Conducting PDSAs in the First2 Network

Problem: Although WV students indicate greater than average interest in STEM Careers, over half of STEM majors do not complete a degree in STEM. 70% for first generation students!

First2Network: Formed to do battle on this issue. Target: FGCS up through first 2 years of college.

Aim: Double number of students who graduate with STEM degrees
How do we get there?

First2 Network is a networked improvement community: a group of stakeholders from diverse backgrounds solving problems together through cycles of Plan-Do-Study-Act. The cycle consists of four stages:

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1. Identify specific areas of need (Plan).
2. Intervene to improve supports to address those needs (Do).
3. Measure any changes that occur (Study).
4. Refine the intervention (Act).
Many members conduct PDSAs on these areas as part of a working group:
NICs share and scale successful PDSAs
Why do STEM interested students abandon STEM majors?

- Poor Math Preparation
- Imposter Syndrome
- Time Management
- Scientific Writing
- Unwelcoming STEM culture in college
- It’s so different from high school science
- Overconfidence going in

How to recover from failure
Lack of Proactive student success practices

- Failure to ask for help (fear, confusion, resistance)
- Lack of study skills
- Lack of time management
- Missing class and waiting too long to do work; Not doing necessary work
- Lack of relationship building with professors
- Faculty reward systems not tied to teaching/advising
- Not tied to student relationships
- Not tied to student retention
- Lack of recognition for schools/programs that prepare students well
- Immediate financial payback not evident to institutions
- No need/willingness/incentive to change trad. teaching
- HS and colleges & industry do not work together to analyze & problem-solve

Ingrained Institutional Resistance

Lack of STEM Industry/College/Community relationships

- Lack of a network
- Lack of formal relationships
- Students (and teachers) don’t know what they can do (ex: diversity of careers available)
- Peer pressure, everyone wants it
- Industries don’t have enough internship opportunities for students
- Lack of infrastructure to organize relationships
- Lack of industry access to schools and classrooms
- Lack of math readiness. Broken math placement, foundations, preparation
- High failure rates in first math/chem classes
- Desire to persist / hardship overcoming barriers
- Lack of knowledge of expectations, bridge to grad school
- Lack of academic/social community
- Lack of incentives for teaching reform
- Cultural challenges

Transition

- Lack of understanding of graduate and professional schools
- Can’t envision STEM careers
- Can’t envision self in STEM careers
- Lack of mentorship
- Community pressure
- Parents can’t help their kids
- Lack of timely check-ins with relevant mentors
- Tension between moving up (in your profession) and moving out (of community)
- Desire to persist / hardship overcoming barriers
- Lack of exposure to diversity/Feeling unlike other students
- Received message that local place is not where youth achieve
- Lack of familiarity with colleges processes/culture
- Increasing sense of difference from hometown people
- Missing access to solitude, outdoors / nature
- Conflict of local and cosmopolitan morals/values
- Sense of isolation, both at home & school

Acculturative Stress

- Lack of infrastructure to organize relationships
- Lack of industry access to schools and classrooms
- Lack of math readiness. Broken math placement, foundations, preparation
- High failure rates in first math/chem classes
- Desire to persist / hardship overcoming barriers
- Lack of knowledge of expectations, bridge to grad school
- Lack of academic/social community
- Lack of incentives for teaching reform
- Cultural challenges
- Lack of full recognition of what it means to be a leader (ex: within family)

Lack of leadership opportunities (no agency opportunity)

- Culture of research – people don’t see leadership roles / aspire to leadership
- Lack of incentive: time for leadership training
- Reticence to share lived experiences
- Need requirements for formal leadership training
- FG students have to work
- Internships are unpaid
- College guidance is broken (+ financial literacy) at both HS and college levels
- Lack of financial guidance: loan/financial literacy
- Moving in and out of dorms for breaks
- Lack of participation in mentoring – only go when there’s a problem (can’t be proactive)
- Families don’t understand earning potential with unknown majors
- Not tied to student relationships
- Not tied to student retention
- Immediate financial payback not evident to institutions
- No need/willingness/incentive to change trad. teaching
- HS and colleges & industry do not work together to analyze & problem-solve

First2Network diagram

Many first generation, rural students do not persist in STEM majors

Come to a common understanding of the problem and the system that produces it.

NSF
Over the next 10 years, double the graduation rate (from 30% to 60%) of the students in West Virginia who enter college with a declared STEM major who complete a STEM degree within 4 years. Measures

**Primary Drivers**

**Engagement with Undergraduate Institutions:** RFG STEM students are meaningfully connected within their undergraduate institutions (faculty, staff and campus) in ways that support retention and success.

**Engagement with Science Process and Community:** RFG STEM students engage in immersive research experiences to develop a sense of belonging and competence in a STEM research community of practice.

**Readiness for College:** RFG STEM students enter college with requisite knowledge, skills and disposition to succeed.

**Engagement in Leadership:** RFG STEM students engage in leadership opportunities that identify issues impeding students’ to success in STEM, help create solutions to these issues, and increase the reach of the network.

**Secondary Drivers**

- STEM course Policies and Practices
- Social STEM community engagement
- Faculty Awareness and Professional Development
- Early research
- Mentoring relationships
- Peer-to-peer academic support
- Math preparation
- Family engagement
- Counseling
- Stronger situational awareness between workplace-academia
- Public outreach

**Change Idea Examples**

- Faculty discuss actionable classroom obstacles in monthly Personnel and Friends lunch
- Apply metacognition strategies in class
- Promote Office hours interactions
- Exam interventions
- Students create and lead campus clubs
- Awareness of K-12 teacher influence
- HSTA students train 4-hExtension agents on HSTA community research
- F2 Ambassadors discuss STEM with high school and middle school students
- Develop student communication skills
- Build relationships with state legislators
NIC

The problem and the system

Our theory of practice improvement

Spread and Scale

Tests of changes

Change ideas to try
Plan-Do-Study Act

• **Plan** to test a change idea
• **Do** the test, and collect data- *easy measurement*
• **Study** the result
• **Act:** keep change idea, modify and try again, or abandon.
• If keep– how will this idea work in different settings? Another classroom, a different school?
• **Quick cycles!**
Documenting PDSAs on NILS