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Infusing authenticity into a service-learning program: examining long-term impacts on professional development

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Abstract

Purpose – The employability of postgraduate students remains a critical concern in higher education, as postgraduate programs, particularly at the doctoral level, traditionally focus on disciplinary and research competencies. This leads to a lack of adequate preparation for employment, especially for non-academic roles. This study examines the long-term impacts of an authentic service-learning program on trainees' professional lives, with a particular emphasis on academia. This addresses the need for insight into the long-term impacts of initiatives that enhance postgraduate programs with opportunities for students to acquire transferable competencies prior to entering employment.

Design/methodology/approach – We adopted a narrative inquiry approach to investigate the impacts of a sustained, authentic-learning-based outreach program (GK-12). To explore trainees' experiences, we used a qualitative questionnaire followed by in-depth narrative interviews. A six-step inductive thematic analysis generated over twenty initial themes across different narratives, subsequently refined into nine primary themes.

Findings – Authentic service-learning experiences in the GK-12 program produced profound and lasting impacts on postgraduate trainees' professional development and career trajectories. These included developing a lasting commitment to outreach and social responsibility, clarifying professional goals, enhancing cultural agility, and building portfolios and communication skills that gave them a competitive advantage in securing employment in academia and industry.

Originality/value – This study provides a novel, empirically grounded understanding of the long-term impact of authentic service learning on postgraduate professional development. It addresses a critical gap in the literature on postgraduate employability from the participants' perspectives and highlights that authentic learning environments are active ingredients in fostering relevant and transferable skills beyond traditional disciplinary knowledge.

Keywords Employability, Authentic learning, Service learning, Professional development, Transfer of learning, Pedagogical competencies, Career development, Career readiness

Paper type Research article

Introduction

The employability of postgraduate students remains a critical concern in higher education, with persistent mismatches between how higher education leaders and employers perceive

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graduates' workforce readiness (Eldeen *et al.*, 2018; Escamilla, 2020; Minocha *et al.*, 2017). In the context of the Fourth Industrial Revolution and a shift toward dynamic careers, the focus has shifted from mere job security to sustained employability (Donald *et al.*, 2018; Jackson and Tomlinson, 2020). Recent evidence suggests this gap has widened, with employers increasingly prioritizing transferable competencies and adaptability alongside domain expertise (Donald *et al.*, 2018).To meet employers' needs, the future workforce must acquire a range of competencies that match those required in employment settings, through authentic experiences that help learners develop transferable skills and bridge the gap between learning and authentic applications (Lowell and Moore, 2020).

Postgraduate programs, particularly at the doctoral level, have traditionally focused on disciplinary and research competencies, resulting in graduates lacking adequate preparation for their careers, especially non-academic careers (Ganapati and Ritchie, 2021; Spronken-Smith *et al.*, 2024). This employability gap has become particularly acute as only 46% of doctoral graduates were employed by universities/colleges in 2023, and teaching was the primary or secondary activity among the majority of them (Council of Graduate Schools, 2025). The percentage of PhDs going into tenure-track positions is much lower (Fuhrmann *et al.*, 2011). Concurrently, longitudinal research demonstrates a declining interest in traditional academic research careers among doctoral students as they progress through their training (Roach and Sauermann, 2017). Yet, the majority continue receiving training optimized exclusively for academic research careers, resulting in a less prepared workforce, particularly those working in research institutions (Council of Graduate Schools, 2025). By surveying over 8,000 science PhDs, Sinche *et al*. (2017) noted the need for improving key transferable skills such as goal setting, management, collaboration, and career awareness, which are shown to be essential across both research-intensive and non-research-intensive career paths. This has prompted initiatives to enhance postgraduate programs with opportunities for students to acquire additional competencies in teaching, communication, and management (Gould, 2015). However, initiatives for this remain scarce (Fuhrmann *et al.*, 2011).

The need for enhanced postgraduate education is particularly pronounced in STEM fields, where students receive limited opportunities to develop teaching and broader communication competencies. Research indicates that oral and written communication are among the top in-demand 21st-century skills for workplace success, yet they remain notably scarce in the STEM applicant pool (Ritchie *et al.*, 2022). Graduates are typically not up to date on pedagogical competencies, which affects their career readiness (Stowell *et al.*, 2015). Ironically, higher education institutions expect new faculty to be ready for teaching while providing little or no teaching training in their postgraduate programs (Agarwal *et al.*, 2020). Outside academia, graduates often report a lack of adequate preparation for their careers because postgraduate programs often fail to provide the range of skills and knowledge required for employment (Spronken-Smith *et al.*, 2024). This disconnect has significant implications for both institutional effectiveness and career preparation.

Authentic learning experiences through educational outreach programs have emerged as an effective platform for developing communication and teaching skills (Matthews *et al.*, 2022). Through outreach, participants build community relationships, experience success as educators, and positively impact learners' behaviors (Matthews *et al.*, 2022). However, implementing authentic learning remains challenging, which might explain the lack of good practice examples (Lowell and Moore, 2020).

The GK-12 program is an authentic learning outreach program based on university and K-12 partnerships (Dyehouse *et al.*, 2010; Weeks and Harbor, 2014; Yang and Harbor, 2023; Yang *et al.*, 2020, 2025). Originally part of the National Science Foundation's (NSF) larger GK-12 initiative, the program studied here evolved from NSF-supported origins (2006–2010) to become a self-sustained university program preparing postgraduate students for diverse professional roles. The program's core objective was to develop participants' teaching and communication skills while bridging the gap between academic research and classroom

teaching. Recruited participants, from earlier domestic STEM PhD students supported by NSF to later graduate students, postdoctoral fellows, or visiting scholars from multiple disciplinary fields, went through a series of pedagogical training workshops and participated in semester-long classroom teaching and practice. Following the authentic design, trainees received context-based training on the university side and real-world experience in the local communities that became a meaningful part of their professional development journey, with strengthened relevance of the learning experiences.

While educational outreach programs have shown promising immediate outcomes, most evaluations focus solely on short-term impacts during or immediately after participation (Huang, 2024). Studies typically examine metrics such as participants' satisfaction (e.g. Ngai *et al.*, 2024), skill development (e.g. Bootsma *et al.*, 2021), or academic performance within the program timeframe. There is a notable gap in understanding how authentic learning experiences influence participants' professional trajectories over the long term. Although recent literature has explored the sustained impact of academic service-learning on undergraduate civic engagement and career exploration (Lin *et al*., 2025; Ma *et al*., 2016), this study aims to fill this gap at the graduate level by evaluating program impact on graduate trainees 3–16 years after participation.

The research question guiding this study is: What is the role of authentic service-learning experience in the career and professional development of postgraduate-level trainees, particularly for those in academia?

Literature review

Career and professional development for postgraduate students

Career development has long been a central topic in vocational psychology, education, and human resource development (Arthur and McMahon, 2018). Contemporary career progression is increasingly understood not as a linear institutional process, but as a complex "identity-trajectory" where individuals self-author their careers across organizations, time, and changing structural constraints (McAlpine, 2025). While postgraduate education traditionally emphasizes research competencies, contemporary careers require broader professional capabilities (Stowell *et al.*, 2015), necessitating skills extending beyond disciplinary knowledge (DiBenedetto and Willis, 2020). For example, Karaca-Atik *et al.* (2023) conducted a systematic review and found that communication and cross-cultural skills are among the top skills valued by employers and social science graduates. Research-intensive universities prioritize research over teaching in hiring decisions (Agarwal *et al.*, 2020), while teaching is normally expected as an equally important activity for tenure-track faculty, creating misalignment between training priorities and professional development demands (Eldeen *et al.*, 2018; Thiry *et al*., 2015).

Employers express concerns about graduates' lack of transferable skills, adaptability, and effective self-presentation (Leniston *et al.*, 2022; Winterton and Turner, 2019). While subject-specific knowledge is valued, generic skills such as time management, teamwork, and responsiveness to feedback are crucial for employability (Chhinzer and Russo, 2018). Teaching skills remain important for academic career pursuers (Ganapati and Ritchie, 2021). Furthermore, as more and more STEM graduate students embark on non-academic careers in today's labor market, professional identity development becomes critical in their profession yet missing in current education (Wenner *et al.*, 2024).

Despite growing emphasis on career pathways, engagement with formal career development activities among postgraduate students remains low (Rizzolo *et al.*, 2016). The challenge of limited authentic professional experiences outside research is particularly acute. Systematic pedagogical training remains absent from many postgraduate programs (DeChenne *et al.*, 2012), with available programs often being overly generic and disconnected from discipline-specific contexts (Luft *et al.*, 2004). Even when professional development is offered, it frequently takes the form of brief workshops or seminars, which research shows

produce minimal lasting impact compared to sustained, practice-based interventions (Feldon *et al.*, 2017).

International graduate students face additional complexity as they navigate linguistic and cultural barriers that significantly impact their professional trajectory (Rodriguez *et al.*, 2024; Xiao, 2021). English communication proficiency emerges as critical for employment prospects, particularly with international employers (Yao and Tuliao, 2019). Cross-cultural competence, the ability to work effectively across diverse cultural contexts, has been identified as an increasingly essential yet underdeveloped capacity in higher education (Deardorff and Arasaratnam-Smith, 2017). For international students, authentic learning opportunities embedded in host-country contexts provide particularly valuable scaffolding for cultural adaptation and professional integration.

Emerging evidence demonstrates that intentional career and professional development produces measurable benefits. Schnoes *et al.* (2018) found that doctoral students participating in experiential professional development such as internships reported significantly improved career development skills and higher self-efficacy. In redefining employability with a broader scope, Bridgstock and Tippett (2019) emphasized connectedness through experiential learning in an authentic environment to develop graduates' capabilities (e.g. workplace cultural knowledge), in comparison with classroom-based instruction.

Authentic learning through service learning for professional development

Drawing from experiential learning theory (Kolb, 2014) and situated learning theory (Lave and Wenger, 1991), authentic learning provides pedagogical approaches for meaningful learning in realistic contexts involving real-world problems. Such learning environments connect classroom instruction with real-world applications, with key elements including authentic contexts and tasks, multiple perspectives, collaborative knowledge construction, explicit reflection, and appropriate scaffolding (Herrington and Oliver, 2000). Service learning, a form of authentic learning with a civic responsibility emphasis, enhances students' learning through providing services to communities (Vieira da Silva *et al.*, 2024). Service learning can take various forms such as internship, field work, or community service (Hallinger and Narong, 2024). It provides rich environments for career development by immersing students in authentic contexts where they apply theoretical knowledge to practical challenges (Culcasi and Venegas, 2023). Though its implementation differs to some extent in different contexts (e.g. Western vs. Asian countries), it has been perceived as an instrument for developing students' employability while engaging them in local communities (Nguyen *et al.*, 2023). Its implementation yields multifaceted benefits professionally such as authentic instructional experiences, project management capabilities, and client interaction skills (Stefaniak, 2015), as well as career readiness (Westover and Andrade, 2025). Through a meta-analysis, Guanlao *et al.* (2025) showed significant impacts of community-engaged learning on students' academic, social, and citizenship outcomes.

Research consistently shows that authentic service-learning experiences enhance transferable skills such as leadership, communication, teamwork, and problem-solving that are critical for employability (Culcasi and Venegas, 2023). Students build adaptability and resilience through engaging in complex tasks over sustained periods (Pang *et al.*, 2021). Service learning situates students in real organizational settings, offering exposure to professional roles and workplace dynamics (Eyler *et al.*, 1999; Roe, 2021). Empirical evidence suggests service learning excels in fostering professional identity development and cross-cultural competencies (Roe, 2021), with documented improvements in communication skills (Najmr *et al.*, 2018; Stefaniak, 2015). This is particularly crucial for international participants, providing structured opportunities to build cultural awareness and effective communication in authentic contexts (Kohlbry and Daugherty, 2015).

Moreover, community involvement has been studied and recommended as one of the "boundary-spanning" activities for career development (McDonald and Hite, 2005). Situated

learning perspectives emphasize that professional learning is not only the acquisition of skills but also participation in communities of practice and the negotiation of professional identity (Lave and Wenger, 1991; Jorgensen and Keller, 2008). Professional identity can be shaped during a fluid process of individual-community interface (Gallop *et al.*, 2023). For doctoral students specifically, the development of diverse developmental networks outside the traditional academic advisor relationship plays a critical role in shaping their professional identity and assessing their fit within future academic or non-academic roles (Sweitzer, 2009). This lens is especially relevant for postgraduate trainees who learn to communicate, teach, and collaborate through legitimate participation with mentor teachers, peers, and community partners. Programs like GK-12 create structured opportunities for such boundary crossing to develop their competencies and identity by participating in multiple communities with different norms, languages, and practices.

To connect this work to the wider professional development literature, we draw on human resource development (HRD) research on learning transfer. Integrative reviews highlight that transfer is influenced by learner motivation, opportunities to apply learning, and social and organizational support (Burke and Hutchins, 2007; Gegenfurtner *et al.*, 2009). HRD scholars also argue for more learner-centered inquiry that attends to complex contexts in which learning is applied (Baldwin *et al.*, 2017). Because authentic service-learning blends experiential, social, and formal learning, it aligns well with professional development models that position these three learning modes as complementary drivers of transfer (Johnson *et al.*, 2018). Sustained transfer requires not only skill development but also identity transformation to perceive themselves as capable professionals (Sweitzer, 2009). Service-learning's emphasis on authentic responsibility and community partnership provides particularly fertile ground for such identity development.

Service learning literature has largely focused on undergraduate populations (Elam, 2024). There have been some emerging studies examining its implementations and impacts at the graduate level, albeit rather limited. The bibliometric review by Hallinger and Narong (2024) showed that service learning, though it constituted an interdisciplinary field, focused mainly within social sciences, with a small portion in STEM fields. For STEM students, particularly, service learning experience could enhance not only the technical skills but also communication and cultural awareness (Bielefeldt *et al.*, 2010), as well as their civic awareness and actions (Mokhtar *et al.*, 2025). In a recent case study of examining service learning for teacher training, Gamito *et al.* (2025) showed students acquired conceptual and procedural learning, and experienced identity change. Due to the time commitment in service learning, Elam (2024) found that integrating service learning projects into existing course materials could lead to greater impacts on improving physical therapy students' professional skills, indicating the intentional design for optimal outcomes. Evidence also suggests that the benefits of service learning can persist beyond the immediate program. Longitudinal and alumni studies report sustained civic engagement, enhanced career exploration, and durable whole-person skills among graduates who participated in service-learning (Ma *et al.*, 2016). Qualitative alumni research similarly links sustained service learning to values clarification, professional identity development, and career pathway decisions (Mitchell and Rost-Banik, 2019). Such findings underscore the need for evaluations that move beyond short-term outcomes to examine how authentic community engagement shapes professional trajectories.

The GK-12 program exemplifies systematic integration of service learning into postgraduate education (Page *et al.*, 2011) and provides opportunities for participants to engage in local communities. Beyond its core missions, it also facilitates leadership development and diverse stakeholder engagement (Matthews *et al.*, 2022), improved capacity to explain complex concepts and better classroom management skills, particularly valuable for academic positions (Cormas and Barufaldi, 2011). Meta-analysis shows its significant positive impacts on students' understanding of social issues and cognitive development (Yorio and Ye, 2012). Studies tracking GK-12 alumni show sustained impact in enhanced teaching and communication abilities transferring to subsequent careers (Laursen *et al.*, 2012). The

authentic engagement experiences shape career paths and professional identities, helping confirm goals and inspiring educational outreach incorporation into future work (Ufnar *et al.*, 2012).

Theoretical framework

This study is grounded in three complementary learning theories: (1) experiential learning, (2) situated learning, and (3) authentic learning, which together explain how professional development can emerge from an authentic service-learning program (see Figure 1).

Authentic learning provides an instructional design lens for creating learning environments that mirror real-world practice through authentic tasks, multiple perspectives, collaboration, reflection, and scaffolding (Herrington and Oliver, 2000). In GK-12, trainees engaged in real classroom problems with real stakeholders (students and teachers), produced artefacts such as lesson plans and instructional materials, and received feedback in context.

Situated learning theory emphasizes learning as participation in social practice, where newcomers develop competence and identity through legitimate peripheral participation in communities of practice (Lave and Wenger, 1991). In GK-12, trainees moved from observation to co-teaching and independent teaching while working alongside mentor teachers and peers.

Experiential learning theory conceptualizes learning as the transformation of experience through cycles of action and reflection (Kolb, 2014). HRD scholarship cautions that "experiential learning" is used in diverse ways and should be specified in terms of learners'

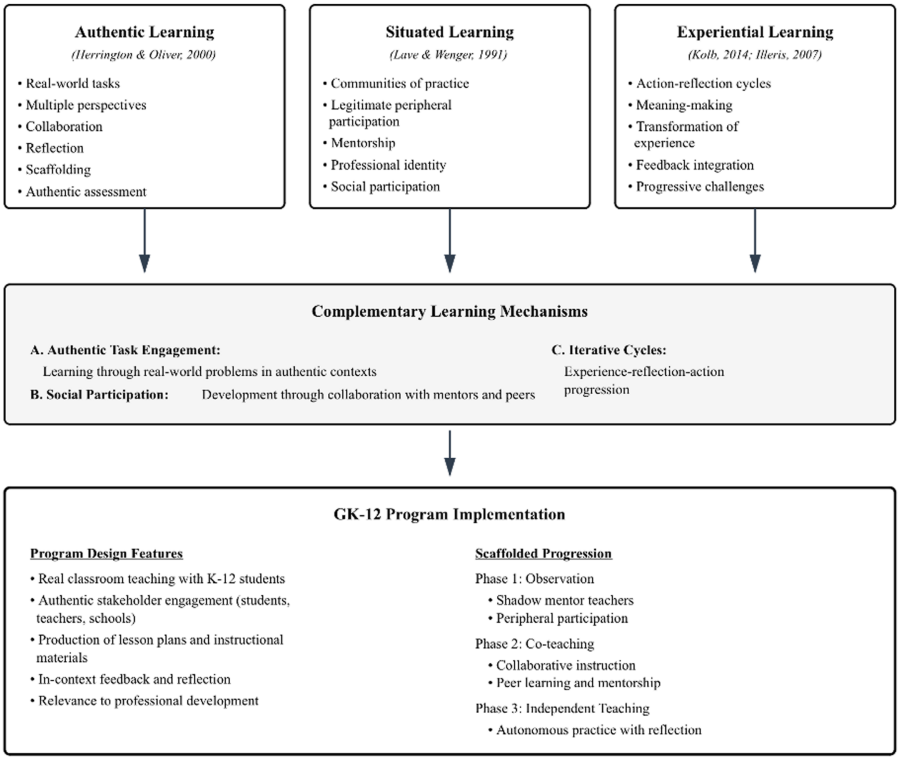

Figure 1. Theoretical framework for service-learning professional development

subjective meaning-making and development (Illeris, 2007) and suggests that experiential learning can be strengthened through intentional supports such as feedback, reflection, and progressively challenging assignments (Matsuo, 2015).

We use these frameworks in combination because they highlight different but complementary mechanisms that are central to authentic service-learning: (1) authentic task engagement in real contexts, (2) social participation with mentors and peers, and (3) iterative experience-reflection-action cycles. They provide a coherent rationale for examining not only immediate learning outcomes but also long-term transfer into participants' subsequent academic and industry roles (Baldwin *et al.*, 2017; Johnson *et al.*, 2018).

These theories informed both the program description and the study design. The GK-12 journey map, as described below, demonstrated the intentionally scaffolded participation (observation and co-teaching phases), encouraged reflection and experimentation across teaching cycles, and centered authentic tasks in community settings. In data collection, the survey and interview protocols were organized around sensitizing concepts derived from the framework (e.g. authenticity of tasks, participation and mentorship, reflection and experimentation, and examples of transfer of learning into later professional practice), strengthening alignment between theory, design, and empirical inquiry.

Methodology

Research design and context

We utilized a narrative inquiry approach to examine former GK-12 participants' retrospective accounts of how authentic learning experiences shaped their professional development trajectories through the lenses of temporality, sociality, and place (Clandinin and Caine, 2008; Creswell and Poth, 2016). Narrative inquiry was appropriate for this study because it centers participants' meaning-making processes and allows researchers to understand how individuals construct professional identities by integrating formative experiences into their evolving career stories. We employed a qualitative questionnaire followed by in-depth narrative interviews to explore participants' experiences (Johnson and Christensen, 2020) in GK-12, a program that emphasized authentic engagement through staged placements in local schools, supported by training workshops and mentorship (Figure 2).

The program was supported by the NSF from 2006–2009, exclusively focusing on domestic PhD STEM students. The structure remained the same as it became an institutional,

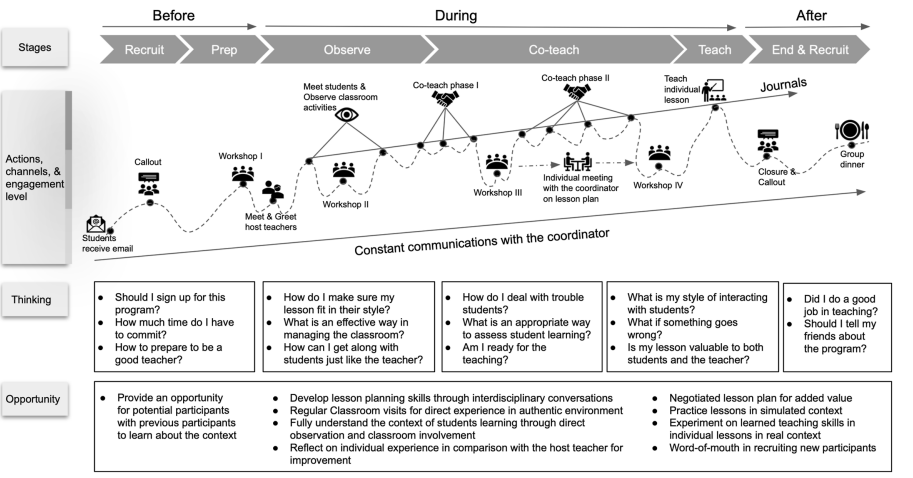

Figure 2. Journey map of the GK-12 program. **Source(s):** Authors' own data

self-sustained initiative. This transition granted program leaders greater autonomy and allowed for an expanded participant base, including master's and Ph.D. students, postdoctoral researchers, and international visiting scholars from diverse disciplines (e.g. computer science, engineering, graphic design, communication, linguistics).

A liaison from each participating school was responsible for recruiting teachers based on the background of graduate participants. Recruitment of teachers was consistently successful due to tangible benefits, such as a teaching grant, logistical support from incoming graduate participants, and high-quality lessons developed by the graduate participants. While primarily focused on middle schools, placements also occurred in elementary and high schools based on participants' interests and backgrounds. The pairing process involved a tiered review by program leaders, school liaisons, and both participants, followed by an initial face-to-face classroom meeting. For example, the program leaders and the school liaison proposed the pairing between graduate and teacher participants, which would be reviewed by the graduate participants and the teachers. This created a mutual mentorship model, highlighted by both sides, where graduate participants provided content expertise while teachers mentored them in pedagogy and communication. The number of graduate participants varied greatly over the years, from 5 to 15 each semester, with certain semesters/years paused due to reasons such as program transition. Overall, the program graduated approximately 120 participants from 2006–2021.

As detailed in Yang and Harbor (2023), the program followed a structured journey map, including the stages (major milestones of the program, such as observation and teaching phases), actions, channels, & engagement level (designed activities such as training workshops and participants' growing engagement), thinking (pre-assumed questions participants might have at different phases), and opportunity (design opportunities and insights). Before the in-person training workshops, an online pre-training via a free LMS (i.e. Schoology) was used to ensure equal access for participants who were not part of the university. The series of trainings were designed with a focus on three themes with a clear progression: (1) pedagogical knowledge (e.g. learning theories, instructional design and methods, evaluation) (2) school logistics and communication (i.e. navigating the school environment, expectations, management, and communication with diverse groups of learners) (3) social and peer interaction (i.e. building a community and collaborative support mechanism). The phased engagement was an intentional design through which participants develop the targeted skills from observing firsthand to doing and experimenting with them on their own. The length of observation and the two co-teaching phases were negotiated with the hosting teachers for the best results.

Participants and data collection

Study participants were recruited from a large Midwestern public university, comprising alumni who participated in the GK-12 training program between 2006 and 2019. Participants represented diverse disciplinary backgrounds and career trajectories, including academia and industry. To assess long-term impacts, the study specifically targeted individuals who had completed the program at least three years prior, with some participants having graduated over a decade before being interviewed.

Participants were identified and recruited through a multi-stage purposive sampling approach. The initial contacts were documented in the program records. Updated contact information was obtained through three primary sources: (1) institutional websites and professional directories, (2) professional networking platforms (primarily LinkedIn), and (3) referrals from existing participants who maintained connections with other program alumni (snowball sampling). This multi-source approach was necessary given the extended time period since participation and the geographic dispersal of alumni.

Prior to data collection, both the screening survey and interview protocol underwent rigorous review and validation. The instruments were piloted and evaluated by four reviewers: two doctoral students who had participated in similar GK-12 programs and could assess the

relevance and clarity of the questions from a participant's perspective, and two faculty members with expertise in qualitative research methodology and graduate professional development. Based on reviewer feedback, modifications were made to enhance question clarity, reduce potential leading prompts, and ensure alignment with the study's theoretical framework. This validation process established both face validity and content validity.

Data were collected in two phases over six years from 2017 to 2022. This was strategically timed to capture participants at varying career stages while maintaining a minimum three-year post-program threshold. The extended timeline also allowed for iterative refinement of the research approach and recruitment of fellows who completed the program during different cohort years, as well as the diversity of career trajectories captured. Following the compilation of contact information, an initial screening survey, administered by a trained undergraduate student assistant under the program coordinator's supervision, was distributed to identified participants to gather demographic information and current employment status. The survey included open-ended questions and one scaled item assessing perceived impact on communication skills. Guided by the theoretical framework and HRD transfer scholarship, the open-ended prompts were designed to elicit participants' description of (1) the authentic tasks and stakeholder interactions they experienced, (2) mentorship and peer participation that supported their learning, (3) reflection and experimentation across program phases, and (4) examples of how these experiences transferred into subsequent professional practice. Two sample questionnaire questions are "What is your current employment sector?" and "Did participation in GK-12 influence your career choice in any way? Please explain." A total of 22 complete responses were received during the initial phase, which provided insights into participants' current backgrounds and perceived impacts of the program.

Following that, at phase 2, we recruited a subset of participants through purposive sampling for semi-structured interviews lasting 30–60 min. Selection criteria prioritized diversity in career pathways (academic vs. non-academic), disciplinary backgrounds, time since program completion, and international vs. domestic student status to ensure maximum variation in professional development trajectories (Patton, 2014). The initial round of interviews informed iterative refinement of the interview protocol, which allowed us to probe emergent themes from their stories more deeply in subsequent interviews. Sample interview questions included: "Reflecting on your authentic learning experience during that time, what things were helpful in contributing to your personal growth? Can you provide specific experiences?" and "Comparing the job market now and # years ago, what recommendations would you have to redesign the program?" Interviews continued through the end of 2022, with later phases focusing on fellows who had completed the program more recently (2016–2019) and had reached the three-year post-program threshold. The COVID-19 pandemic necessitated a temporary pause in both the program operations and data collection activities. All interviews were conducted remotely via telephone or video conferencing platforms (primarily Zoom). While the final interviews were conducted in late 2022, we acknowledge that the two-year gap since data collection conclusion warrants consideration. However, several factors support the continued relevance and validity of these data. First, this study examines long-term career and professional development impacts spanning 3–16 years post-program participation, which are characterized by stability rather than rapid change over 2–3 year periods. Secondly, the recruitment design means that participants represented different temporal distances from their GK-12 experience. Despite such variation within the dataset, consistent themes emerged across participants, which further indicated that the fundamental impacts are not time-sensitive. Additionally, our narrative inquiry approach explicitly examines how participants retrospectively construct meaning from formative experiences, and the current meaning participants ascribe to past experiences is precisely what we seek to understand, rather than attempting to capture real-time impacts.

Interviews were scheduled and conducted by the first author, who also served as the program coordinator and training workshop trainer between 2017 and 2019. While this insider status facilitated deep rapport and contextual understanding of participant narratives, we

mitigated potential bias through peer debriefing and formal validation of the interview protocol by external faculty experts. Additionally, the temporal distance between the completion of the program and the interviews reduced fellows' concerns about evaluation or consequences related to their participation responses. IRB approval was obtained from the corresponding institution. The final 15 interviewees included both domestic and international participants, with representation across gender, occupation, and geographic location (Table 1). Interviews were recorded with participant permission and transcribed verbatim.

Data analysis

We conducted an inductive thematic narrative analysis, which examines what is told across multiple narratives to identify common patterns while maintaining attention to the storied nature of participants' accounts, following Braun and Clarke (2006) six-step process (Figure 3). While each participant's narrative was unique in its temporal unfolding and contextual details, our analysis sought to identify shared dimensions of how authentic service-learning experiences contributed to long-term professional development.

Initial open coding yielded 295 codes. Due to one coder's unfamiliarity with the program, initial inter-coder reliability was low (22%). Through iterative discussion, consensus was reached on all codes. Axial coding was used to group codes into categories and identify relationships among them. This process resulted in over 20 initial themes, which were refined into nine primary themes through hierarchical mapping. Thematic matrices were developed to link codes, subthemes, and overarching themes, ensuring alignment with the research question. NVivo software was used to manage and analyze the data.

Results

The analysis revealed nine major themes (Figure 4). These themes span cognitive, behavioral, and career-related transformations, with particular emphasis on teaching competencies, cultural agility, and career identity. Survey results indicated a strong positive impact on trainees' communication skills (7.52/10, SD = 2.34).

Theme 1: authentic learning experiences provide real-world insights

Trainees consistently described their GK-12 experiences as transformative, offering deep insights into the realities of K–12 education. The initial 23 codes were grouped into three axial subthemes (Table 2). Dana from China, now a tenure-track assistant professor, said the experience built her "general understanding of K-12 education in the U.S." John from Russia, now a tenure-track assistant professor, found it "really helpful to see how life is outside the university." Zana from China, now a corporate software engineer, called it an "eye-opening opportunity with a new insight." Alexa, a visiting scholar from Germany, became aware of classroom "restrictions" like technology and time. Jack, a U.S.-raised South Korean, now a software engineer, didn't grasp the value of the 4-h training workshops until he interacted with

Table 1. Participants' demographics

Demographic characteristics	Category	Number
Origin	Domestic (U.S.)	5
	International	10
Occupation	Higher Education	12
	Industry	3
Gender	Male	8
	Female	7

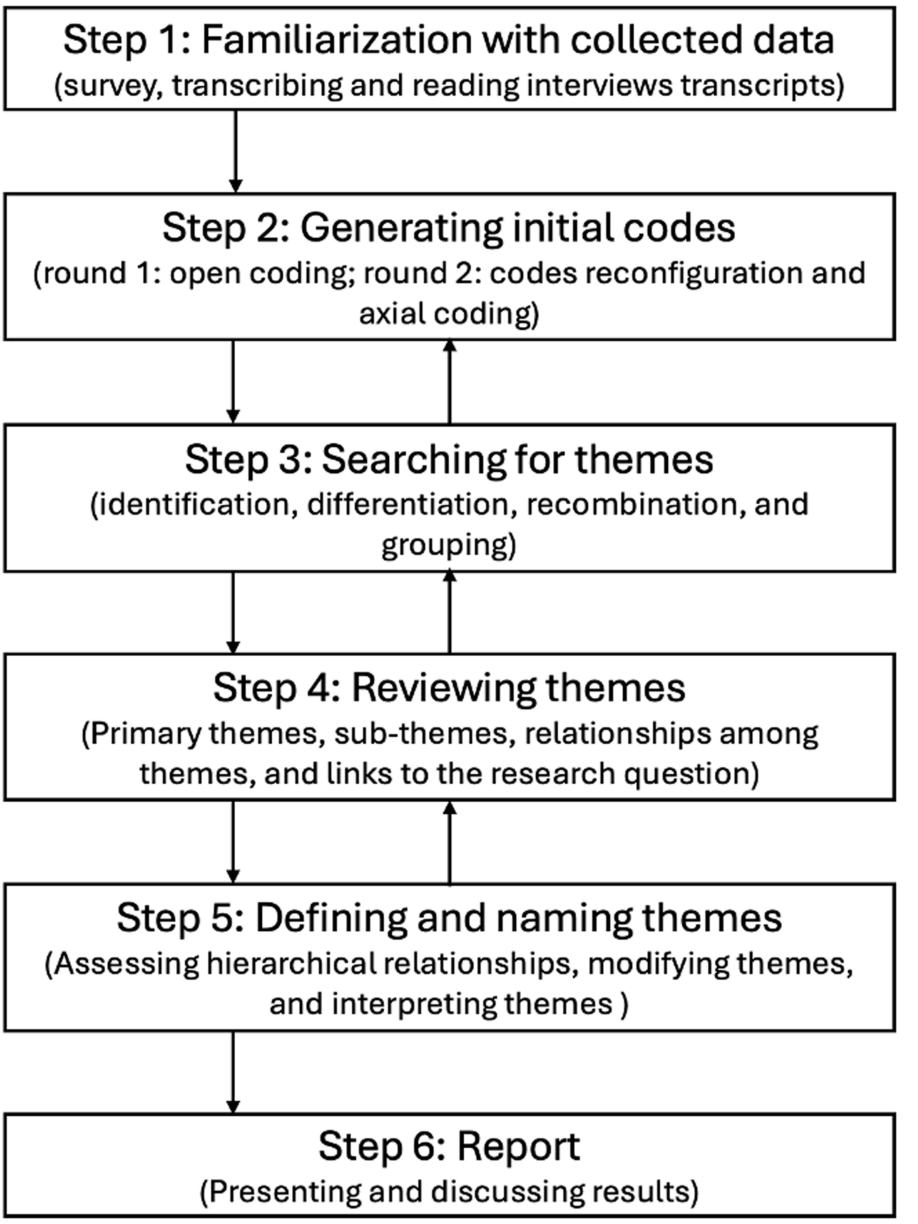

Figure 3. The thematic analysis process. **Source(s):** Authors' own data, adapted from Labra *et al.* (2020)

students and teachers, experiencing "gotcha moments." Domestic trainees also reported shifts in perspectives. Faye, now a tenured science professor, said it "absolutely changed how I understood the classroom." Jason, now a Chief Scientific Officer, noted the experience "mirrors real life" in how people learn, especially relevant for STEM fields in academia or industry. For those in teaching or preparing for academic roles, understanding K–12 education made their jobs easier and more effective. The experience was especially memorable for

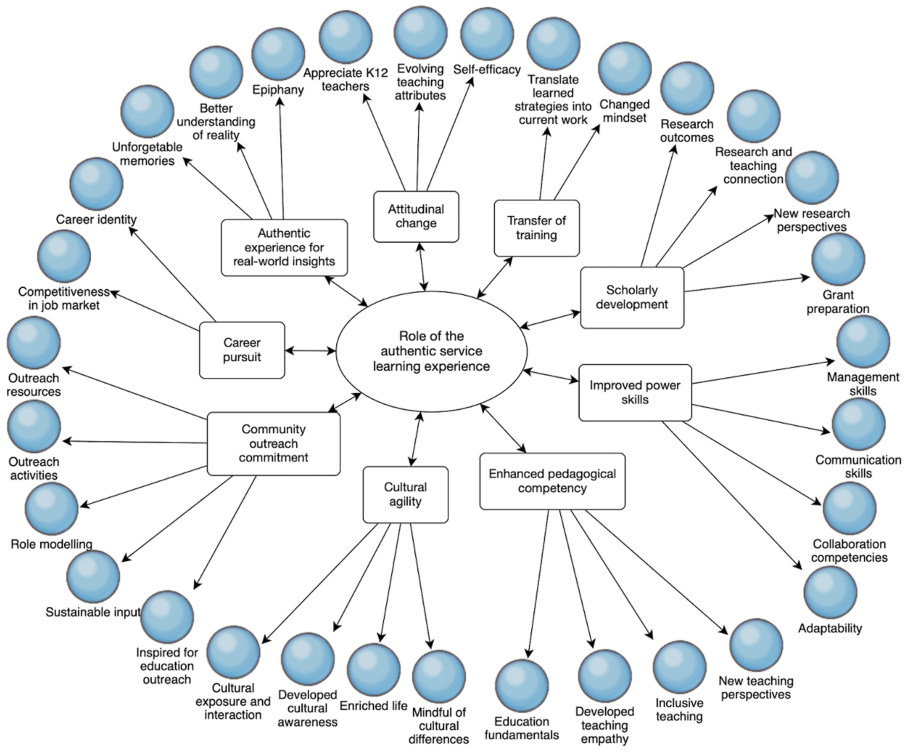

Figure 4. Themes, subthemes/axial codes

Table 2. Theme 1 subthemes, sample codes, and quotes

Subthemes	Sample codes	Sample quote
Better understanding of reality	Reality of public education How students really learn Stimulating real environment	*It's certainly more realistic . . . It mirrors real life, how people learn in the first place* (Jason, a 2007 trainee)
Epiphany	A-ha moment	
Unforgettable memories	Sticky memories	

international trainees. Dana still recalls details from training years ago, and Gus, a visiting scholar from China, described it as a "lifetime treasure." According to trainees, such insights would not have been possible without immersion in authentic environments, even with pedagogical coursework at the university.

Theme 2: attitudinal change toward teaching and self through authentic learning

The coding process generated 19 codes related to trainees' attitudinal changes, with three axial codes emerging (Table 3). After spending a semester or longer in classrooms, trainees

Table 3. Theme 2 subthemes, sample codes, and quotes

Subthemes	Sample codes	Sample quote
Appreciate K12 teachers	Empathy for teachers Respect for K12 teachers	*The confidence that you think you can communicate with those people . . . it's basically the same setting as in the school, you're in an environment that is theoretically alien to you . . . so I think, the skill you learn at the program, definitely can translate into how you do your research* (Alexa, a 2014 trainee)
Evolving teaching attributes	Different perception of respect	
Self-efficacy	Improved confidence	

developed greater respect, admiration, and empathy for K–12 teachers. Teaching was not as easy as they had assumed. These mindset shifts, combined with hands-on practice, led to evolved teaching attributes such as improved patience. One wrote, "The experience helped me gain the skills to be patient, willing to wait for students to catch up with learning and provide plenty of examples to help their understanding." Gus began reflecting on his communication style and developed a new perception of "respect." Another major change was improved self-efficacy in teaching and communication. Zana, now a software engineer, reported increased confidence despite language barriers, saying, "Sometimes it doesn't need language. What you need is your body language, your smile, and your passion . . . especially the youngsters will feel your energy." Leigh, now a tenured professor at a teaching university, became involved in lab school initiatives with "confidence developed from the GK12 program." Alexa also gained confidence in communicating her research globally during a postdoctoral fellowship.

Theme 3: the authentic experience as a driver in pursuing personal careers

Over 20 codes and several categories emerged regarding trainees' career pursuits, leading to two axial codes (Table 4). The authentic experience influenced several trainees' career choices. One described it as "a shining light" that changed their career ambition. Others reported a realization or shift in self-identity, which either fostered or confirmed their passion for teaching and understanding how people learn. Through managing a small project and interacting with others, Zana realized she was a people person and might pursue project management as a career goal. Trainees also discovered personal strengths and limitations, as one noted, "GK-12 helped me refine what type of teacher I wanted to be and what I did not want to be." Reflecting on their job market experiences, many believed the program helped them build stronger portfolios. Several added teaching, grant experience, or publications from the program to their resumes, which became highlights in job interviews. Many felt the experience directly contributed to securing their current jobs. Mason, now an assistant professor at a community college, said the "teaching component" was a prerequisite for many

Table 4. Theme 3 subthemes, sample codes, and quotes

Subthemes	Sample codes	Sample quote
Career identity	Influenced career path Realized passion in people	*This program made me realize I do have a passion in communicating and interacting with people, which is probably not some engineers love to do. I might pursue the career of a project manager* (Zana, a 2018 trainee)
Competitiveness in job market	Enriched CV Helped finding current job	

academic roles. Zana discussed her outreach experience during interviews, which aligned with her company's community values. Kim, now an assistant professor preparing pre-service teachers, shared that she "wouldn't have made it" without the GK-12 experience.

Theme 4: authentic learning fostering sustained community commitment

Spending time with local communities inspired trainees to maintain long-term engagement in outreach. This commitment manifested across several dimensions (Table 5). One European trainee noted the lack of recognition for community engagement in academia. In disciplines like math, increased outreach resources and networking opportunities have made local involvement more accessible than a decade ago. The experience led trainees to value K–12 outreach, with some suggesting it should be mandatory, especially given postgraduate students' limited awareness of its benefits for both them and local communities.

Several trainees later initiated outreach activities in their current roles, such as founding a "math circle" or "robotics league." One now serves on a Canadian outreach committee focused on increasing First Nations representation. Many recognized the importance of serving as role models, particularly for underrepresented groups in STEM. Alexa visited primary schools where young girls showed strong interest in science, echoed by Liam. Zana hoped to inspire students by reducing fear around STEM subjects.

To ensure sustainable collaboration, trainees emphasized shared goals and the use of low-cost, reusable materials. Mason and Faye stressed the need for affordable lesson plans that schools could continue using after outreach ended—an approach they now apply when preparing student teachers.

Theme 5: enhanced cultural agility for intercultural interaction

The GK-12 experience provided in-depth cultural exposure for international trainees from diverse countries, and fostered a community where trainees collaborated professionally and socially. For domestic trainees, it was also a "lifetime" opportunity to engage interculturally, especially during GK-12 program visits to China. These cross-cultural interactions enhanced trainees' cultural agility (Table 6). Zana joined a local drama outing with students and teachers—an "amazing cultural immersion." John found the experience "really helpful to see how life is outside the university," while Jason, who spent a month in China, described it as "a great way to meet people of different cultures and research backgrounds," especially given the limited opportunities to interact outside his major.

This cultural exposure led to greater awareness and challenged trainees' assumptions. One trainee began to "look at cultural differences" in how to engage and challenge students. Dana, an international student during the program, initially struggled with training due to cultural unfamiliarity, but immersion helped her develop empathy and shared understanding. Several international trainees compared educational and cultural norms between the U.S. and their home countries, which influenced their teaching practices. Zana, for example, adapted by

Table 5. Theme 4 subthemes, sample codes, and quotes

Subthemes	Sample codes	Sample quote
Outreach resources	Outreach not valued in Europe	*As I live and work in Europe, where broader community engagement is encouraged but not really rewarded or acknowledged in academia, I think it's not been seen as an advantage by employers (survey)*
Inspired for education outreach	K12 outreach inspiration	
Outreach activities	Outreach initiation	
Role modeling	Role model for student	
Sustainable input	Shared goals with participating partners	

Table 6. Theme 5 subthemes, sample codes, and quotes

Subthemes	Sample codes	Sample quote
Cultural exposure and interaction Developed cultural awareness Enriched life Mindful of cultural differences	Interact with diverse people Developed shared experience and empathy Broadened perspectives Adapt to local culture	*So for the native (speakers) . . . they just naturally got that from their own experiences. So they can just share their own experience . . . Can you imagine what happened for us internationals? We totally don't know. So it's why this program is so valuable* (Dana, a 2019 trainee)

using "open-ended questions" instead of demanding definite answers. Mindfulness of cultural differences emerged as a common and lasting outcome, particularly among international trainees.

Theme 6: enhanced pedagogical competencies

The 42 codes under this theme were categorized into four axial codes (Table 7). Trainees, particularly from STEM fields, reported limited prior pedagogical training and few opportunities to practice teaching. Teaching assistantships often followed rigid syllabi, offering little room for instructional creativity. Leigh, for example, was initially confused by inquiry-based learning and its application in mathematics. The GK-12 training and classroom immersion helped fill gaps in foundational knowledge (e.g. lesson planning, assessment, and instructional design), making trainees more aware of strategies to motivate students through "realistic teaching experiences."

Beyond foundational skills, trainees developed teaching empathy. Being in classrooms helped them relate to their students, especially those training future teachers. Dana said, "I totally understand what they are experiencing . . . it helped me build my empathy," which strengthened her relationships with students. Kim used her own experience to help students grasp the "big picture," especially during the pandemic.

Trainees also became more attuned to inclusive teaching. Exposure to diverse learners helped them recognize differences in how students approach problems. Dana emphasized, "Every learner is different, unique." This awareness empowered trainees to adapt their teaching to varied audiences. Those accustomed to lecturing college students had to learn how to engage younger learners and "keep them on task." John noted, "This gave me some ideas how I could keep them engaged, and that's what I've been using in my classes." Dana, now mentoring teachers, said she tailors her approach "based on their different . . . background and experience," emphasizing the importance of differentiation.

Table 7. Theme 6 subthemes, sample codes, and quotes

Subthemes	Sample codes	Sample quote
Developed teaching empathy Education fundamentals Inclusive teaching New teaching perspectives	Teaching empathy Basic pedagogical skills Being cognizant of diversity Education outreach for different perspectives	*(Here we) have a very diverse population, a large Hispanic Latino population, Southeast Asian population now. So being cognizant of that type of diversity is very important. I take a lot away from the GK-12 program and how it has made me think about my teaching for the past seven years* (Liam, a 2008 trainee)

Trainees were also "forced to find new ways to communicate complex concepts to diverse audiences." One noted that junior faculty often struggle with this, while they felt prepared due to GK-12. Alexa adjusted her teaching to "start at a much lower base," adding slides to ensure clarity for all learners. John echoed this, stressing the need for added detail when teaching adult learners.

Finally, the experience offered new teaching perspectives. Liam described it as "a valuable learning experience to think about education in a different way." Zana felt her thinking had become limited by formal education and found inspiration in the unconventional thinking of younger students. Jack called his classroom interactions "gold," as students challenged him with questions he had never considered.

Theme 7: improved power skills

Power skills, also known as interpersonal or soft skills (PMI, 2022), include the ability to communicate, collaborate, adapt, and lead (Groover and Gotian, 2020). Nearly 30 codes were generated on these competencies (Table 8). Several trainees became more aware of environmental dynamics and the need for adaptability. Jade, now an assistant professor in Canada, described learning to navigate a male-dominated cohort by being more adaptable. Others, like Dana and Faye, emphasized teaching students to be flexible and responsive to real-world classroom challenges.

Peer collaboration was a core program feature. Mason described becoming more "collegial," while Gus noted learning from others' strengths. Liam continued collaborating with fellows after finishing the program, and Helen found the experience valuable for building partnerships with local schools, skills she now uses as a faculty member.

Communication emerged as a key takeaway across contexts. Jason, now in business, credited the program with helping him "distill complex topics" for lay audiences. Jack, working in industry, learned to return to "the fundamentals" when training internal employees. Zana realized that teaching diverse students improved her ability to connect with people from different backgrounds, especially those from immigrant families. She became more confident in initiating conversations and inspiring others in her industry. In academia, trainees developed the ability to simplify complex ideas for students and peers. Faye noted, "How to bring your research to people without dumbing it down . . . is not an easy thing." She added that many postgraduate students struggle to communicate clearly in job interviews.

Leadership and management skills also stood out. Zana described managing and distributing materials for multiple classrooms, which directly translated to her current logistics role. She also improved her time management by learning to prioritize and balance daily tasks. Trainees who are now instructors reported better classroom management skills, considering factors like pacing, materials, student engagement, and their own teaching voice. Trainees also developed leadership skills by coordinating projects and observing how experienced teachers managed large groups. Facing real-world challenges, such as social conflicts or limited resources, pushed them "out of their comfort zones" and encouraged them to "take ownership" in problem-solving.

Table 8. Theme 7 subthemes, sample codes, and quotes

Subthemes	Sample codes	Sample quote
Adaptability	Be adaptable	*Being able to distill the complex topics into something that is understandable by lay people, I still use it the whole time . . . when I started my business, we went on to do a live business plan competitions. That's where it really helped, because it improved the communication skills, being able to discuss complex topics to these business leaders and investors. I attribute a lot of success from that to things I learned from the GK12* (Jason, a 2007 trainee)
Collaboration skills	Interaction with peers	
Communication skills	Communicate business	
Management skills	Better project management skills	

Theme 8: empowered scholarly development

For trainees who needed to include a focus on scholarly development, GK-12 empowered them in multiple ways (Table 9). As part of the program requirements, trainees applied their research to teaching practice, which gave them the opportunity to practice new concepts or ideas in an authentic environment. Helen experimented with mathematical modeling, which was underexplored in practice. Leigh and Dana expressed the difficulty of converting research into teaching or conducting research directly in the classroom, but several trainees observed that the teaching practice helped shape their research agenda or simply made them look at research from different angles. Kim got interested in collaborating with in-service teachers to prepare pre-service teachers more "effectively and efficiently." Leigh placed attention on inquiry-based learning, an underlying concept of the GK-12 program. Gus acknowledged that his previous research was directed by policies and that being involved in a new environment and education system prompted him to pursue his personal interests. For trainees who aspired to apply for educational grants, such as Helen, the GK-12 experience provided insights into broader impacts on communities and helped her to develop pilot data for a proposal. One direct research outcome from the experience for some researchers was the publication of peer-reviewed journal articles that gave them a head start in their careers.

Theme 9: positive transfer of learning to workplaces

Approximately 30 codes were grouped and categorized into two main sub-themes related to transfer of learning (Table 10). Mindset changes were mainly in pedagogy, communication, and research. Seeing younger students' problem-solving approaches encouraged Leigh to break his habitual thinking patterns in teaching and to help postsecondary students achieve that, too. Others became more mindful of certain pedagogical strategies, such as inquiry-based learning and inclusive learning. Some international trainees perceived their teacher role differently after GK-12 and now viewed themselves more as a "facilitator" rather than focused on "passive transmission of knowledge." Working in training in an industry setting now means a faster pace for Jack. One mentality he learned while working with kids was "getting to the

Table 9. Theme 8 subthemes, sample codes, and quotes

Subthemes	Sample codes	Sample quote
Bridging research and teaching New research perspectives Grant preparation Research outcomes	Practice new ideas in authentic settings Look at research in different ways Grant writing insights Publications	*They [students] are really comfortable just asking me any question. So, sometimes they made me actually even think about my research in a little bit of different way, especially the impact of my research, just because you know, kids have these creative interesting way of thinking* (Jade, a 2007 trainee)

Table 10. Theme 9 subthemes, sample codes, and quotes

Subthemes	Sample codes	Sample quote
Changed mindset	Break habitual thinking patterns Shifted to student-centered mindset	*In my home country the classroom was typically teacher-centered, with the teacher doing most of the talking. However, through my participation in training workshops and classroom observations, I developed a deeper understanding of the student-centered approaches that we have always advocated for in theory but rarely implemented effectively* (Yana, a 2019 trainee)
Translating acquisitions into current work	Apply inquiry-based strategy Applied 5E in Canada	

point," which he thought worked perfectly with adults who were exhausted in the workplace. In research, Alexa became more open to multidisciplinary research by "inviting" people from different disciplines to participate. One survey trainee highlighted the approach of conducting undergraduate research with a mindset of taking complex ideas to undergraduate contexts.

Trainees translated different aspects they acquired from the program into their own performance. Jade applied the 5E lesson planning approach she experienced in GK-12 to her teaching in Canada. Gus integrated more active learning strategies and technologies in his courses in China. In preparing community college-level students, Liam strived to prepare them to be critical thinkers and better communicators by applying inquiry-based learning. Jason motivated students who he thought were "accustomed to getting answers directly," to be more active explorers. Jack structured his corporate training in a similar way to the GK-12 program, which he found worked just fine. In preparing pre-service and in-service teachers, with whom Kim now had a better understanding, she integrated activities practiced in the program. The application and maintenance of learned strategies remained vivid for some participants more than a decade after their GK-12 experience.

Discussion

The themes that emerged from this work show that immersive, real-world experiences, such as those provided by the GK-12 program, can produce transformative effects that extend well beyond the duration of the experience. These effects include enhanced pedagogical competencies, attitudinal shifts, career identity formation, and the development of transferable "power skills," which underscores the value of such programs in preparing individuals for the complexities of modern professional demands (Eldeen *et al.*, 2018; Minocha *et al.*, 2017; Spronken-Smith *et al.*, 2024; Thiry *et al.*, 2015).

Authenticity as a catalyst for professional growth

Infusing authenticity in postgraduate training programs can provide real-world insights, as consistently expressed by trainees in this study. The program's authentic context, that is, engaging with real classrooms, students, and community stakeholders, enabled trainees to gain insights that were not accessible through traditional coursework. This aligns with Herrington and Oliver's (2000) framework emphasizing the importance of authentic contexts and tasks in fostering meaningful learning. The real-world immersion also supports situated learning theory (Lave and Wenger, 1991), which posits that learning is most effective when embedded in social and cultural contexts. The insights trainees gained produced attitudinal changes towards teaching as a career and improved their sense of self-efficacy.

Career identity and employability

The training program played a significant role in shaping trainees' career trajectories. Many reported that the experience helped them clarify their professional goals, build competitive portfolios, and secure employment in academia and industry. This finding reinforces the argument that authentic learning environments contribute to career preparedness by fostering transferable skills and real-world experience (Chhinzer and Russo, 2018; Ganapati and Ritchie, 2021). Importantly, trainees highlighted the value of teaching and outreach experience in job interviews and applications. These components not only enriched their CVs but also demonstrated their ability to engage with diverse audiences and manage complex projects—skills highly sought after by employers across sectors.

Civic engagement and cultural agility

The program's emphasis on community engagement had lasting effects on trainees' commitment to outreach and social responsibility. Many continued to initiate or participate in educational outreach activities, often adapting their approaches to local contexts and

resource constraints. This sustained engagement reflects the potential of service learning to instill civic values and promote educational equity (Vieira da Silva *et al.*, 2024).

The intercultural interactions facilitated by the program also enhanced trainees' cultural agility. International and domestic trainees alike reported increased awareness of cultural differences, improved communication across cultures, and a broader worldview. These outcomes are particularly relevant in today's globalized workforce, where cultural competence is a key attribute of employability (Minocha *et al.*, 2018; Yao and Tuliao, 2019). This aligns with the importance of developing global graduate attributes like mindsets, heartsets, and skillsets in a globalized world, often through experiential learning and application.

Pedagogical and scholarly development

The authentic training experience significantly enhanced trainees' pedagogical competencies, especially among those with limited prior teaching experience. Trainees reported gaining foundational knowledge in lesson planning, inclusive teaching, and classroom management. These skills were not only applied in their current roles but also influenced their approach to mentoring, curriculum design, and educational research. This reinforced the importance of pedagogical training via authentic experiences for graduate students, particularly doctoral-level students, who are often expected to prioritize research over teaching skills development (Jepsen *et al.*, 2012; Thiry *et al.*, 2015). Moreover, the program empowered scholarly development by bridging research and teaching. Trainees experimented with applying research concepts in classroom settings, which in turn shaped their research agendas and led to publications. The experience also provided valuable insights for grant writing, particularly in articulating broader impacts—a critical component of many funding proposals, which are prioritized by research-intensive universities and an important criterion for academic hiring and career advancement (Jepsen *et al.*, 2012; Wolfgramm and Zhou, 2024).

Power skills development

In an era with a dynamic workforce, practitioners have rebranded traditional soft skills as power skills since Bersin's (2019) statement. A set of foundational power skills is not only critical for effective leadership (Groover and Gotian, 2020) but also essential for citizens in the future of work (Dondi *et al.*, 2021). Some foundational power skills include collaboration, communication, adaptability, and empathy (Dondi *et al.*, 2021; PMI, 2022). The program significantly enhanced trainees' adaptability, collaboration, communication, and management skills. Achieving those skills aligns with employer expectations for a future-ready workforce (Chhinzer and Russo, 2018; Sumanasiri *et al.*, 2015).

Transfer of learning and long-term impact

One of the most compelling findings is the positive transfer of learning to trainees' current workplaces. Skills and mindsets acquired during the program were translated into diverse professional contexts, from academia to industry. Trainees adapted inquiry-based strategies, inclusive teaching practices, and communication techniques to suit their roles and audiences. This long-term transfer underscores the enduring value of authentic learning experiences and their relevance to dynamic, interdisciplinary work environments (Brion, 2020; Spronken-Smith *et al.*, 2024).

Limitations

Although purposive sampling ensured a diverse representation across disciplines and career stages, we acknowledge a potential self-selection bias. Alumni with more impactful or positive experiences may have been more inclined to participate in a long-term retrospective study.

During the interviews, we encouraged participants to recall interactions they had with peers to identify and contact participants who might have new insights.

Data collection relied on participants' memories of experiences that occurred between 3 and 16 years prior. While the "sticky" nature of these memories, as indicated by a participant, was a finding in itself, retrospective accounts are inherently subject to memory decay or reconstruction over time.

Additionally, the first author's dual role as both the researcher and the former program coordinator/trainer provided essential insider access and rapport. Although steps were taken to mitigate bias through peer debriefing and external validation of the interview protocol, this positionality may have influenced participants' responses or the researcher's initial thematic interpretations. To mitigate the interpretation bias, multiple coders were involved.

While the program's core objectives remained consistent, it evolved from an NSF-funded initiative to an institutionally sustained one, which included an expansion of participant disciplines and backgrounds. These subtle shifts in program structure over a 15-year period may have introduced variables that were not fully captured in the thematic analysis.

Lastly, the data collection concluded in late 2022, which created a gap between final interviews and publication. While we argue that this timeline falls within normal parameters for qualitative research involving analysis, writing, and peer review, we acknowledge potential limitations regarding the currency of findings. Professional contexts, labor market conditions, and higher education landscapes have continued evolving since data collection, particularly in the post-pandemic environment. However, we note that this limitation is partially mitigated as mentioned in the methodology.

Implications for research and practice

While this study provides rich qualitative insights, future research should adopt longitudinal or mixed methods designs to track the evolution of skills and career outcomes over time. While this narrative inquiry provides deep qualitative insights, quantitative measures could complement narrative data by assessing the extent and durability of learning transfer, career advancement, and scholarly productivity. Comparative studies across disciplines and institutions would also help generalize findings and identify contextual factors that influence program effectiveness. Additionally, future research should explore specific mentorship models and the role of mentorship, institutional support, and the varying cultural contexts in shaping the impact of authentic learning programs. Understanding these variables could inform the design of more inclusive and scalable models.

Graduate programs should systematically embed authentic experiential learning opportunities into their core curricula. This includes structured outreach, interdisciplinary collaboration, and pedagogical training tailored to diverse career paths in both academia and industry. Programs should also provide support for reflection, feedback, and integration of learning across contexts. Institutions must recognize and reward community engagement and teaching excellence as integral components of graduate education. This shift would not only enhance graduate employability but also strengthen the societal impact of higher education. Given the significant long-term transfer of power skills identified in this study (e.g. adaptability, collaboration), programs should prioritize these competencies, besides the domain knowledge as essential for a future-ready workforce. Further, in the era of globalization, institutions should leverage models such as service-learning or community engagement to foster cultural agility, particularly for international students who benefit from immersive, context-based interactions that build empathy and a deeper understanding of local professional norms. Such engagement should also be recognized as an integral component of graduate success, rather than secondary to research output. Finally, authentic learning programs should be designed with sustainability in mind. This will ensure that materials, partnerships, and goals align with the needs of participating communities, which fosters long-term collaboration and maximizes the return on investment for both students and stakeholders.

Conclusion

This study demonstrates that authentic service-learning experiences have profound and enduring impacts on graduate trainees' professional development. Trainees gained real-world insights, enhanced pedagogical competencies, and developed transferable power skills that shaped their career trajectories across academic and non-academic sectors. The program fostered cultural agility, civic engagement, and scholarly growth that contribute to both personal and professional transformation. These findings underscore the value of integrating authentic learning into graduate education to bridge the gap between disciplinary training and workforce readiness. By embedding experiential opportunities into curricula, institutions can better prepare graduates for diverse roles and evolving professional demands.

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