An Evolving Model of Community Support and Mentoring to Meet the Needs of New STEM Teachers in Rural High-Need Districts

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Context

The Maine Center for Research in STEM Education (RiSE Center), founded in 2001, developed the NSF Teaching Fellowship Program based on the Center's prior work. Core elements that shape the NSF Teaching Fellowship Program include:

Interdisciplinary and Discipline-Based STEM Education Research

The core of the RiSE Center's work is STEM education research led by 20 affiliated faculty members across 6 STEM departments (Chemistry, Earth and Climate Sciences, Forest Resources, Marine Sciences, Mathematics and Statistics, and Physics and Astronomy), the College of Education and Human Development, the Honors College, and the Climate Change Institute. Faculty collaborate with and are supported by 7 professional staff at the RiSE Center, and mentor over 30 STEM education graduate students at both the Master's and Doctorate levels.

Master of Science in Teaching (MST) Program

The MST Program is a key pathway to the NSF Teaching Fellowship, with most Fellows recruited during their first or second year of teacher preparation through the Program.
An interdisciplinary STEM education and STEM teacher preparation Master's degree program, the MST program provides a rich learning experience for students, career-changers, and current teachers with a STEM degree and/or strong STEM background. The program provides research-based courses that blend STEM content and pedagogy and focus on developing key areas of knowledge for teaching. All students complete an education research thesis as a graduation requirement. Students seeking teaching certification also complete a student teaching internship.

Figure 1. NSF Teaching Fellow's high school classroom during a lesson on carbon dioxide and climate. This Fellow graduated from the MST Program with a focus in Life Sciences. Her MST thesis involved collaboration with faculty across multiple campuses, designing a Life Science unit for use in biology classrooms. Photo by Holland Haverkamp.

Maine STEM Partnership at the RiSE Center

NSF Teaching Fellows and program mentors benefit from participating in a vibrant, state-wide professional community for STEM educators, convened and coordinated by the RiSE Center: the Maine STEM Partnership. Through the Partnership, mentors and Fellows have opportunities to participate in ongoing professional learning with STEM educators across grade levels and across the state. The Partnership began through grant-funded projects from the National Science Foundation and Maine Department of Education focused on improving STEM education in elementary, middle, and high school classrooms across Maine and in undergraduate education. Through new grants, private donations, and support from the University of Maine and Maine school districts, this partnership continues to provide professional learning opportunities and resources for K-16+ STEM educators as well as a forum for conducting and disseminating education research.

Figure 2. High school students exploring mathematics through virtual reality in the classroom of one of the NSF Fellowship Program mentors. Program mentors are veteran teacher leaders who have participated in leadership development and have taken on leadership roles in the Maine STEM Partnership. Photo by Holland Haverkamp.

Guiding Questions

1. What successes and challenges do fellows encounter in classrooms in high-need rural schools and how can the fellowship program help them build from the successes and meet the challenges?
2. How can the fellowship program support fellows at each stage in their professional growth?
3. How can mentorship from experienced teacher leaders support fellows in responding to opportunities and challenges?

NSF Fellowship Model: Program Plan and Pathway for Fellows

Program Plan: Inputs and Outcomes for the NSF Fellowship

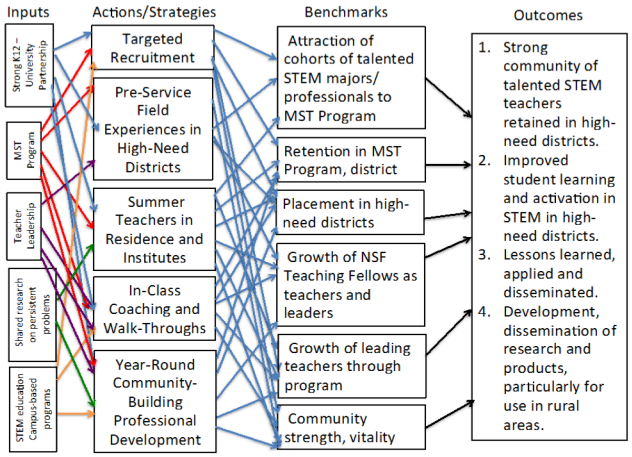

Figure 3. NSF Fellowship inputs and outcomes as planned prior to the start of the Fellowship program.

Pathway for NSF Fellows

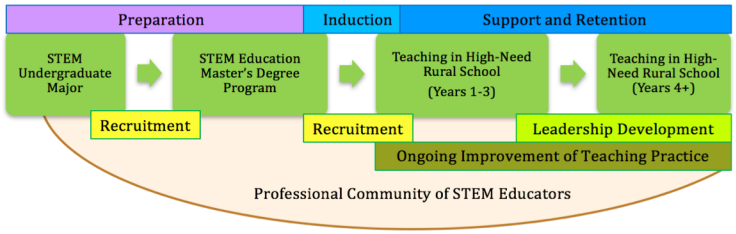

Figure 4. Model of the progression for NSF Fellows from their undergraduate STEM majors through induction and retention as STEM teachers in high-need, rural schools, including key inputs throughout the process.

Data Collection and Evaluation

Internal and External Evaluation

External evaluators for the program have conducted classroom observations and interviews with Fellows as well as interviews with mentors and program leaders during each year of the project. In addition to external evaluation, the Program has used classroom observations, conversations with Fellows and mentors, and surveys of Fellows and mentors to gather formative feedback. Project leadership has also conducted regular classroom observations of Fellows, sometimes with external evaluators. These sources of data have provided key insights into the challenges for Fellows and ways for the Program to improve supports for both Fellows and mentors. One result so far was a retreat for Fellows and mentors held in June, 2019 to reflect on the previous year and plan for the coming year, while building community within the Program. Fellows and mentors were unanimous in valuing the retreat. For example, one Fellow wrote:

This retreat did a lot to improve my perception of the group as a team with shared goals rather than individual collaborators. I appreciate that shift as it encourages me to rely on others and be more open about my struggles.

Figure 5. NSF Fellows, mentors and staff imitate the Schoodic Institute sculpture during the first NSF Fellowship retreat in June, 2019. During the retreat, Fellows and mentors planned working groups and discussed mentorship plans for the coming year.

Challenges and Current Strategies

Recruitment and Retention

We have found that there are two recruitment phases for the NSF Fellowship. The first is initial recruitment of STEM majors into the MST Program and the NSF Fellowship. A key second recruitment phase is when MST students are on the cusp of completing their Master's degree and considering whether to teach in Maine, or in another state. Some students accepted into the Fellowship program have decided, prior to entering a Maine classroom, to pursue employment in other states.

Building Community and Mentorship

Fellows face different challenges during completion of the MST degree and as they begin to teach in high-need, rural schools. To build community across the cohorts of Fellows and with mentors, we held our first Fellowship retreat in June, 2019 with Fellows and mentors collaborating for two days in developing working groups and plans for mentorship in the coming year.

Classroom Practice and the Teaching for Robust Understanding (TRU) Framework

Evaluation and feedback have shown areas where Fellows who are new teachers can benefit from developing their classroom practices. To support this growth, our program has adopted the TRU framework. In the coming year, Fellows and mentors will collaborate through working groups focused on supporting evidence-based classroom practices, including use of productive talk.

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