, therefore, functions as both a practical skill and a marker of professional identity, reinforcing adaptability and confidence in multiple contexts.

Collaboration with Mentors, Peers, and Communities

Mentorship and collaboration show that student growth happens on a personal level and through relationships with others. Faculty mentors contribute more than instruction by opening access to professional and scholarly networks, giving students opportunities they otherwise would not have had. In this way, UREs became a channel for faculty to share their social capital and help students step into broader communities of practice.

The significance of these collaborations cannot be overstated. Mentorship provides intellectual challenge while also offering validation and support, and peer collaboration reinforces a sense of belonging and teamwork. These relationships help students see themselves through others' eyes and strengthen their identities as professionals in formation. UREs develop technical competence and facilitate entry into communities where professional identities are shaped and sustained.

Realizing Potential and Career Clarification

The final theme highlights how UREs shape students' ability to see the trajectory of their professional lives. These projects often go beyond classroom exercises and function as windows into what professional practice feels like. By creating and sharing new knowledge, students rehearse the habits, language, and confidence associated with professional identity. For many students, UREs can confirm their existing goals; for others, these experiences can redirect their ambitions. UREs clarify what it means to be marketable at graduation by pointing to the skills, credentials, and dispositions valued in both academic and workplace contexts. These findings highlight what UREs demand of faculty mentors and how institutions and even departments can position undergraduate research as part of their larger academic mission.

Implications

For Faculty Mentors

Faculty mentors play a pivotal role in guiding research and opening their networks to students. While UREs are generally beneficial, mentors should emphasize opportunities beyond the university community, such as conferences and presentations, to give their mentees greater visibility and access to the broader academic world. This can be achieved through careful planning of the research design and by setting this as a goal from the start of the project. Additionally, when students see their mentors in professional contexts outside the classroom, they gain a fuller understanding of academia beyond the campus.

This study also provides insight into how faculty mentors should approach adversity and mistakes, since these moments often represent the most meaningful learning opportunities. Allowing students to make minor errors and turning them into teaching moments leaves a lasting impression. Finally, faculty mentors serve as respected role models for students completing UREs. Part of that responsibility involves helping students frame their experiences in their own words and translate them into language that is recognized and valued by prospective employers.

For Administrators

University administrators should recognize UREs as more than enrichment activities. These experiences directly strengthen career readiness, which remains a priority for institutions expected to demonstrate accountability and workforce alignment. Supporting faculty who mentor and structure these opportunities benefits the institution by improving retention, graduation rates, and alumni marketability. These outcomes have been linked to a sense of belonging among students, as reflected in student quotes about collaborating with mentors, peers, and communities (Pedler et al., 2022; Tinto, 1994). For that reason, UREs deserve a place in university strategic plans as a high-impact practice that connects academic learning with professional identity, reinforcing their role in student success and employability (Council on Undergraduate Research, 2023; Kuh, 2008).

At the same time, institutions that devote considerable attention to graduate-level research and mentorship should extend that commitment to undergraduates. Graduate education typically emphasizes theory, advanced research, and applied practice, and these experiences are widely recognized as critical for developing professional expertise. Offering undergraduates access to similar opportunities earlier in their academic careers cultivates the same habits of inquiry and professionalism at an earlier formative stage. Research has shown that undergraduates who participate in these experiences develop many of the same skills typically associated with graduate training, including problem-solving, persistence, and a stronger sense of professional identity (Lopatto, 2004). Providing these opportunities early not only prepares students for graduate study but also strengthens their readiness to enter the workforce with confidence and a clear sense of direction.

For Researchers

Five themes consistently emerged across disciplines, and less than 15 % of the student reflections remained uncoded. Those uncoded sections typically described the activities students performed, indicating that the themes accurately represent the student experiences. The themes speak directly to the current conversations on the value of higher education. The most sought-after skills by employers are prevalent throughout the reflections. In 2015, the National Association of Colleges and Employers (NACE) launched a career readiness initiative that ultimately identified eight Career Readiness Competencies. These eight competencies represent the skills most sought after by employers and what are needed for college graduates to successfully navigate the modern workforce. The Career Readiness Competencies in order of decreasing importance by employers are critical thinking, communication, teamwork, professionalism, technology, equity & inclusion, career & self-development, and leadership. The largest gaps between the importance of a given competency and recent graduates' proficiency in the eyes of employers are in critical thinking, communication, and professionalism (National Association of Colleges and Employers 2025).

Critical thinking, problem-solving, and communication were all mentioned consistently enough in the student reflections to emerge as themes. Professionalism as defined by NACE and described in its sample behaviors is strongly related to work ethic and resilience. Resilience recurred throughout our themes and was part of the description of the first two themes. In the theme of growing confident, comfortable, and capable, professionalism was demonstrated through recovery from setbacks and

learning to view those as learning opportunities. In the second theme learning techniques, processes and problem-solving, professionalism is demonstrated similarly through persevering through setbacks and learning how to troubleshoot unforeseen challenges. UREs are not only fostering skills that employers desire but also honing the most in-demand skills, as these are the most frequently mentioned themes. Additionally, the least developed competencies in college graduates, career & self-development and leadership, are featured in the student responses (National Association of Colleges and Employers 2025). Career & self-development maps directly connected to the last theme on realizing potential and career clarification and leadership was directly linked by students to developing naturally from their increased confidence and self-efficacy from their UREs. It is clear to the students that by undertaking UREs they are benefiting by developing the skills that employers are seeking.

Expanding beyond NACE, Handshake and Society for Human Resource Management (2024) released a recent joint report noting that 90 % of HR professionals expect employees to be adaptable and willing to learn. These skills can also be found in the student reflections on their UREs. Adaptability is a recurring idea. In the first theme, students related their growth to new learned flexibility and adapting to new challenges. In the theme learning techniques, processes, and problem-solving, students repeatedly talked of development in terms of needing to change or adapt to a variety of new challenges and obstacles with equipment, methods, and data analysis.

Limitations

Given the nature of the data, there are important limitations to note. The sample size was students who voluntarily continued into a second semester of research and wanted it recognized on their transcripts. Additionally, the prompt asked about student growth as an expectation and did not explicitly invite challenges or negative outcomes. It is therefore reasonable to infer a bias toward positive reflections. The brevity of the responses leaves unanswered questions about the extent to which students can articulate the details about their development. The data analyzed were collected prior to the rapid expansion of GenAI use and adoption, therefore the findings need to be interpreted within a pre-GenAI context.

Conclusion

The study results show that students, regardless of their major, consistently view their development through UREs. The areas of growth identified by students match what employers most value. This adds to the growing evidence that UREs are a valuable mechanism for meeting the needs of students, universities, and employers.

Students are the direct beneficiaries, gaining sought-after and durable skills they can use throughout their careers. Universities and Colleges can expand UREs and collect student perspectives to market their impact to stakeholders. The skills, when mentioned, were often described in general terms that would need refining for use in obtaining employment. Universities should build on programs that support students in refining their language to describe their development of career readiness skills. Two areas where this could be implemented are through faculty development for research mentors and career services. Overall, this study adds to the growing evidence that students see the link between UREs and career growth.

Institutional Review Board Statement

The research was conducted under the approval of the Institutional Review Board at Radford University (IRB protocol 2019-312-RU).

Acknowledgements
We would like to acknowledge the Radford University Highlander Research Rookies and Summer Undergraduate Research Fellowship programs for funding and the Radford University Social Media Analytics and Research Technology Lab for training support.

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