Findings from the first two years of the First2 Network

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Introduction

Nationally, more than half of all college students who declare a major in STEM fields drop out or change their majors in the first two years of post-secondary education. Among first-generation college students (FGCS) in West Virginia this number may approach 70%. The literature outlines several reasons and indicators:

Reasons:
- Under preparation in math
- Lack of connection to other STEM students
- Retention interventions that are divorced from students’ coursework

Indicators:
- Enrolling in fewer STEM courses during freshman year
- Enrolling in lower-level math courses during freshman year
- Performing worse in STEM courses than in non-STEM courses
- Accumulating withdrawn/failed STEM credits

Networked Improvement Community Fishbone: Defining the Problem

Our goals are to:
- Understand how these issues intersect with first-generation students, specifically rural first-generation students—who face a myriad of other stresses in college life;
- Engage students in describing the problems, articulating solutions, and testing novel interventions;
- Build a network willing to tackle FGCS persistence at scale

The Pilot Program, 2016-2018

Summer Internships: Early Exposure to Scientific Research
- 2016 GSO and Fairmont State 2017, 2018
- Two weeks in duration
- N=36
- Rising freshmen were targeted; N= 24
- 12 students were sophomores or juniors - mentor role
- Focus on research and communication

STEM Skills and Leadership Course: Sustained Engagement
- Two semesters; 1 credit each semester
- Weekly online/face-to-face meetings
- Students choose topics
- STEM skills
- Resumes, internship applications, outreach to professors
- Leadership training: Mentors/First2 Ambassadors

Research: Progress and Pilot Results

Research Questions:
- What factors contribute to rural first-generation college students’ entry into postsecondary STEM programs of study?
- What factors threaten or enable STEM program persistence among rural first-generation students (in what ways do these emerge from factors affecting non-rural STEM students)?
- In what ways do rural first-generation STEM students become socialized to their disciplines? In what ways do these discipline socialization experiences confirm or conflict with their rural identities/values?
- What institutional policies/practices and STEM program structures/practices do rural first-generation STEM students experience that confirm or conflict with their rural identities/values?

Data collection:
- Preliminary student survey to freshmen and sophomore first-generation STEM students attending Fairmont State and WVU; N= 101
- First2 intern survey administered at pre/post internship
- Student focus groups and interviews
- Extant data on First2 Interns (e.g. application data, academic data)

Pre/Post Pilot Survey Results:
After the summer research experience, measures of self-efficacy and confidence improved. Interns were significantly:
- Less concerned that their team-mates knew more than they did
- Less overwhelmed by research
- Less afraid of looking foolish
- Less afraid to ask the scientists questions
- More likely to think scientists will help them when they need it
- Less likely to feel that scientists were too smart for them
- More likely to know how to answer a research question

Results from the preliminary student survey (N=101):
- Top Reasons for pursuing a STEM major were similar between rural and non-rural students: Interest, wanting to contribute to the development of knowledge, good careers opportunities in STEM, and wanting to make a difference in the world. Rural students were significantly less likely to cite family wishes as a reason to enroll in STEM
- All students confident in their ability to succeed in STEM fields
- Barriers to persistence: rural students significantly less concerned than non-rural students by the following factors: feeling intimidated by professors, finding STEM classes more boring than expected, the possibility that they might not be able to afford to finish their studies, and not knowing where to get help with coursework.
- Rural first-generation STEM students had a moderate sense of rural identity and moderate feelings of place attachment. Rural students did not appear to be threatened by rural stereotypes.
- Few significant differences between female and male students: female students more concerned than male students about finding the math in STEM classes to be too difficult; male students more concerned than female students about not knowing where to get help if they feel depressed or worried.

Additional results from First2 interns
- Rural identity / place attachment increased significantly by post test
- Interns less concerned about barriers to STEM persistence at post test
- Interns less likely to be intimidated by professors at post test

Implications

General:
- Further research may uncover factors that contribute to the higher level of optimism displayed by rural students vs non-rural students in our sample.
- Overall, fewer differences than expected were found in our survey of rural and non-rural students. Could our findings be applied to all First Generation students?

Intensities for Rising Freshmen:
- Self-reported value to students was very high. Pre/post results indicate that the internship increased students’ self-efficacy and confidence - important predictors of STEM persistence.
- Faculty found that 2-week residential internships can be more scientifically productive than academic year student research experiences. Both of these findings imply value in college professors engaging students in research early in their college years.

Course:
- Time pressure, and course load from more important courses, resulted in attrition. There was some redundancy between other freshmen seminars and the topics we covered.
- However, the social and support aspects were highly valued, as was the opportunity for leadership. Sustained academic engagement is useful, but a course structure may not be optimal.

Moving Forward

First2 has received a National Science Foundation (NSF) INCLUDES Alliance award of $7.15 million (2018-2023).

We are seeking partners who share our vision for improving the success of undergraduate STEM students, particularly rural, first-generation students. We will keep student voices at the center as we work to:
1. replicate and scale promising programs and encourage institutional cultures that support student persistence
2. involve students as ambassadors and change agents
3. improve preparation for and transition to college
4. develop a collaborative statewide network of stakeholders, including industry partners
5. build a long-term alliance, which includes a permanent hub organization at Higher Education Policy Commission (HEPC)
6. conduct educational research to understand factors affecting persistence of first-generation STEM students

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