



Compendium of stories and outcomes from change ideas implemented by First2 institutional teams

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First 2 Improvement Science Overview for Year 5

The systems that First2 is targeting to increase STEM student success are systems in higher education. First2 Network has collectively identified change ideas as having the highest potential for impacting the systems that need to be changed. These high impact change ideas are centered around the four Drivers in our theory of change (see below). We have established common templates and common metrics across these high impact change ideas that are available for Institutional Teams to adopt and test. Institutions are required to undertake at least three established change ideas, and may initiate others that address problems at their own institutions. First2 data analysts synthesize results from completed PDSA cycles and share these across the Network.

Improvement science (PDSA) findings and First2 research and evaluation results from the first 5 years point towards the likely high impact of scaling the following improvement science initiatives. At our most recent conference, the following practices, as carried out in PDSA cycles by individual institutional teams, were discussed in affinity group breakout sessions so that team members could learn from each other's work.

This document highlights PDSA activities and outcomes through 8 short stories and two longer briefs, on the following change ideas:

Driver 1: STEM students succeed academically.

Math Anxiety: Addressing math course structures and identifying techniques that instructors can use to reduce math anxiety that hampers student progression.

Metacognition: Employing metacognition strategies and incorporating FGC student feedback to design academic preparedness activities that improve introductory STEM course success rates

Driver 2: STEM students are meaningfully connected with faculty, staff, and peers in ways that promote belonging (fit), wellness, resilience, and financial stability.

Campus Clubs: Providing a "home base" on campus for first generation students that acts as a social space and a springboard for designing and carrying out other activities to benefit students.

Social Interactions: Offering activities to increase a sense of belonging and promote relationships between FGC and other underrepresented students and the faculty and staff who direct key campus resources (e.g., instructors, advisors, tutoring centers, financial aid offices, and Career Services Centers.)

Driver 3: STEM students feel connected to STEM research, understand STEM career options and feel competent enough to pursue them.

Research Experiences: Providing opportunities for students to engage in STEM communities of practice, including early undergraduate research experiences (in summer bridge programs, academic year, and course-based research).

Improving Career Readiness by Directly Connecting Students and Industry Professionals
Fostering direct interactions between students and industry professionals (e.g., resume review, mock interviews, networking connections at First2 conferences and events organized by the First2 Industry Advisory Board).

Driver 4: STEM students engage in leadership experiences that identify systemic issues impeding students' success in STEM, and co-create new solutions to these issues.

Student Leadership - Empowering Students to Lead: Developing student leadership capabilities in ways that can lead to needed changes identified by each institution.

College Readiness Ambassadors: Leveraging student voices and leadership to promote knowledge sharing back to high schools by College Readiness Ambassadors.

Driver 1 Stories: STEM students succeed academically.

Math Anxiety -STEM Majors Need Math to Succeed - Now We Can Help Them Embrace It

WVU: WVU has been engaging in Math Anxiety training for a few years, and have adapted their techniques after receiving feedback from students. A math professor and counselor at WVU joined forces to focus on self-compassion, self-efficacy and mindfulness. Students were asked to complete a pre and posttest as they engaged in a number of modules. Analysis found that self-efficacy and self-compassion were predictive of reduced math anxiety and that mindfulness also correlated negatively with math anxiety (though not predictive). (Leppman & Darrah, 2022).

Glenville: Glenville held Math Anxiety workshops to help students face and overcome negative preconceptions, experiences, and emotions regarding mathematics using self-compassion and mindfulness techniques. Throughout the semester, 65 math students completed topical modules in class that encourage self-compassion and mindfulness to overcome any negative experience with math and replace them with a more positive experience. Students then completed the Abbreviated Math Anxiety Rating Scale (AMARS), Five Facet Mindfulness Questionnaire (FFMQ) and the Self-Compassion Scale-Short Form (SCS-SF)?

Math causes anxiety for many STEM majors and often causes them to leave their major. If you can find meaning in something and it is important to you, you can find persistence to move forward and excel. Mindfulness and self-compassion are important for math anxiety and STEM persistence. They provide courage, meaning and acceptance to avoid negative self-talk, frustration and anxious feelings. These tools on mindfulness and self-compassion overlay with grit (persisting despite failures and setbacks) allowing students to overcome math anxiety. The Math Anxiety program, started at WVU, was adapted and shared with Glenville. Both have been successful and befitted students in their pursuit of STEM majors. WVU Tech is planning to implement the program next year.

Metacognition - Let's Think About It - Using the Power of Self-Reflection to Better Academic Behavior

WVU Tech: WVU Tech Student Directors and Co-Chairs have led three iterations of a PDSA around Developing Study Habits. The change idea involved students reviewing modules on Prioritization, Time Management, Resource Management and Help Seeking. The latter two modules were not completed due to student feedback on repetitiveness. At the end of the semester, students were asked to reflect on the effect of the modules on their academic behavior. All 6 students completed the Reflection survey, and all felt the Prioritization unit was most beneficial.

Fairmont: Fairmont State STEM faculty planned for three refresher sessions on math and connecting math to other science courses. The sessions were held in weeks 2, 3 and 4 of the Fall semester. Despite plans for 20 students, few students attended the first two weeks. To encourage participation, students were offered homework help during the third session, to which 10 attended. Surveys measuring mindset and self-efficacy were administered. Poor attendance and complications with survey distribution resulted in inconclusive data interpretation.

Marshall: Marshall's Office of Student Success partnered with the College of Science to offer a 2-week/8-day workshop for incoming freshmen reviewing basic concepts for math and chemistry courses; 77 attended. This was followed by an 8-week workshop for interested students; 29 attended. Students were surveyed and reported improved preparedness for STEM course success. Grades of the students in the six math and chemistry courses who attended the workshops averaged 3.0, compared with those who did not attend who averaged 2.3.

Driver 2 Stories: STEM students are meaningfully connected with faculty, staff, and peers in ways that promote belonging (fit), wellness, resilience, and financial stability.

Campus Clubs - Come One Come All - An Exciting Way to Engage with STEM Students and Faculty

Fairmont: Fairmont State's Campus Club, led by Student Directors and Co-Chairs, met regularly during the Fall semester to share experiences and identify barriers to success, academic needs, etc., and to suggest possible solutions. Participants were surveyed at the end of the semester on how club participation affected their sense of belongingness in their STEM community and classes on campus. 13 students responded to the exit survey: 69% attended more than 4 club meetings during the semester, and 62% reported an increase in feelings of belonging and acceptance in both their STEM classes and their STEM campus community.

Marshall: Marshall's Campus Club held bi-weekly meetings during the semester, in which group activities were planned, with a goal of having students meet their academic goals. 17 students attended at least one; 71% attended at least 4 of the 5 meetings. Students were surveyed before and after club activities. 66.7% of students who attended regular meetings reported on the post survey that they had reached their Fall GPA goal.

WVU: WVU Students centered their Campus Club activities around reading the book *Your Time to Thrive*; this book discusses how to decrease burnout and how to instill healthy habits. The 13 attendees were surveyed at the end of semester, 84% of whom reported a higher sense of belongingness at the end of the spring semester.

WVU Tech: WVU Tech's Campus Club met through the semester; 9 students completed an intake form their campus clubs meetings, 67% of whom were first-generation college students. Club leaders planned and recruited other students for faculty-student social events which were well attended. No data was collected from club participants at the end of the semester.

Social Interactions - Time to Have Some Fun - Students, Faculty, and Staff Come Together

Blue Ridge: Blue Ridge Student Directors and Co-Chairs planned a networking Dinner with the Dean and STEM Showcase Social to connect STEM students and faculty members. Club members also visited the National Cryptologic Museum in Maryland. No data on these events were reported.

Fairmont: Early in the Fall semester, STEM faculty worked with Student directors to plan a welcoming social event on campus, which they called the SciTech Social. About 100 students and 40 faculty attended. 27 students responded to a follow-up survey, 25 of whom reported that they were more comfortable approaching faculty and less intimidated by professors, and that they know where to go for assistance, are aware of clubs, and have a connection with other STEM majors.

Marshall: Student Directors and Co-Chairs organized a networking dinner with faculty; 13 students and 7 faculty members attended. Pre and post surveys were sent to both student attendees. There was an increase from 3.63 to 4.85 (on a scale of 1-5) in students' ratings of their comfort with approaching Marshall STEM faculty and institution team.

WVU Tech: WVU Tech students organized social events with faculty in both the fall and spring semesters. After the Bingo Night in the fall semester, a post survey was sent to 24 attendees, both students and faculty; no data was reported. An Escape Room event was held in the Spring semester; 40 attended, and 22 responded to a post survey (17 students and 5 faculty). When asked how the event affected their sense of belongingness on a scale of 1-5, 71% of students responded at 4 or 5, and 100% of faculty responded 5.

Driver 3 Stories: STEM students feel connected to STEM research, understand STEM career options and feel competent enough to pursue them.

Early Research Experiences in Multiple Formats Increase Student Belonging

First2 Network studies the impact of student research experiences on STEM student persistence. First2 institutions have piloted course based micro-research experiences involving industry, academic year programs for first- and second-year students and summer immersive experiences for rising Freshmen. The latter program has been implemented across all First2 Institutions and has been iteratively studied through PDSA cycles. Network-wide data from the pre/post surveys show significant improvement in students' reported school belonging, knowledge about research, personal skills, STEM identity, and research skills even though pre-test means were high throughout. These results seem to indicate positive outcomes on learning questions addressing belonging and to a smaller extent research self-efficacy. The career subscale showed the smallest pre/post gains, network wide and in most individual institutions' disaggregated data.

Improving Career Readiness by Directly Connecting Students and Industry Professionals

Direct interactions between students and industry professionals via panels, breakout sessions, resume review and "expo" style tabling interaction led by the First2 Industry Advisory Board (IAB) have been evaluated highly at First2 conferences. The IAB worked during Year 5 to develop plans for a

“Sophomore Experience” consisting of a Mentoring Support System and Mock Interview Cycle. The idea and basic structure for this new PDSA was presented for feedback at the First2 Spring conference in May 2023 and is under development this summer for implementation in fall 2023.

Driver 4 Stories: STEM students engage in leadership experiences that identify systemic issues impeding students’ success in STEM, and co-create new solutions to these issues.

Student Leadership - Empowering Students to Reach Their Goals and Stand Out

Network-wide: High Rocks Educational Corporation conducted a two-day training workshop for First2 Students focused on leadership skills and techniques within First2 Network; 15 students attended and were surveyed following the training. Among the 14 who responded were 9 Directors, 3 Co-Chairs, and 2 Scholars. 13 of the respondents felt the training prepared them for their roles within First2. When asked if their time was well spent on a scale of 1-5, the average response was 4.5.

College Readiness Ambassadors Impact High School Students and Teachers

College Readiness Ambassadors is a network-wide change idea designed to build leadership skills in undergraduate STEM students and improve the college readiness of high school students. This PDSA engaged 24 First2 student directors and scholars in creating presentations that shared their personal STEM story, and educating high school students on the behaviors and skills needed to succeed in college. They visited 31 schools and engaged more than 500 students in interactive dialogue. Teachers, high school students and the Ambassadors themselves completed surveys to assess the impact of these visits. Of 18 teachers who successfully completed the survey, 70% reported learning something new (3-5 on the 5-point scale), and all reported a moderate to high likelihood of using classroom resource; 89% rated the presentations as having moderate to high impact on their students. Most Ambassador

Appendix I. PDSA Brief: Summer Immersive Experience

One of the primary drivers for student success in the First2 Network is to engage students in professional immersive experiences early in their post-secondary STEM journey (Figure 1). Research experiences are the high impact practice related to this driver situated around development of STEM identity and professional self-efficacy.

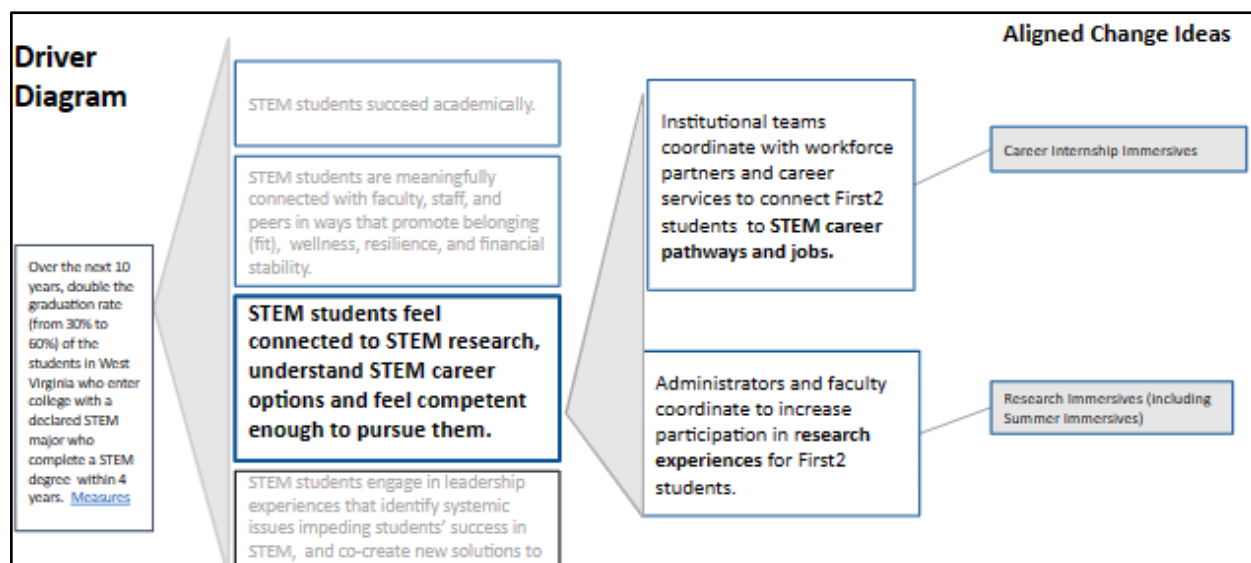


Figure 1: snapshot of First2 Driver Diagram

Intervention Description: This Immersive Experiences is a two-week residential summer program, for rising college freshmen, generally hosted by the university or college the students will be attending. This has been a network-wide activity with Immersive summer programs occurring at most First2 institutions.

Students are recruited to the program through monthly announcements to WV Teacher listservs beginning in November preceding the summer, posters mailed to all WV High Schools, the First2 website which lists all of the summer opportunities, and through direct mailing and emailing to students accepted into a STEM program. First-generation students are targeted specifically.

While each summer immersive experience is unique, all contain the following components:

- Authentic STEM research experiences in a campus lab
- Social activities led by upper-class mentors, generally First2 student leaders.
- Interactions with faculty who act as research mentors or just members of the STEM departments. Research mentors interact every day for several hours through lectures and one-on-one help and mentorship. Staff interact with students informally as well at social events. Faculty (called site leads) receive mentor training as part of the regular preparation to mentor summer students. Student mentors receive extensive mentor training with High Rocks at the beginning of the summer. Site leads and student mentors then collaboratively plan and organize a full activity schedule for the incoming interns.

Learning questions and predictions for this change idea are:

Question 1: How many of the students attended all planned sessions of the immersive experience?

Question 2: How many of the students completed each component of the immersion?

Question 3: To what extent does the immersive experience increase feelings of belonging among STEM students?

Question 4: To what extent does the immersive experience increase students' confidence in interacting with research faculty as measured by the [First2 Network Summer Research Internship Program Survey](#)?

Question 5: To what extent does the immersive experience increase students' awareness of STEM career options?

Question 6: To what extent does participating in the immersive experience improve students' self-efficacy related to their STEM courses?

Question 7: To what extent does the immersive experience impact STEM student persistence through their following year of college?

Shared metrics are collected by the external evaluators via a pre/post survey. The intern survey is administered to student interns before and after their participation in the immersive research experiences to assess changes in their STEM efficacy, identity, and education and career plans; sense of school belonging; and knowledge of, attitudes about, and skills to conduct research. These are analyzed in aggregate across all summer sites, and also broken down into individual statistics for each institution.

Additional data is collected by the qualitative evaluation survey during the first semester of the academic year to learn STEM and non-STEM programmatic aspects of the summer immersive experiences encouraged student's pursuit of STEM.

Student academic standing at the end of each semester of Freshman year is also sought as a direct outcome measure.

Outcomes: Outcomes vary slightly for each institution, but when taken in aggregate, the immersive research experience is highly impactful and worth continuing.

Network-wide data from the pre/post surveys show significant improvement in students' reported school belonging, knowledge about research, personal skills, STEM identity, and research skills even though pre-test means were high throughout. These results seem to indicate positive outcomes on learning questions addressing belonging and to a smaller extent research self-efficacy. The career subscale showed the smallest pre/post gains, network wide and in most individual institutions' disaggregated data (Figure 2).

Figure 3 shows students' agreement with statements at the end of the summer immersive program. It is clear that they personally found high value in the program.

Data collected in the following academic year asked students who had participated in the summer immersive: "When you attended the summer internship experience, what aspects of the program encouraged you to continue in STEM or discouraged you from pursuing STEM? Mark only those items that apply" (Figure 4). Almost all students ranked being with students with the same interests, conducting research, meeting faculty and making friends as encouraging, while other activities showed more spread.

Table 14. 2022 Intern Pre/Post Matched Pairs Survey Results

| Subscales | N | Post Mean | Pre Mean | Mean Diff. (post – pre) | t | df | Sig. |
|--------------------------------|----|-----------|----------|----------------------------|-------|----|--------|
| STEM Career | 34 | 3.62 | 3.54 | 0.08 | -0.59 | 33 | 0.56 |
| STEM Efficacy | 34 | 4.11 | 3.99 | 0.12 | -1.50 | 33 | 0.14 |
| School Belonging | 34 | 4.29 | 4.09 | 0.20 | -2.26 | 33 | 0.03** |
| STEM Identity | 34 | 3.82 | 3.64 | 0.18 | -1.99 | 33 | 0.06 |
| STEM Plans | 34 | 4.41 | 4.26 | 0.15 | -1.20 | 33 | 0.24 |
| Knowledge About Research | 34 | 3.89 | 3.37 | 0.52 | -4.28 | 33 | 0.00* |
| Attitudes/ Beh. About Research | 34 | 3.76 | 3.73 | 0.03 | -0.16 | 33 | 0.87 |
| Personal Skills | 34 | 3.86 | 3.61 | 0.25 | -2.62 | 33 | 0.01** |
| Research Skills | 34 | 3.72 | 3.51 | 0.21 | -1.90 | 33 | 0.07 |

*Statistically significant at .001; **statistically significant at .01 (using only matched pairs for the analysis).

Figure 2 Pre/post survey items

| Items | (1) Strongly Disagree | (2) Disagree | (3) Neither Agree nor Disagree | (4) Agree | (5) Strongly Agree | Mean | Std. Dev. |
|--|-----------------------------|-----------------|--|--------------|--------------------------|------|--------------|
| The immersion experience met my expectations. (n=36) | 0% | 3% | 8% | 42% | 47% | 4.33 | 0.76 |
| This experience helped to improve my research skills. (n=36) | 3% | 0% | 8% | 39% | 50% | 4.33 | 0.86 |
| This experience helped me to increase my knowledge of research within a STEM field. (n=36) | 0% | 0% | 8% | 36% | 56% | 4.47 | 0.65 |
| This experience helped me to increase my general scientific knowledge. (n=36) | 0% | 6% | 6% | 36% | 53% | 4.36 | 0.83 |
| This experience helped me learn how STEM research is conducted. (n=36) | 3% | 0% | 8% | 39% | 50% | 4.33 | 0.86 |
| This experience helped me see myself as someone who can do STEM. (n=35) | 0% | 3% | 11% | 34% | 51% | 4.34 | 0.80 |
| I am more likely to pursue a career in research as a result of this experience. (n=35) | 0% | 6% | 14% | 40% | 40% | 4.14 | 0.88 |
| The things I learned during this experience will help me stay in my STEM major when my coursework is challenging. (n=35) | 0% | 6% | 9% | 34% | 51% | 4.31 | 0.87 |
| I am more likely to pursue a STEM degree as a result of this experience. (n=36) | 0% | 6% | 11% | 36% | 47% | 4.25 | 0.87 |
| This experience will help me succeed in college. (n=36) | 0% | 0% | 6% | 44% | 50% | 4.44 | 0.61 |

Figure 3 Post survey reflection questions.

| Activity - 2022 - N=22 | % Encouraged | % Discouraged | % No Response |
|--|---------------|---------------|---------------|
| Conducting research | 95.45% | 0.00% | 4.55% |
| Being with students with the same interests | 100.00% | 0.00% | 0.00% |
| Meeting faculty | 95.45% | 0.00% | 4.55% |
| Doing activities related to my major | 86.36% | 4.55% | 9.09% |
| Learning about my campus | 81.82% | 9.09% | 9.09% |
| Doing after-hours fun activities | 81.82% | 0.00% | 18.18% |
| Working in a team environment | 86.36% | 4.55% | 9.09% |
| Learning skills I can use in college | 90.91% | 0.00% | 9.09% |
| Making friends | 95.45% | 0.00% | 4.55% |
| Doing hands-on experiences | 90.91% | 0.00% | 9.09% |
| Visiting STEM-based companies | 54.55% | 9.09% | 36.36% |
| Being exposed to new STEM technology | 77.27% | 4.55% | 18.18% |
| Learning about STEM job opportunities | 72.73% | 4.55% | 22.72% |

Figure 4 Academic year survey for immersive students.

One learning question was not well answered through this test. Career awareness was simply not addressed in most summer immersive programs. In the academic year survey, it is unsurprising that visiting STEM companies and learning about STEM job opportunities had the **highest % of no response**. This is an area for future improvement.

What about persistence? Persistence rates were measured in 2022 for all immersive students **to date** over three cohorts and these were compared to one-year persistence rates at WVU over the past 14 years and the results are encouraging.

| | |
|---|---|
| <p>Persistence Rates by First2 cohorts in spring 2022:</p> <ul style="list-style-type: none"> ● Fall 2019: 92% ● Fall 2020 64%. ● Fall 2021 86% | <p>WVU 1 Year STEM Persistence Rates over 14 years</p> <p>Averages:</p> <ul style="list-style-type: none"> ● 62% Non-First Gen (range 61-66%) ● 57% First Gen (range 49-64%) |
|---|---|

Most institutions did not include persistence data in their PDSAs. Marshall University is the exception. In 2022, 8 students participated in the summer immersive program. All 8 were still enrolled in college. Five of 8 were still in STEM majors, and 5 of 8 performed 1 semester of academic year research in their freshman year.

Other outcomes: In addition to promoting STEM identity, the summer immersive experiences were successful in addressing another primary driver, **“STEM students are meaningfully connected with faculty, staff, and peers in ways that promote belonging (fit), wellness, resilience, and financial**

stability. “The summer immersive expanded into an effective STEM bridge program that, through interactions with faculty and older students, created a community that supported students into their first year in college.

Comments collected by external evaluators on 2022 student interns:

“For me, I'd say it far exceeded my expectations. It ended up being far more enjoyable than I ever thought it would be and I loved it. For me, it helped me find the major I wanted to go into. It helped connect me with research experiences here. It's helped me find this network, which has helped me develop leadership skills, and I made several friends during the internship ... and I'm still in contact with them so that was really helpful.”

“For expectations, I don't know if I necessarily had any besides just getting to know the faculty more ... that was a big thing that drew me in, but ... I made friends that I still have to this day from that, and then I also learned a great deal about things that I was going to do in the next semester with computer science.”

“Going into my internship, I thought it was going to be more of a shadowing experience and I wouldn't get hands-on experience, but I got to work with the machines and the materials in the lab and that was super cool. So it exceeded my expectations, and I tried to carry that experience for when I was a mentor to other interns.”

Concluding thoughts: Participating in a summer research focused bridge program is a great way to ease first generation students into college life as STEM majors, not only by providing an opportunity to “try on” being a professional STEM person, but by creating a welcoming community for these students. Even though the experience appears to be very valuable, there is expense involved, time and labor on the part of faculty and student mentors, stipends, and room and board for students. This year, in 2023, there are very few summer immersive experiences, in large part because the external funding has diminished. Much work needs to be done to convince institutions that there is a sizable return on the investment with this program.

Resources:

- Related change idea: WVU and other colleges offer an academic year paid research program that places freshmen and sophomore STEM students in labs. At WVU, of 1000 students who participated in freshmen year 90% stay in college. While the program is a high impact activity and an excellent opportunity, very few of our First2 students take part. When asked why a dominant theme emerges which was unsatisfactory experiences with their research mentors. This led to a PDSA to test a mentor training program with faculty and graduate student mentors. Here is a [brief handout](#) with the main findings. This PDSA will be repeated and the training is open to all.
- Literature related to this change idea: This is an excellent article for Institutional Teams interested in this driver. [Course-Based Undergraduate Research - Crazy Observations, Audacious Questions | Tomorrow's Professor Postings \(stanford.edu\)](#)

Appendix II. PDSA Brief: College Readiness Ambassadors

One of the primary drivers for student success in the First2 Network is to engage students as leaders who drive change at their institutions. The high impact practice related to this driver is Service Learning. Although not the same as a traditional service learning course, First2 Scholars lead activities designed to improve the STEM experience for all First2 students (IE first-gen or other underrepresented students), including future ones.

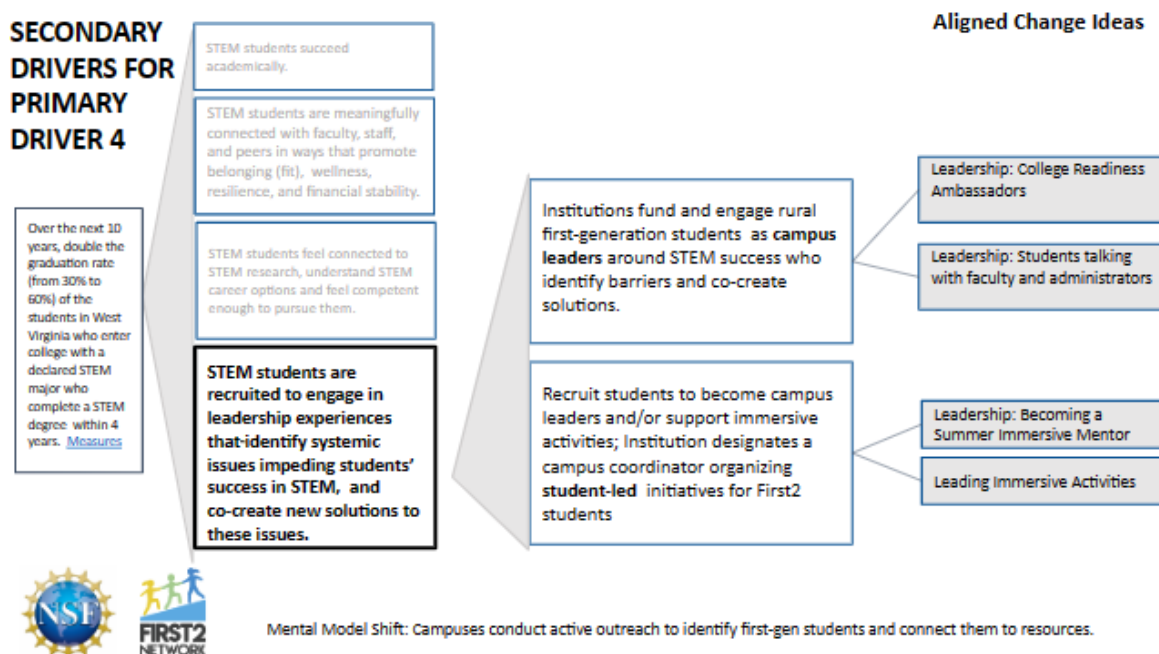


Figure 1: snapshot of First2 Driver Diagram

Intervention Description: STEM persistence starts at the K-12 level, where college readiness is a large problem. College readiness extends beyond academic readiness such as math placement. This is especially true for first generation students. First2 Student leaders were asked if high school prepared them for college work, and the answer was a resounding “no”. Even students who had excelled in honors courses or advanced placement courses did not feel prepared. Students cite time management, study skills, and just the sudden awareness of the difficulty of college level classes.

The College Readiness Ambassadors change idea engages First2 undergraduate students to become local leaders who return to their hometown high schools to inspire high school students and to illuminate problems and solutions to improve students’ chances for success in their first year of college as a STEM major. Readiness College Ambassador (CRA) presentations are personal, and communicate an ambassador’s personal STEM journey. In addition to benefiting high school students and teachers it is hypothesized that ambassadors will benefit by developing a message that they can take not only to HS students but to leadership at their own institutions. This is also an opportunity to practice public speaking, to practice professional networking and to be of service by connecting with high school students.

This is a Network-wide change idea.

Students prepare a presentation that tells their personal STEM story, practice their delivery with other STEM students, and ultimately visit WV High Schools to engage HS students in an interactive dialogue using their presentation, and First2 generated materials. There are three functional goals of the presentation: 1) to inspire students to consider STEM career paths 2) to articulate the differences between high school and college, 3) share resources with high school teachers.

Student ambassadors strive to make the visits interactive. They use a publication that former First2 students created called “20 Things I wish I knew as a freshman” to spur discussion between high school students. Additional resources for teachers include materials on time management, study skills and note-taking, in hopes that they might use these in their STEM classes.

Students reach out to their hometown science/math teachers in order to arrange a visit. In addition, teachers can request a CRA through an online form. Ambassadors may visit schools other than their hometown high school. First2 advertised the opportunity through the West Virginia Science Teachers Association listserv.

As they conduct this activity, all First2 Student Ambassadors complete an individual PDSA using a common template. They are coached through the process of developing a presentation, visiting a school, collecting data and studying the results in network wide zoom sessions.

There are seven learning questions:

1. Process: How many high school students and teachers will request a College Readiness Ambassador (CRA)?
2. Will teachers learn something new about current STEM courses of study and college?
3. To what extent will the Undergraduate Ambassadors report soft skill attainment, as the result of participating?
4. To what extent will high school students learn new ideas that they were previously unaware of regarding life as a college STEM major?
5. What skills will high school students acknowledge that they lack training in?
6. How much impact will the visit have on HS students and their teachers?
7. How much impact will the CRA process have on undergraduate student ambassadors who participate?

Data was collected through three simple surveys:

- [Teacher Survey](#) asks teachers to rate the impact of the Ambassador visit on them and their students; to comment on anything new they learned, and to state how likely they are to use the classroom resources in the future.
- [Student Survey](#). Data is collected in real time at the conclusion of the visit. Students are asked to put their heads down and raise their hands to respond to questions regarding impact. Teachers record the numbers in the survey.
- [CRA reflection survey](#). Ambassadors take this survey after participating in the classroom visit. They are asked to comment on any ways the visit impacted them. They also offer suggestions to improve future Ambassador visits.
- We planned to have students do a sticker vote on a list of skills they needed more practice in, but this did not happen.

In 2023, xx first2 student leaders served as College Readiness Ambassadors. Some Ambassadors elected to team-teach and present together, most presented individually.

Results of the activity:

LQ1: The number of teacher requests for Ambassador visits exceeded our prediction. (31 versus 20).

LQ2 We predicted that 60% of newly visited high school teachers will report learning something new about current STEM courses of study and college. Eighteen teachers successfully completed the survey. All Teachers were asked to rate on a scale of 1-5 (nothing new to important learnings) "Did you learn anything new about the ways in which college and high school learning expectations differ?" From the [Survey data](#), 12 of the 18 teachers reported learning something new (3-5 on the 5 point scale), and all reported a moderate to high likelihood of using classroom resources (3-5) we provided to improve students' readiness for college.

LQ 4,5: We predicted that teachers would report that 60% of high school students would learn something new, and that 50% of high school students will list at least one skill that they need more practice in (through an anonymous Sticker Vote).

Ambassadors were unable to do a sticker vote during the presentations Teachers responding to the survey indicated that students learned new things, but did not call out skills like study skills, time management. The [student feedback](#) revealed a wide range of new things learned, some were related to the skills and differences between college and high school, and some were related to careers, research, funding opportunities, and mental health.

LQ6: We predicted that 80% of high school teachers will strongly agree that the visit was impactful for students and themselves: Students and Teachers agreed that the visits were impactful to them. 58% of students responded that the visit had substantial to high impact, and another 25% said the visit was moderately impactful. 14 of 18 (78%) teachers ranked the impact of the visit on them as either 4 or 5, on a scale of 1-5. 16/18 (89%) reported impact on their students as either 4-5 on the 5-point scale.

Learning questions 3 and 7 addressed impact of the activity on the ambassadors themselves.

LQ3: We predicted that 80% of all undergraduate students will report soft skill attainment, as the result of participating.

LQ7: We predicted that 90% of all undergraduate students who participate, will report gains in sense of social responsibility and citizenship skills, leadership and communication skills, personal development and greater satisfaction with college.

Twenty-four Ambassadors completed the survey in 2023.

On a scale of 1-4 with four being highest impact the average impact score was 3.7 among all ambassadors. Ambassadors who entered a low impact score, explained that the students they presented to were uninterested. Some others who entered a moderate impact score, also commented that many in their audience were not interested in STEM or going to college.

Overall, when we asked how being an ambassador impacted them, 14 students specifically mentioned soft skills like communication, and presenting skills. Of the current ambassadors, 5/24 responded with specific mentions of communication or presentation skill development.

By far the most commonly reported impact was related to their sense of value in what they did: “Rewarding, fulfilling, giving back, making an impact in students’ lives” are words/phrases that represent this common thread. Some representative student comments from the Ambassador Reflection survey follow:

I love sharing my experience and knowledge with the students every year. I was once in their shoes and I would have loved if someone gave this type of presentation to me.

I was able to present meaningful information to first-generation and underrepresented students. This truly impacts me as I am a first-generation student that wants to help my peers succeed in life.

It helped me overcome my fear of public speaking.

It was nice to be able to give back to students that I was in their shoes 4 years ago.

It was very fulfilling to feel like I might be helping bridge the gap between high school and college for students like myself. I am glad I was able to use what I have learned throughout my time in college to, hopefully, impact others who will be going through a similar experience soon.

I enjoyed having a chance to reflect on how I've grown since high school and getting to share that experience with other students.

It made me feel more comfortable doing outreach of behalf of F2.

It was really rewarding to be the college student that came back to help high school students learn about college. I know my senior year every opportunity I had to talk to someone with college experience meant a lot to me.

I really enjoyed getting to give back to the marginalized community (HSTA, so first-gen, Black, low-income, rural) that got me this far! I think it really would've been impactful to me at that age to see what life post-HSTA and into college would be like (even just a few years out). As well, I think hearing about the college perspective from a HSTA graduate who looks like you, sounds like you, and was in the same place you are just a few years ago was especially beneficial.

A less common but pervasive theme concerns the engagement level of the audience. For example:

It didn't impact me because the students were not interested.

It was fun to give a presentation to students that used to be my peers, however the majority are not going to college, so I did not make that connection with them.

In reviewing individual PDSAs from students and the reflection survey, a useful modification for future visits would be to target the Ambassador visits to older high school students. However, one Ambassador team visited seventh graders and found the students to be very engaged, asking lots of questions.

Reflections: The data clearly show that the Ambassador program makes an impact on students, teachers, and on many of the Ambassadors themselves.

As a change idea designed to better prepare future students for college, in the short term, there seems to be value in it, and the activity is fulfilling for most Ambassadors but not all.

As a change idea designed to improve First2 student leadership and development, which in turn should enhance their own success, the data are less clear. Fewer than 25% of the 2023 Ambassadors mentioned gaining communication skills.

For students who had been an ambassador before, this year was different in that the presentations focused more on college life as a STEM major and their own story, and less on joining First2. This was the first time that we offered resources to teachers, and used the “20 Things I wish I knew” as a discussion prompt with students. Veteran Ambassadors remarked that these additions were improvements.

Resources:

[This instruction “toolkit”](#) contains a checklist with links to an example PowerPoint presentation, the resources used in the interactive portions of the visits, all surveys, and even email templates to use with their teachers.