Navigating shifting funding challenges in STEM teacher preparation

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ABSTRACT

The preparation of qualified STEM teachers remains a critical national priority, particularly in regions experiencing acute shortages. A University-based STEM teacher preparation program in the Southeast was developed to address local STEM teacher shortages through a collaborative model combining strong content knowledge and practical pedagogical preparation, supported by Robert Noyce Teacher Scholarship funding. However, recent shifts in National Science Foundation (NSF) priorities, including the suspension and termination of some Noyce grants, have created significant challenges for such programs. This manuscript explores the local context of STEM teacher shortages, the impact of Noyce funding on recruitment and retention, and the consequences of shifting federal priorities. It highlights the importance of comprehensive teacher preparation that balances content expertise and pedagogy and addresses the seeming contradiction between NSF's stated goals and funding actions. The case program illustrates resilience and innovation in navigating funding uncertainty while advocating for sustained investment in STEM teacher education to ensure all students have access to quality STEM instruction.

KEYWORDS

NSF funding priorities, STEM teacher preparation

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When I joined a regional public university in the Southeast in 2012, one of the first challenges I encountered was the absence of a pathway for students to earn professional certification to teach science or mathematics at the secondary level. This gap was particularly concerning given the region's ongoing struggles with STEM education. During my early visits to middle and high schools across the surrounding region I found many STEM teachers lacked appropriate subject-area degrees. In some cases, students were left without a full-time teacher for extended periods—sometimes even the entire academic year. This issue was most acute in high-need schools, where students from economically disadvantaged backgrounds were especially vulnerable to the effects of teacher shortages. This shortage of qualified STEM teachers is not isolated but represents a national challenge. According to the National Science Foundation (NSF, 2023), the shortage has been persistent across the United States. Schools with high percentages of low-income students and English language learners are the most affected (Hansen et al., 2024). This disparity limits access to quality STEM instruction and perpetuates gaps in student achievement. Without qualified teachers, students miss crucial learning opportunities that influence their academic and professional futures.

Building a University-Based STEM Teacher Preparation Program

The case program emerged from a shared vision between faculty in the School of Education and STEM departments at the university. The goal was clear: to address the regional STEM teacher shortage by developing a program that combined strong content knowledge with practical, classroom-focused preparation. Drawing on the nationally recognized UTeach model, the program allows students to pursue STEM degrees and teaching certification concurrently, aligning academic and teaching goals and making STEM teaching a realistic and attractive career option. The alignment of these goals provides a seamless path for students interested in both science and service.

The UTeach model emphasizes hands-on, inquiry-driven teacher preparation with early field experiences (Rodriguez et al., 2018). Program participants complete coursework blending pedagogical theory with real-world practice, gaining teaching experience well before entering the profession officially. This contrasts with traditional programs where student-teachers typically have limited classroom exposure until their final year. Early and frequent fieldwork ensures candidates develop both content knowledge and pedagogical skills essential for classrooms with varied learner needs (Darling-Hammond, 2006; Loewenberg et al., 2009). The curriculum's focus on

experiential learning, inquiry-based teaching, and problem-solving equips future teachers to engage students effectively, especially in schools facing significant challenges (Borko, 2004).

Additionally, the program's collaborative nature extended to strong partnerships with local schools, districts, and informal STEM centers. These partnerships were critical in shaping the curriculum and ensuring the program remained responsive to the evolving needs of the local community. Input from practicing educators helped refine field placements and internships, providing students with opportunities to engage with a wide range of teaching environments. These collaborative efforts ensured the program stayed aligned with state standards and the specific needs of students in local classrooms.

Noyce Funding Impact

The Robert Noyce Teacher Scholarship Program played a crucial role in attracting talented STEM majors to teaching by offering scholarships, stipends, and valuable resources. Over 70% of students in the case program received the Noyce Scholarship, demonstrating its critical role in supporting the majority of our teacher candidates. These supports reduced financial barriers that often prevent STEM undergraduates from considering education careers (Smith, 2022). For many students, the Noyce Scholarship transformed teaching into a viable and attractive career choice, enabling them to graduate debt-free and focus fully on their teaching careers after graduation. It allowed future teachers to pursue the profession with confidence and without the burden of student debt.

Beyond financial aid, the program provided mentoring, professional development, and academic resources, enabling students to balance coursework, field placements, and certification preparation. Mentoring relationships provided vital guidance during the program's demanding final years. Retention was equally important, and the program supported scholars through clinical experiences, mentorship from experienced teachers, and professional development, easing the transition into teaching. These structures contributed to the development of a supportive learning community and a sustainable professional pipeline.

Shifting Federal Priorities

In 2025, NSF suspended the Noyce Teacher Scholarship solicitation for revision and terminated grants that no longer aligned with new priorities. This shift ended support for initiatives aimed at recruiting and preparing teachers for high-need schools (Sawchuk, 2025). For programs like the case program, which depended heavily on this funding, the termination of the grant created significant challenges, disrupting critical student support and undermining recruitment and retention efforts. The Noyce scholarship grant at this institution was not the only one terminated. Institutions across the country that relied on similar grants were similarly impacted, putting additional strain on the teacher preparation pipeline.

This policy change comes amid an urgent need for qualified STEM teachers nationwide. Over 4,000 STEM vacancies were reported nationally in 2023–24, especially in high-need areas (Florida Education Association, 2023). Without Noyce funding, institutions must scramble for alternative resources to attract and retain strong candidates. The NSF's shift exacerbates funding instability for teacher preparation programs built around Noyce's framework, raising concerns about their long-term sustainability, especially in underserved communities. These challenges demand immediate attention and collaborative solutions to sustain progress in STEM education.

Contradicting Policies

The halting of funding for programs that contain aspects within the program that are now considered controversial reveals a troubling contradiction in federal education policy. While NSF guidelines previously encouraged recruiting teachers from varied backgrounds to serve underrepresented communities, some grants containing such language were nonetheless terminated. This shift contrasts with research highlighting the importance of adaptive teaching practices and representation in improving student outcomes (Ladson-Billings, 1995; Hutton, 2019). The change raises concerns about whether future programs will be able to fully meet the needs of all learners. This shift also creates uncertainty for institutions seeking to design future proposals that align with both instructional goals and changing federal expectations, casting doubt on the future direction of STEM teacher preparation.

The contradiction raises urgent questions about the alignment of policy with educational goals. The case and similar programs were intentionally designed to meet the needs of all learners, especially in schools facing staffing challenges. Removing

support threatens to undo progress in addressing the national STEM teacher shortage and limits efforts to prepare teachers capable of engaging students with varied learning needs effectively.

Curriculum and Teaching

The NSF's shifting priorities spotlight a critical dilemma in teacher preparation: while strong content knowledge and certification are essential, they are insufficient on their own. Comprehensive preparation, including pedagogy and practical experience, is necessary to equip teachers to create engaging and effective learning environments for all students (Allen et al., 2016; Wright & Waxman, 2021; Xie & Ferguson, 2024). Effective STEM teaching requires more than content expertise; it demands adaptive pedagogy responsive to varied classroom needs. Prioritizing holistic preparation ensures that future teachers are equipped to meet the complex realities of today's classrooms.

The case program addresses these demands by providing strong subject-matter expertise alongside comprehensive pedagogical preparation and early field placements, creating a model that prepares teachers for today's complex classrooms. However, these efforts risk being undermined if funding priorities favor narrowly focused preparation that excludes essential pedagogical preparation. The dilemma challenges stakeholders to balance content strength with the development of skilled educators ready to teach students with varied needs. Ensuring continued support for both subject mastery and instructional effectiveness is crucial for preparing effective STEM educators.

Effective Pedagogies

The case program has always prioritized preparing teachers to work in varied educational settings, including high-need schools. Recent shifts in national funding priorities, however, threaten to undermine the program's ability to continue focusing on these critical areas. The curriculum is intentionally designed to incorporate strategies that connect STEM content to the real-world experiences and interests of varied learners. These strategies, informed by both local context and national research on best practices in student-centered instruction, help ensure that STEM teaching is both accessible and relevant to all students.

The goal is not only to ensure there are no educational disparities but also to enhance the learning experience for every student. Research shows that students are more likely to succeed when they see themselves reflected in the curriculum and have

teachers who understand their backgrounds and needs (Gay, 2018). This focus is especially important in STEM education, where women and minorities remain underrepresented. To truly transform STEM education, it is essential not only to increase the number of qualified teachers but also to prepare those teachers to engage and inspire all students, regardless of their background. Equipping educators with the tools to reach every learner helps close long-standing opportunity gaps in STEM.

Moving Forward

Preparing high-quality STEM teachers remains a pressing national priority. NSF's recent policy shifts create obstacles for programs like the case program, which have demonstrated success in addressing teacher shortages in schools facing staffing challenges. Despite these challenges, the program remains a promising model for adapting STEM education to evolving landscapes. Resilience, innovation, and community engagement offer insights into how localized efforts can inform national strategies and navigate uncertainty.

The future of STEM teacher preparation depends on continued innovation and collaboration among educational institutions, schools, policymakers, and stakeholders. Advocacy for sustained funding and resources that support effective STEM teaching is crucial. By focusing on student needs and long-term impact, we can work toward a future where all students have access to quality STEM instruction and opportunities for success. Ongoing efforts guided by evidence and a commitment to excellence in teacher education are essential to foster meaningful growth and realize this vision.

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