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Enhancing Mentorship Programs with an Experiential Learning Approach

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Effective mentorship is vital for student success, fostering skill development, networking, and career readiness. This study introduces an Experiential Learning Approach to mentorship within a STEM-focused framework. Built on data from programs like IST, SCM, and Accounting housed at a higher education institution in the Northeastern U.S., the model emphasizes hands-on training, industry mentorship, and reflective learning to enhance student outcomes. The mentorship model is developed based on Experiential Learning Theory, emphasizing learning through doing, and Situated Learning Theory, which highlights context-driven knowledge acquisition. Research on existing mentorship programs underscores the value of structured guidance and real-world applications. Key concepts include mentor-mentee collaboration, adaptive support, and reflective learning — all proven to boost technical skills, confidence, and career readiness for mentees. This study further identifies the common gap in extant mentorship programs by analyzing data of sample mentorship programs in three diverse STEM areas. Participant's feedback highlights the need for experiential learning and industry partnerships that foster large networks. The proposed model integrates skill-building workshops, career coaching, networking, technology exposure, and self-assessment, addressing gaps in traditional programs to improve student engagement and post-graduation success. To further address these identified gaps, we proposed a technological solution designed to streamline processes and improve overall mentorship mentor-mentee experience. Findings indicate that structured mentorship with experiential components should be promoted, enhancing students' confidence, resilience, technical skills, and career preparedness. Strong industry partnerships and real-world applications can improve engagement and outcomes. Recommendations include strengthening mentor-mentee collaboration, incorporating adaptive support, and refining program assessment to ensure effectiveness — offering actionable insights for institutions aiming to optimize mentorship initiatives.

Keywords: Experiential learning, STEM mentorship, career readiness, industry partnerships, reflective learning

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Introduction

Success for students is largely dependent on mentoring, especially in STEM fields where it is critical for developing critical skills, networking opportunities, and career readiness. As Denzel Washington aptly stated, "I think a role model is a mentor—someone you see on a daily basis, and you learn from them," highlighting the profound impact mentors can have on shaping students' professional trajectories. However, the industry engagement and practical application required for the best student outcomes are frequently lacking in traditional mentorship programs. This gap hinders students' ability to bridge academic knowledge with professional demands, leaving them underprepared for the swift dynamic system in STEM industries.

To address this gap, this paper proposes guidelines through an experiential learning approach to mentoring, which emphasizes learning through doing, and situated learning, which highlights context-driven knowledge acquisition. Specifically, these guidelines integrate hands-on training, industry mentorship, and reflective learning to enhance student outcomes. Research supports the effectiveness of this method. For instance, a study on mentorship in STEM found that students with research mentors strongly identify themselves as scientists, with mentorship facilitating opportunities for self-discovery and confidence-building (Atkins et al., 2020).

This work designed a technological solution to facilitate the implementation of these proposed guidelines to support key aspects of mentoring, including mentor-mentee matching, scheduling, engagement tracking, and access to preparatory resources.

In sum, focusing on STEM programs such as Information Systems Technology (IST), Supply Chain Management (SCM), and Accounting, this study analyzes participant feedback and program data to develop a comprehensive mentorship model that optimizes effectiveness. By incorporating experiential components, the proposed approach aims to improve student engagement, confidence, resilience, technical skills, and career preparedness, ultimately contributing to improved outcomes for successful careers in STEM.

Literature Review

Experiential learning theory, as articulated by Kolb (David & Kolb, 2014), posits that learning is a dynamic process rooted in experience, encompassing a cycle of concrete experience, reflective observation, abstract conceptualization, and active experimentation. In STEM mentorship, this theory suggests that mentees develop skills and confidence by engaging in hands-on activities, such as research projects, internships, or collaborative problem-solving, under mentor guidance. Reflective practices, such as structured discussions or journaling, allow mentees to process experiences, identify strengths, and especially set goals, deepening their learning. This approach helps with practical skill development in STEM, where theoretical knowledge alone is often insufficient for career success.

Situated learning theory proposed by Lave and Wenger (2012), emphasizes learning as a social and context-driven process within communities of practice. This underscores the importance of integrating mentees into professional or academic communities through activities, such as working with industry professionals. This socialization fosters a sense of belonging and scientific identity, particularly for underrepresented minorities who may face barriers to persistence in STEM fields (Estrada et al., 2018). By engaging in context-specific tasks, mentees also acquire the norms and values of the STEM community, enhancing their career readiness.

Together, these theories provide a robust framework for enhancing STEM mentorship. Experiential Learning Theory emphasizes the value of hands-on engagement and reflection, while Situated Learning Theory highlights the importance of contextual learning within professional communities, making them ideal for addressing gaps in traditional mentorship models. Research on mentorship in STEM underscores its critical role in fostering skill development, networking, and career preparation (Ragins & Kram, 2007; Zachary, 2011). A longitudinal study by Estrada et al. (2018) examined 1,015 underrepresented minority students and found that quality mentorship and two semesters of research experience significantly predicted science self-efficacy, identity, and values. Science identity was a unique predictor of STEM career choice four years post-graduation, highlighting the long-term impact of experiential mentorship. Similarly, (Pfund et al., 2016) demonstrated that mentored research experiences enhance research self-efficacy among biology undergraduates, correlating with enrollment in advanced STEM programs. These findings align with Social Cognitive Career Theory (SCCT), which posits that mentorship shapes self-efficacy and career outcomes through hands-on learning experiences (Lent et al., 1994).

An experiential learning approach of STEM mentorship program promotes engaging in practical activities, such as research projects or internships, mentees gain direct experience that enhances technical skills and confidence. Industry mentorship, as seen in recent programs connects students with professionals, providing exposure to real-world challenges and professional networks. Reflective learning fosters critical thinking and self-awareness by encouraging mentees to process experiences and set goals.

Methods

This study adopted a mixed-methods approach to evaluate mentorship programs, with a focus on Duquesne University, a diverse and vibrant private institution in Pittsburgh, Pennsylvania, recognized for its academic excellence and commitment to making a difference. The IST, SCM, and Accounting programs in the Business School at Duquesne University pair students with industry mentors to support research and networking, fostering increased engagement and career readiness through experiential learning.

Quantitative data from the Accounting program were used to analyze measurable outcomes, such as student performance metrics, participation rates and mentor retention. The 2022 Accounting Mentorship Program, involving 29 students paired with 29 mentors (17 returning in 2023), served as a key case study, offering a robust sample for analysis. This design aligns with recommendations from the National Academies of Sciences, Engineering, and Medicine (2019), which advocate for multidisciplinary research using advanced multimethod approaches to study mentorship in STEM (The Science of Effective Mentorship).

Qualitative data from the three programs were used to explore mentor-mentee interactions, and experiences. Feedback was collected through surveys and semi-structured interviews. Surveys, informed by validated scales like the Mentorship Functions Scale (Noe, 1988) and Mentoring Competency Assessment (Fleming et al., 2013), included questions about program satisfaction, strengths, weaknesses, and suggestions.

Results

This study integrated qualitative insights from participant feedback with quantitative metrics on program outcomes to provide a comprehensive understanding of program effectiveness and areas for improvement.

Data collected from Accounting mentorship program encompassed structural details, such as program duration, format, and outcomes. For example, the program ran for 12 months, with 67.86% of 28 surveyed participants supporting this duration, though 21.43% preferred an academic year (September to August). Meeting frequency varied, with 35.71% of participants meeting three times and 61% meeting more than four times. Outcomes included 80% of participants securing internships or full-time employment and 100% meeting or somewhat meeting their goals, demonstrating high effectiveness.

Survey data from all three programs clearly identifies the need for experiential components, with mentees requesting more group activities and in-person interactions, and mentors emphasizing structured preparation. For instance, a mentee suggested "more structure around times to meet mentor, actions to take," aligning with the need for clear, experiential objectives. Survey data from SCM mentorship program reflect these gaps, with mentees noting a lack of group activities and in-person involvement. When asked what was of great benefit from the program, one mentee stated, "Networking with a working professional in the industry. Their experience and insight were a great learning experience," while another suggested "a networking event for the IST mentorship program." There were positive instances of experiential learning already. For instance, a mentee in the program praised networking with professionals, stating, "Networking with a working professional in the industry… was a great learning experience," while another when asked what his best part of the program was expressed his thoughts saying "a networking event for the IST mentorship program." Mentors noted challenges, such as mentees needing coaching on meeting preparation, with one stating, "It needs to be a two-way street."

The above analyses highlighted some gaps that include little or no hands-on opportunities, unclear expectations, unbalanced pairing and scheduling difficulties. To address these gaps, this work proposes the following key components and guidelines in developing STEM mentorship program with an emphasis on experiential learning. The approach incorporated five key components:

- Skill-Building Workshops: Hands-on sessions to develop technical and soft skills, addressing the need for practical experience noted in feedback.
- Career Coaching: Personalized guidance to align mentees' goals with career paths, responding to feedback about unclear meeting objectives.
- Professional Networking: Events to connect mentees with industry professionals, aligning with suggestions for networking events and firm visits.
- Technology Exposure: Activities to familiarize mentees with current tools, particularly relevant for IST and SCM, addressing the need for real-world relevance.
- Self-Assessment and Reflective Learning: Structured reflection sessions to foster critical thinking, addressing the need for deeper learning and goal setting.

Mentor-Mentee guidelines were established based on feedback and literature best practices. Key responsibilities include:

- Structured Guidance: Mentors must provide clear expectations, regular feedback, and a mentorship plan, addressing feedback about unprepared mentees and unclear objectives (e.g., "Students need to be coached on how to come prepared").
- Active Engagement: Mentors participate in workshops, networking events, and one-on-one meetings, responding to requests for more in-person involvement (e.g., "More in-person involvement").
- Adaptive Support: Mentors tailor their approach to mentees' needs, considering diverse backgrounds and career goals, aligning with feedback about better mentor-mentee matching (e.g., "Adjust the mentor selection process to better match up industry and career goals").

Proposed Technology Solution

To facilitate the operationalization of the above Mentor-Mentee guidelines, a web-based application was designed to streamline interactions and address feedback. The features to facilitate this include:

- Mentor-Mentee Matching System: An algorithm matches mentors and mentees based on interests, career goals, and availability, addressing feedback about better alignment. Students create profiles detailing their backgrounds and preferences. This data is then analyzed and .
- Scheduling Tool: Integrates with Google Calendar or Outlook to suggest meeting times, tackling the 100% reported scheduling difficulties. Automated reminders ensure at least four meetings annually, as recommended.
- Checklists and Goal-Setting Dashboards: Provides customizable checklists for activities (e.g., resume reviews, shadowing) and dashboards to set and track goals, addressing the need for "more formal directions and advice.".
- Communication Platform: A messaging system facilitates regular interaction, encouraging mentees to prepare for meetings and addressing concerns about unclear objectives.
- Resource Library: Offers materials on resume writing, interviewing, and networking, building on the program's strengths.
- Progress Tracking: Dashboards visualize goal achievement, motivating users and supporting the 100% goal completion rate.
- Feedback Mechanism: Allows participants

to provide input, ensuring continuous improvement based on the 93% recommendation rate.
- Event Calendar: Organizes networking events and group activities, responding to suggestions for more group interactions.

The proposed web application will be developed using React for the front end and .NET for the back end, and it will be hosted on AWS to ensure scalability and mobile accessibility. Planned features include mentor training modules and mentee preparation guides, designed to address common challenges such as unprepared mentees and unclear expectations. Once the application is deployed, data will be analyzed to assess the effectiveness of this model in improving mentoring outcomes.

Discussion

This study demonstrates that structured mentorship grounded in experiential learning is an evidence-based, effective practice for supporting undergraduate students in STEM disciplines. By combining skill-building workshops, career coaching, industry networking, reflective learning, and technology-driven tools, the proposed model addresses critical gaps in traditional mentorship programs—particularly the lack of real-world application and sustained industry engagement.

The approach is especially effective for underrepresented undergraduate STEM students during the critical transition from academic training to career readiness—typically between sophomore and senior years. It fosters practical technical skills, self-efficacy, and professional identity, increasing both engagement and long-term success. Effectiveness is maximized under conditions that include ongoing mentor-mentee interaction, adaptive support tailored to individual needs, institutional backing, and integration with academic performance and tracking systems. When implemented with a digital platform for matching, scheduling, and feedback, the model allows for scalable mentorship, continuous improvement through data analytics, and enhanced student outcomes.

Conclusion

Future work will involve longitudinal and comparative studies to assess the long-term impact of the mentoring model, as well as integration with institutional data systems to allow for broader analytics on academic performance, retention, and graduation rates. This could further enrich the platform's ability to support students throughout their academic journey.

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