

Evaluation of the First2 Network

Final Evaluation Report, Year 6

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Submitted to:

The West Virginia Higher
Education Policy Commission

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Table of Contents

1 Executive Summary.....	5
1.1 Context in Which the First2 Network Operates.....	5
1.2 First2 Network Structures and Processes	5
1.3 Systems Targeted by the First2 Network.....	Error! Bookmark not defined.
1.4 Impact of the First2 Network.....	Error! Bookmark not defined.
1.5 Recommendations	Error! Bookmark not defined.
2 Introduction.....	8
2.1 Overview of the First2 Network	8
3 Findings.....	10
3.1 First2 Network Context.....	10
3.1.1 Socioeconomic, Political, and Historical Context	10
3.1.2 Educational Context.....	11
3.1.3 STEM Educational Context.....	12
3.2 First2 Network Structures and Processes	14
3.2.1 Participants	14
3.2.2 Improvement Science Activities	15
3.2.3 Network Partnerships.....	19
3.2.4 Steering Committee Survey	21
3.2.5 Steering Committee Focus Group.....	31
3.2.6 Institutional Team Survey	36
3.2.7 Institutional Team Group Interviews.....	50
3.2.8 Conference Feedback Forms.....	65
3.3 Systems Targeted by the First2 Network.....	72
3.3.1 Increased Pathway Capacity	72
3.3.2 Increased Pathway Connections.....	74
3.3.3 Network Value Survey	77
3.4 Impact of the First2 Network.....	79
3.4.1 Social Network Analysis.....	79
3.4.2 Follow-Up Intern Survey	84
3.4.3 Student Focus Groups	92
3.4.4 Student Outcomes	109
4 Conclusions and Recommendations	115
4.1 Conclusions.....	115
4.1.1 First2 Network Structures and Processes.....	115
4.1.2 Systems Targeted by the First2 Network	117
4.1.3 Impact of the First2 Network	117
4.2 Recommendations	119
5 Notes.....	121

List of Tables

Table 1. First2 Network Member Institutional Roles.....	14
Table 2. Institutions With PDSAs Underway or Completed for 2022–2023 and 2023–2024.....	16
Table 3. Change Ideas on PDSAs Underway or Completed for 2022–2023 and 2023–2024.....	17
Table 4. Institutions With PDSAs Planned for 2024–2025.....	18
Table 5. Change Ideas on PDSAs Planned for 2024–2025.....	18
Table 6. First2 Network Partnerships (Current and Former).....	20
Table 7. Steering Committee Progress Item Descriptive Statistics From the Steering Committee Survey Years 1–6.....	22
Table 8. Steering Committee Role Item Descriptive Statistics From the Steering Committee Survey Across Years 1–6.....	27
Table 9. Response Count for the Institutional Team Survey.....	36
Table 10. Descriptive Statistics and Response Option Percentages for First2 Network Items About the First2 Network.....	37
Table 11. Descriptive Statistics and Response Option Percentages for First2 Network Items About Their Institutional Teams.....	39
Table 12. Descriptive Statistics and Response Rates for PDSA Items by Member Type	42
Table 13. Session Participation Rates for the May 2024 Conference	69
Table 14. SNA Survey Respondent Organizational Affiliation	79
Table 15. Network Members Identified as Collaborators in the First2 Network.....	80
Table 16. Responses Rates by Year for the Follow-Up Intern Survey	84
Table 17. Colleges Attended (or Most Recently Attended) From the Follow-Up Intern Survey	85
Table 18. Pre/Post/Follow-Up Subscale Scores From the Intern Survey	86
Table 19. Pre/Post Matched Pairs Subscale Results for the Intern Survey.....	87
Table 20. Post/Follow-Up Matched Pairs Subscale Results for the Intern Survey	87
Table 21. Pre/Follow-Up Matched Pairs Subscale Results for the Intern Survey.....	87
Table 22. Response Option Percentages and Descriptive Statistics for Items Related to Their Summer Immersive Research Experience From the Follow-Up Intern Survey	88
Table 23. Job/Career Expectations in 5–10 Years From the Follow-Up Intern Survey	89
Table 24. How Respondents Remained Involved in the First2 Network From the Follow-Up Intern Survey	89
Table 25. STEM Persistence and Graduation Rates by Cohort for First2 Network Freshmen With Tracking Consent.....	109
Table 26. STEM Persistence and Graduation Rates by Cohort for First2 Network Sophomores and Higher With Tracking Consent.....	110

List of Figures

Figure 1. PDSA Submission Process	15
Figure 2. Steering Committee Progress Item Mean Scores Across Years 1–6	23
Figure 3. Steering Committee Progress Item Response Percentages From the Year 6 Steering Committee Survey (June 2024)	24
Figure 4. Steering Committee Role Item Mean Scores From the Steering Committee Survey Across Years 1–6	29
Figure 5. Steering Committee Role Item Response Percentages From the Year 6 Steering Committee Survey (June 2024)	30
Figure 6. Mean Score by Years 2023 and 2024 for First2 Network Items About Their Institutional Teams	38
Figure 7. Mean Scores by Students, Non-Students, and All Respondents Status	41
Figure 8. PDSA Mean Scores by Students, Non-Students, and All Respondents Status	45
Figure 9. Mean Scores by Participant Type for PDSA Items From the Institutional Team Survey	46
Figure 10. Mean Scores by Year 2023 and 2024 for PDSA Items From the Institutional Team Survey	48
Figure 11. Overall Mean Scores by Year for PDSA Scales From the Institutional Team Survey	49
Figure 12. First2 Network Item Mean Scores for the November 2023 Conference	65
Figure 13. Conference Item Mean Scores for the November 2023 Conference	66
Figure 14. Session-Specific Item Mean Scores for the November 2023 Conference	67
Figure 15. First2 Network Item Mean Scores for the May 2024 Conference	68
Figure 16. Conference Item Mean Scores for the May 2024 Conference	70
Figure 17. Overall Mean Scores From the Network Value Survey Identified by Year	78
Figure 18. Levels of Collaboration by Individuals Identified	80
Figure 19. Levels of Collaboration by Individuals Identified by Year	81
Figure 20. SNA Map of Connections to the First2 Network by Year for All Respondents	82
Figure 21. SNA Map of Connections to the First2 Network by Year for Student Respondents	83
Figure 22. Pre/Post/Follow-Up Mean Subscale Scores From the Intern Survey	86
Figure 23. One-Word Descriptions of the First2 Network Experience	92
Figure 24. Summary of Respondent Demographics	93
Figure 25. STEM Readiness Rate (Percentage) by Freshmen Cohorts: Rurality by Major	111
Figure 26. STEM Readiness Rate (Percentage) by Freshmen Cohorts: Rurality by STEM Major by Pell	111
Figure 27. Fall-to-Fall Retention Rate (Percentage) by Freshmen Cohorts: Rurality by Major	112
Figure 28. Fall-to-Fall Retention Rate (Percentage) by Freshmen Cohorts: Rurality by STEM Major by Pell	112
Figure 29. Four-Year Graduation Rate (Percentage) by Freshmen Cohorts: Rurality by Major	113
Figure 30. Four-Year Graduation Rate (Percentage) by Freshmen Cohorts: Rurality by STEM Major by Pell	113

1 Executive Summary

From its funding in 2016, the First2 Network has served as a valuable West Virginia alliance to improve the early persistence of rural, first-generation science, technology, engineering, and mathematics (STEM) students in their programs of study. The network was established to help address a troubling problem identified by research, namely that attrition from STEM majors is most likely to occur during students' first 2 years of college. Research also suggested that first-generation students—students whose parents did not attend college—majoring in STEM disciplines face considerable obstacles to their college success. Given that 70 percent of adults in the State do not have a postsecondary degree, many West Virginia STEM students matriculating to college are likely to be the first in their family to attend.

Supported by a National Science Foundation (NSF) grant from the program Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (INCLUDES), the First2 Network engages a wide range of State STEM stakeholders in *improvement science* activities such as developing driver diagrams to conceptualize how to address dimensions of the problem at hand, and Plan-Do-Study-Act (PDSA) cycles to test ways to improve STEM persistence. The INCLUDES program supports projects that improve access to STEM education and career pathways, particularly for groups that are underrepresented in STEM.

1.1 Context in Which the First2 Network Operates

Much about the context in which the First2 Network operates remains consistent since its launch. West Virginia continues to be poorer, less diverse, and less educated than the Nation in general. West Virginia is still designated as an Established Program to Stimulate Competitive Research (EPSCoR) State, which is one indicator of limited STEM capacity. Despite these challenges, new efforts to improve and support STEM education have emerged since the grant's inception. Policymakers passed several STEM education bills during the 2022 legislative session, and a bill approved in 2023 will expand dual enrollment programs for high school students to earn college credit, which is a move that may affect the STEM pipeline in future years.

1.2 First2 Network Structures and Processes

The First2 Network has grown substantially since its beginning—from 144 members in Year 1 to 1,156 by Year 6, which is an increase of more than 700 percent. Membership increased steadily through the period, increasing by 33 percent during the past 2 years. Of particular importance is that the number of participating students rose steadily through Year 5.

Similarly, the Plan, Do, Study, Act (PDSA) process showed impressive growth across the 6-year period. In Years 1–4, the network launched 141 PDAs, a period when such activities were led by specific working groups. An audit and quality review then identified strategies for improvement, including a shift to institutional team-led efforts in Year 5 with an increased focus on shared measures, metrics, goals, and key strategies. Within this new context, 24 of 34 PDAs (71 percent) carried out in school year (SY) 2022–2023 were completed, as were 25 of 47

PDSAs (53 percent) in SY 2023–2024. Looking ahead, network members are planning for 54 PDSAs in SY 2024–2025.

Partnerships also experienced significant growth. From an initial set of 12 partners, this number grew to 76 by Year 6. The Year 6 total included 20 higher education partners and 56 other partners, including STEM entities, industry, and educational organizations.

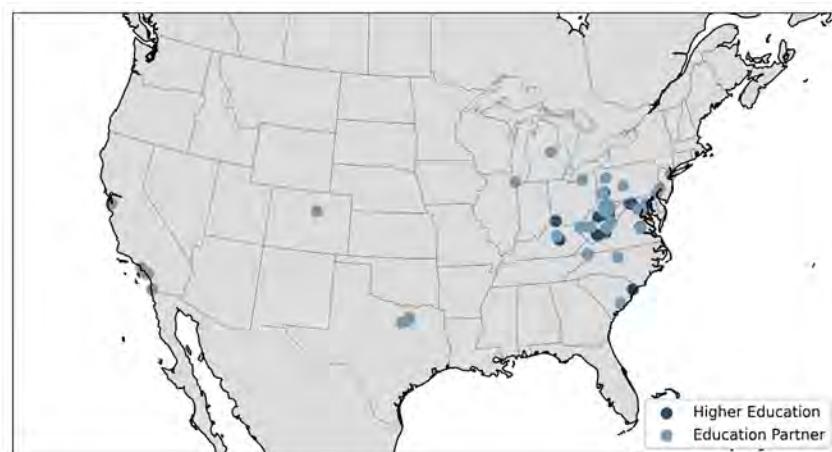
The network also enhanced its pathway capacity and connections over this period. To build capacity, the network retained two new backbone positions in Year 6—a new First2 program coordinator to lead communications and develop relationships among stakeholders and serve as a mentor to emerging backbone leaders, and a communications coordinator to work with a communications team to grow the network. Network members also conducted onboarding sessions for more than 125 institutional team members to familiarize them with the organizational structure and network practices. To facilitate connections, members developed publications and made presentations to regional and national groups. Members also had articles accepted for publication in a variety of journals, giving network activities added visibility nationally.

Interviews and surveys with Steering Committee members and institutional team members showed progress in many areas. Steering Committee members agreed that they have made progress on key activities and goals, while institutional team members had positive perceptions of the support delivered to students and the effectiveness of their teams.

1.3 Systems Targeted by the First2 Network

The First2 Network aims to change the systems that influence STEM persistence. Members of the First2 Network undertook an array of efforts to improve the systems that can enable or constrain the early STEM persistence of rural, first-generation students in West Virginia. During Year 6, these included increased pathway efforts, sustainability of the institutional teams to coordinate student tracking and support, and growing into a coordinated network comprised of twenty named Institutions of Higher Education (IHE) and twice as many higher education partners both within West Virginia and surrounding regions (see map below).

The network also enhanced its pathway capacity and connections over this period. In Year 6, the First2 Network established standard procedures and timelines for synthesizing and reporting what is learned from PDSAs and it has led to greater visibility and movement towards sustainability of the network.



Steering Committee members reported that they valued the Deep Dives and agreed they have

made progress on key activities and goals, while institutional team members had positive perceptions of the support delivered to students and the effectiveness of their teams.

1.4 Impact of the First2 Network

Compared to the project's beginning years of operation, the First2 Network has increased its members, increased buy-in across the State, and developed stronger in- and across-network collaboration, all indicating growth in the STEM social capital of members. The overall STEM fall-to-fall persistence rate among First2 Network first-time freshmen who provided consent for tracking is 70% (50 of 71 students) for the 2021, 2022, and 2023 cohorts. This rate is lower than the overall statewide persistence rates for rural STEM and non-rural STEM youth for the 2021 and 2022 cohorts, which range between 82%–85%. Because State institutions do not consistently collect or report data about students' first-generation status the evaluation team employs a proxy group to create a rough estimate of STEM outcomes for rural, first-generation STEM students—rural, Pell-eligible students, an imperfect proxy, given that not all Pell-eligible students are first-generation college students and not all first-generation students qualify for Pell grants.

The overall STEM graduation rate among First2 Network freshmen who provided consent for tracking is 61% (17 of 28 students) for the 2018, 2019, and 2020 cohorts. This rate is higher than the overall statewide graduation rates for rural STEM and non-rural STEM youth for the 2018 cohort (latest data available), which range between 25%–29%. In sum, rurality and Pell-eligibility appear to be associated with lower levels of readiness to undertake college-level STEM coursework and with lower levels of persistence in STEM majors, but completion rates are promising.

2 Introduction

First funded in 2016, the First2 Network is a West Virginia alliance seeking to improve the early persistence of rural, first-generation science, technology, engineering, and mathematics (STEM) students in their programs of study. The First2 Network was established as a means by which to address a troubling problem identified by research, namely that attrition from STEM majors is most likely to occur during students' first 2 years of college.¹ Research also suggested that first-generation students—whose parents did not attend college—majoring in STEM disciplines face considerable obstacles to their college success.² Accurate estimates of how many West Virginia students could be characterized as first generation are difficult to obtain. However, given that fully 70 percent of adults in the State do not have a postsecondary degree, many West Virginia STEM students matriculating to college are likely to be the first in their family to attend.

ICF serves as the external evaluator for the First2 Network. The evaluation employs a longitudinal, multimethod design to understand the project from various stakeholder perspectives and via an array of data collection and analysis techniques. This final report summarizes evaluation findings from the project's sixth year and looks at trends and results across years. For more complete details about the evaluation design and methods, see Appendix A. For copies of data collection instruments, see Appendix B.

2.1 Overview of the First2 Network

The First2 Network is supported by a 5-year National Science Foundation (NSF) grant from the program Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (INCLUDES).

The INCLUDES program supports projects that improve access to STEM education and career pathways, particularly for groups underrepresented in STEM. The network was one of the first 37 such projects, which were 2-year design and development launch pilots (DDLPs) to develop prototypes for new models that broaden STEM participation.

In 2018, following completion of the 2-year DDLPs, the First2 Network was awarded one of five grants to expand pilot projects into alliances. Alliances are collective impact projects bringing together programs, people, organizations, technologies, and institutions to achieve results at scale, providing new research and leveraging NSF's broadening participation investments. In its role as an INCLUDES-funded alliance, the First2 Network facilitates collaboration among university STEM faculty, rural first-generation STEM undergraduates, National Laboratories STEM professionals, State department of education staff, informal STEM educators, and industry representatives, among others, to study and address the problem of undergraduate attrition in STEM majors that occurs during the first 2 years of college.

First2 Network Lead Organizations

The following organizations were awarded NSF INCLUDES collaborative grants to broaden the participation of underrepresented groups in STEM by improving persistence rates among rural, first-generation college students in STEM programs of study:

- Green Bank Observatory
- Fairmont State University
- West Virginia University
- High Rocks Educational Corporation
- West Virginia Higher Education Policy Commission

To achieve its aim, and in addition to pursuing a collective impact approach, the First2 Network employs improvement science tools and processes, such as developing driver diagrams to conceptualize how to address the dimensions of the problem at hand, and Plan, Do, Study, Act (PDSA) cycles to test improvements. Another hallmark of the First2 Network is its adherence to the principle that students—those with the lived experience of barriers to STEM persistence—should inform the search for ways to improve STEM persistence. Given this commitment, network students serve in leadership roles (e.g., Steering Committee members, institutional team members, campus club leaders, mentors, directors, co-chairs), participate as full peers in PDSA working groups, and conduct outreach to STEM-interested students at their former high schools and to State legislators. In addition, students have opportunities to participate in authentic STEM research experiences for the purposes of building students' STEM knowledge and skill and enabling students to experience the practice of STEM.

Based in West Virginia, this project reflects increasing State needs for STEM workers and increasing concern that the often rural and first-generation college students in the State may struggle to complete their programs of study. Key First2 Network activities include the following:

- Facilitating institutional teams to iterate and study improvements to practices and programs using improvement science processes and tools (current topics include STEM summer immersive research experiences, faculty–student engagement, and college transition, among others).
- Facilitating additional, sometimes ad hoc, teams or committees to address important emerging issues (such as the ongoing Measurement Team).
- Integrating students into First2 Network leadership and facilitating a student leadership group in which students test improvement strategies.
- Conducting early STEM experiences for rural, first-generation STEM students via summer research internships while simultaneously subjecting such internships to PDAs to continuously improve them.
- Operating a support network, including campus clubs, for students.
- Facilitating a STEM ambassadors program component to prepare students to return to their home communities to engage younger students' interest in STEM and to harness teachers' and school board members' support for STEM education, and to engage with legislators and other State education leaders about the network's vision and efforts.

To implement these activities in the context of collective impact, the First2 Network provides several leadership and management structures:

- **Leadership Team:** This team consists of principal investigators and representatives from the five lead institutions—Green Bank Observatory, Fairmont State University, West Virginia University (WVU), High Rocks Educational Corporation, and the West Virginia Higher Education Policy Commission (HEPC) Division of Science and Research (DSR)—as well as key subcontractors, such as SRI International.
- **Steering Committee:** This committee includes leadership team members, institutional team representatives, and students in First2 Network leadership roles.

3 Findings

This section summarizes analyses of data collected during Year 6 of the First2 Network and provides summary analysis across Years 1–6. Data sources include surveys (Steering Committee survey, institutional team survey, Social Network Analysis [SNA] survey, and intern follow-up survey); interviews (Steering Committee, institutional teams, and students); conference feedback forms; extant network data (membership and PDSA trackers); document review of network artifacts; and student outcome data (statewide and network-specific).

3.1 First2 Network Context

3.1.1 Socioeconomic, Political, and Historical Context

The only State falling entirely within the federally designated Appalachian region, West Virginia is among the poorest States in the region based on U.S. Census Bureau data on poverty and median income.³ Eighteen (33 percent) of the State's 55 counties are considered *distressed*, with high unemployment, low per capita income, and high poverty rates; 12 (22 percent) are at risk of economic distress; and 24 (44 percent) are *transitioning* between strong and weak economies. Only one county ranks among the best 10 percent to 25 percent of the Nation's counties and is considered *competitive*, or having a high likelihood of competing in the national economy.⁴ Average per capita income in 2022 was \$31,462,⁵ which is below the national average of \$41,261,⁶ with 17.9 percent of the State population falling below the Federal poverty line.⁷ More than 20 percent of the State's children under age 18 live in poverty and 14 percent of households are food insecure.⁸ At the same time, while 88 percent of West Virginia residents 25 years of age and older are high school graduates,⁹ in 2021, only 23 percent had a bachelor's degree and 69 percent lacked a postsecondary credential.¹⁰ In the school year 2022–2023, slightly more than half (52 percent) of public school students qualified for free/reduced-priced school meals.¹¹

While a variety of issues contribute to the State's social and economic woes, many can generally be characterized as resulting from a "resource curse." Appalachia's resource curse means that the region is rich in natural resources; however, its people are, ironically, poorer, on average, than those in less resource-rich areas.¹² Factors contributing to this circumstance include industry manipulation of State policy and legislation to protect the interests of natural resource extraction (e.g., coal, timber), economic instability arising from cycles of economic boom and bust, low tax bases stemming from deals that limit corporate taxes, and the export of profits to the often out-of-State owners of industry.¹³

The State is racially/ethnically homogenous compared with other States. With a 93 percent white population,¹⁴ only 4 percent of the population is Black, and 2 percent is Hispanic. In addition, the overall population in the State decreased by 3 percent from 2010 to 2020, with another 1 percent loss from 2020 to 2023.¹⁵ Of its 251,224 K–12 public school students,¹⁶ 89 percent are white, 4 percent are Black, and 2 percent are Hispanic; 1 percent are English language learners; and 22 percent are students with disabilities. More than half (55 percent) of the State population live in rural areas¹⁷ and 21 percent of rural school-age children live in poverty.¹⁸ Overall, half (50 percent) of the State's schools are located in rural communities.

3.1.2 Educational Context

State trends in K–12 and postsecondary education provide a mixed picture of student achievement. Based on the West Virginia General Summative Assessment, reading, math, and science performance increased slightly among students in 2023–2024 compared with the previous year. Forty-five percent of students showed proficiency in reading, while the rates for math and science were lower at 36 percent and 29 percent, respectively.¹⁹ Despite small increases during the past 3 years, the rates are slightly below the 2018–2019 levels prior to the COVID-19 pandemic. For Grade 4, 48 percent of students were proficient in math and 47 percent attained proficiency in reading. In Grade 8, 41 percent reached proficiency in reading, while 29 percent and 26 percent achieved that same level in math and science, respectively. For Grade 11 students, half (51 percent) were proficient in reading, yet only 28 percent were proficient in science and 18 percent were proficient in math.

The West Virginia National Assessment of Educational Progress results show moderate declines from 2019 to 2022, with COVID-related learning loss among the likely factors. The share of students at or above proficiency in Grade 4 math declined from 30 percent to 23 percent, while reading proficiency decreased from 30 percent to 22 percent. For Grade 8, math proficiency dropped from 24 percent to 15 percent, while reading fell from 25 percent to 22 percent. In both reading and math, a large gap between West Virginia's performance and that of the Nation overall has remained relatively stable over time.²⁰

The State shows some growth in its efforts to ensure college and career readiness, however. For example, it offers multiple ways for students to earn postsecondary credit, and public postsecondary institutions are required to accept credits.²¹ From 2009 to 2020, the number of students taking Advanced Placement tests increased 27 percent and a higher percentage of tests had scores of 3 or higher. Graduation rates for 4-year high school students have improved over time (89 percent in 2016–2017 to 93 percent in 2022–2023), while the rate of white and African American 4-year high school students graduating on time increased (90 percent and 86 percent, respectively, in 2017–2018, and 93 percent and 90 percent, respectively, in 2022–2023).²² The average American College Testing (ACT) score of 2023 West Virginia high school graduates was 20.3, similar to scores in prior years.²³

The 2021 high school dropout rate for West Virginia was slightly below the national average (5 percent versus 5.2 percent),²⁴ and college-going rates dipped below 50 percent during the COVID-19 pandemic in 2020 and have remained there since, with the most recent rates of 47 percent for both 2022 and 2023.²⁵

West Virginia's postsecondary students are served by 12 public 4-year institutions,²⁶ nine public community and technical colleges,²⁷ and six independent 4-year colleges.²⁸ In the 16-State Southern Regional Education Board (SREB) region, West Virginia is in last place among SREB States in overall first-year persistence, with a rate of 77 percent for 2019.²⁹

However, action taken by the Governor and the State legislature in 2023 is expected to produce a substantial increase in high school students taking dual enrollment courses for college credit. Under House Bill 2005, the State will cover the cost of such courses tied to some of the State's most in-demand careers. While the former system mainly served students who expected to go to college, the LevelUpWV program is targeting students with specific workforce interests who may

not have thought about college. Community and technical colleges and 4-year institutions will offer courses in designated career pathways such as healthcare, information technology, advanced manufacturing, construction, engineering, education, agriculture, and others that meet a workforce need as determined by the West Virginia Department of Commerce.³⁰

3.1.3 STEM Educational Context

West Virginia high school students indicate higher levels of interest in STEM than students nationally, according to a 2019 report by ACT—60 percent versus 43 percent.³¹ However, just 14 percent of test takers that year achieved the STEM Benchmark (a derived score combining mathematics and science scores and correlated with success in STEM courses commonly taken by STEM students). More recent data from 2021 indicated that only 32 percent of test takers achieved the Mathematics Benchmark and only 36 percent achieved the Science Benchmark.³²

Policymakers, education leaders, and advocates have sought to improve STEM education across the State in various ways. The West Virginia Department of Education has implemented a comprehensive statewide approach to improving science, technology, engineering, arts, and math (STEAM) education (STEAM-Minded WV), and advocacy organizations, such as West Virginia Forward, the Education Alliance, and the West Virginia Public Education Collaborative, have designed initiatives to promote STEM. In addition, young people have access to various STEM enrichment opportunities, including STEM summer camps at State institutions of higher education, the Governor’s STEM Institute, and programs sponsored by the National Aeronautics and Space Administration (NASA) and Green Bank Observatory.

West Virginia is designated as eligible for the Established Program to Stimulate Competitive Research (EPSCoR)—that is, the State is one in which NSF has determined the need for special investment because it has received less than or equal to 0.75 percent of NSF research funding. EPSCoR eligibility is one indicator of limited STEM capacity, a circumstance that EPSCoR funding seeks to ameliorate. Under EPSCoR, NSF awarded more than \$2 million to the State’s higher education institutions in 2022.³³

Several additional efforts are underway to improve STEM education. The Education Alliance promotes collaboration with industry and business partners to enhance student STEM skills and STEM career readiness; in 2024, it created a STEM Toolkit to promote innovative learning. NSF also awarded a grant to a founding member of the First2 Network to operate the Mountaineer Mathematics Master Teachers program, which is a network of math teachers representing 30 counties that collaborate to engage in the continuous improvement of math teaching and learning.³⁴ The West Virginia Alliance for STEM and the Arts, created in 2019, also sponsors educational programs, including virtual field trips and career pathways. Since 2018, a partnership between the WVU Center for Excellence in STEM Education and the West Virginia Department of Education has provided professional development and other supports for computer science instruction. As a result, by 2021, 76 percent of West Virginia’s public high schools offered at least one computer science course, up from 46 percent in 2018–2019.³⁵ In addition, 52 of 57 school districts participate in CodeWV for All, with leadership from the WVU Center for Excellence in STEM Education.³⁶

Nationally, despite the rapid growth of enrollment in STEM disciplines in recent years, the number of students graduating with a STEM degree has remained relatively stagnant due to diminishing student retention rates. While these results indicate the success of elementary and secondary education in cultivating interest in STEM fields, more attention is needed to better understand retention rates at the postsecondary level. Improving STEM retention nationally and in West Virginia is crucial to ensuring a stable STEM pipeline and guaranteeing underrepresented young people's fair access to STEM educational opportunities.

3.2 First2 Network Structures and Processes

3.2.1 Participants

As of August 12, 2024, the First2 Network included 1,156 members (see table 1), an increase of 702 percent from 144 in Year 1, a 33 percent increase from the 866 members reported in August 2022, and a 15 percent increase from the 1,002 members reported in August 2023. The largest identified role group was college/university faculty at 15 percent. Other identified role groups ranged from 3 percent to less than 1 percent. Of the 404 identified members, 175 (43 percent) of those were college/university faculty and 131 (32 percent) were students (K–12, undergraduate, and graduate). The organization type with which approximately 65 percent of First2 Network members are affiliated is unknown.

Table 1. First2 Network Member Institutional Roles

Role	Number	Percent
Unknown	752	65.05%
College/University Faculty	175	15.14%
University/College Undergraduate Student	108	9.34%
K–12 Faculty or Staff	31	2.68%
Nonprofit	19	1.64%
Government Agency or State Education Agency	18	1.56%
Industry/Private Company	17	1.47%
K–12 Student	15	1.30%
University/College Graduate Student	8	0.69%
National Laboratory	6	0.52%
Backbone Mentor	4	0.35%
Foundation	2	0.17%
Independent Consultant	1	0.09%
TOTAL	1,156	100%

Network Participant Summary

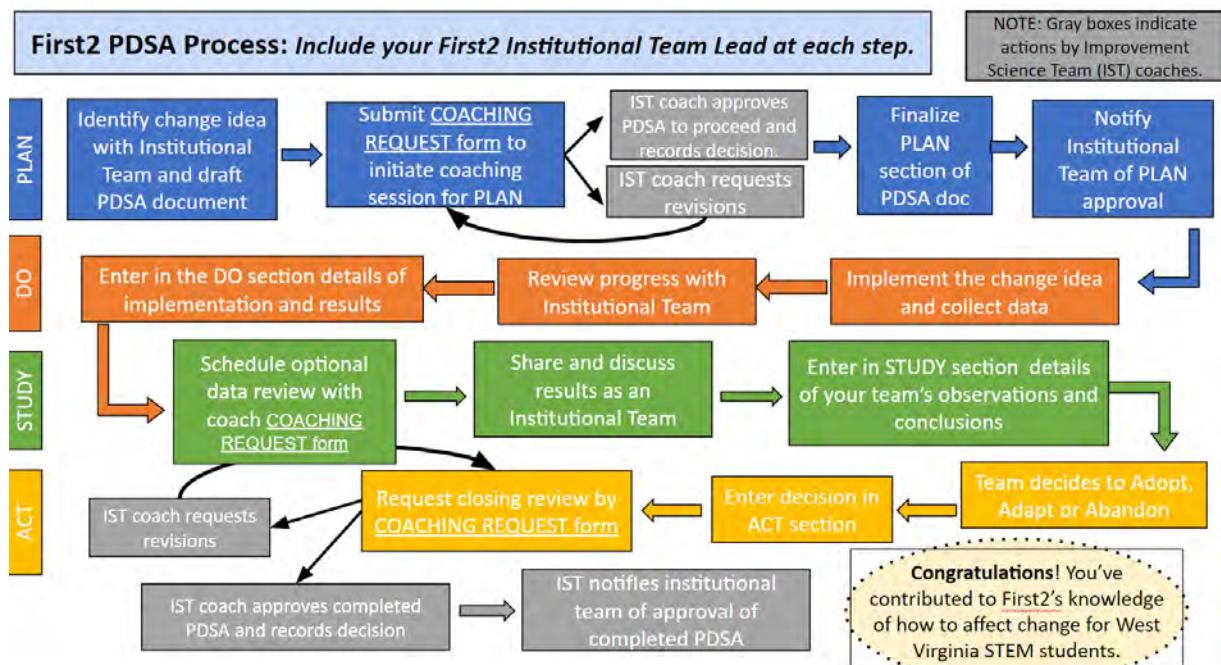
Membership in the First2 Network has increased substantially since Year 1. Students and college/university faculty continue to be well-represented.

3.2.2 Improvement Science Activities

In 2023, the backbone organization began quality assurance efforts on all PDSA work conducted on behalf of the network and, as a result, set a foundation for more clarity on shared measures, metrics, and goals that can support data sharing across the network. This provided support for the transitioning from working group-led improvement science activity to institutional team-led activity where members align their institutional change ideas with First2 Network's grant aims using PDSA cycles to investigate whether new or modified practices improve the outcomes in question. For example, PDSAs with campus clubs connect with the primary First2 Network driver—STEM students are meaningfully connected with faculty, staff, and peers in ways that promote belonging (fit), wellness, resilience, and financial stability. A few other topics, aside from campus clubs, included student leadership, student voice, mentoring, academic support, and student-faculty interaction.

Year 5 First2 Network activities continued with institutional team-led improvement science activities through an implementation process focused on key PDSA strategies (see figure 1), developed in collaboration with a full-time data liaison who is also supported by the backbone and backbone mentor. This new system focused on coordinated efforts across members within the same institutions. As stated in their written guidelines, "Institutional teams should have a discussion on the change idea they want to pursue and what resources are available to complete this idea." Additionally, coach support is available to foster a collaborative institutional team-generated idea, which improves and standardizes PDSA metrics and, ultimately, aligns with the First2 driver diagram to affect student-level change.

Figure 1. PDSA Submission Process (as provided by F2N)



Based on a review of the First2 Network PDSA Tracker on August 8, 2024, there was a total of 35 PDAs intended for school year (SY) 2022–2023 and 49 for SY 2023–2024. However, for SY 2022–2023, one PDA had been committed in the proposal but did not move forward. For SY 2023–2024, two PDAs had been committed in the proposal but did not move forward. For the remaining 34 SY 2022–2023 and 47 SY 2023–2024 PDAs, the results are summarized below.

According to coaching updates in the PDA data tracker, 24 of 34 PDAs carried out in SY 2022–2023 were completed and 25 of the 47 PDAs carried out in SY 2023–2024 were completed. The remaining PDAs are still underway (i.e., PDA revisions are needed, PDA is being implemented, and/or status updates need to be added to the tracker). Details about the institutions and change ideas for the PDAs underway or completed for both school years are provided in tables 2 and 3, respectively.

Table 2. Institutions With PDAs Underway or Completed for 2022–2023 and 2023–2024

Institutions	School Year 2022–2023				School Year 2023–2024			
	Underway		Completed		Underway		Completed	
	Number	Percent*	Number	Percent*	Number	Percent*	Number	Percent*
Blue Ridge	0	–	5	21%	7	32%	0	–
Fairmont	1	10%	4	17%	3	14%	5	20%
Glenville	0	–	1	4%	2	9%	3	12%
High Rocks	0	–	0	–	1	5%	1	4%
Marshall	3	30%	1	4%	0	–	7	28%
Shepherd	0	–	0	–	2	9%	0	–
U of Charleston	2	20%	2	8%	3	14%	3	12%
WVU	2	20%	7	29%	1	5%	6	24%
WVU Tech	2	20%	4	17%	3	14%	0	–
TOTAL	10	100%	24	100%	22	100%	25	100%

* Percentages may not equal 100 percent due to rounding.

In addition, based on institutional proposals for supplemental grants awarded to network institutions for the 2024–2025 school year, there are a total of 54 PDAs intended for 2024–2025. Of these, two have begun moving forward—one has had the initial PDA plan approved and one has initial coaching scheduled. See tables 4 and 5 for more details on these planned PDAs.

Table 3. Change Ideas on PDSAs Underway or Completed for 2022–2023 and 2023–2024

Change Ideas	School Year 2022–2023		School Year 2023–2024	
	Number	Percent*	Number	Percent*
Ambassadors	6	18%	1	2%
Bingo Night	1	3%	0	–
Biweekly Listserv	1	3%	1	2%
Campus Book Club	1	3%	0	–
Campus Clubs	6	18%	10	21%
Campus Resources	0	–	2	4%
Course Policies/Procedures	1	3%	0	–
Course Policies to Promote Academic Success	0	–	1	2%
CS Boot Camp	0	–	2	4%
Department Retreat	0	–	1	2%
Discord	1	3%	0	–
Embedded Students	1	3%	1	2%
Enhance Student Voice	0	–	1	2%
Escape Room	1	3%	0	–
Faculty Mentors	0	–	1	2%
Faculty-to-Student Communications	0	–	1	2%
Falcon Fresh Start	1	3%	0	–
Hyflex	0	–	1	2%
Math Anxiety	1	3%	1	2%
Math Boot Camp	1	3%	1	2%
Mentor Training	1	3%	0	–
Peer Mentoring Across Campuses	0	–	1	2%
Sci Tech Social	0	–	1	2%
Semester Research Immersion	0	–	1	2%
Social Interactions	1	3%	2	4%
STEM Capstone Social	0	–	1	2%
STEM Student Success Center	0	–	1	2%
STEM Study Week	0	–	1	2%
Student-Faculty Interaction	3	9%	8	17%
Student Leadership	0	–	2	4%
Study Habits	1	3%	0	–
Summer Immersion	6	18%	4	9%
TOTAL	34	100%	47	100%

* Percentages may not equal 100% due to rounding.

Table 4. Institutions With PDSAs Planned for 2024–2025

Institutions	School Year 2024–2025	
	Number	Percent*
Blue Ridge	10	19%
Eastern Kentucky	1	2%
Fairmont	7	13%
Glenville	6	11%
Marshall	6	11%
Shepherd	6	11%
U of Charleston	6	11%
WVU	6	11%
WVU Tech	6	11%
TOTAL	54	100%

* Percentages may not equal 100 percent due to rounding.

Table 5. Change Ideas on PDSAs Planned for 2024–2025

Change Ideas	School Year 2024–2025	
	Number	Percent*
Academic Support	6	11%
Campus Clubs	7	13%
Embedded Students	2	4%
Math Anxiety	1	2%
Math Boot Camp	1	2%
Student–Faculty Interaction	15	28%
Student Leadership	7	13%
Student Resources	8	15%
Summer Immersion	5	9%
Other	2	4%
TOTAL	54	100%

* Percentages may not equal 100 percent due to rounding.

Improvement Science Activities Summary

In sum, the network's transition to institutional team-led activities was supported by increased clarity on shared measures, metrics and goals, and a focus on key PDSA strategies. During Year 5, change ideas were aligned with the aims of the First2 Network grant and institutional team members used PDSA cycles to investigate whether new or modified practices improved outcomes, with support from a full-time data liaison and the backbone. Twenty-four of 34 PDSAs (71 percent) carried out in SY 2022–2023 were completed, 25 of 47 PDSAs (53 percent) carried out in SY 2023–2024 were completed, and there are 54 PDSAs intended for SY 2024–2025.

3.2.3 Network Partnerships

Partnerships provide a “platform for collaborative action”³⁷ and underwrite the power afforded by collective action. A review of First2 Network documents—including quarterly reports to NSF, Steering Committee meeting minutes, a file of partnerships, and other project data—indicates that the network continued to expand and formalize its relationships with other entities.

The First2 Network has established relationships with 14 higher education institutions across West Virginia and is expanding into Kentucky, Pennsylvania, and Virginia. The network also maintains partnerships with STEM entities in the State, as well as industry and other education partners. In addition, the First2 Network mentors a new coalition in the State—the West Virginia Jobs Network—funded by the Appalachian Regional Commission to build a “power skills” workplace competencies curriculum and training program with certification, and then connect workers with jobs. Additionally, at the time of this report, First2 Network leadership is partnering with institutions and organizations in Kentucky to support their pursuit of expansion of First2 efforts in their State, through the submission and support of a Connector grant. See table 6 for a list of all current and former partners with whom the First2 Network has established relationships.

Network Partnership Summary

In sum, the network continues to establish, maintain, and expand partnerships within the State and now beyond. These collaborations with current and former partners have included 20 institutions of higher education and 56 STEM entities, industry, or other education partners, as well as mentorship of a new statewide coalition.

Table 6. First2 Network Partnerships (Current and Former)

Institutions of Higher Education	
Blue Ridge Community and Technical College	Shepherd University
STEM Entities, Industry, and Other Education Partners	
Coastal Carolina University	University of Charleston
Davis & Elkins College	University of Pittsburgh
Eastern Kentucky University	West Virginia School of Osteopathic Medicine
Fairmont State University	West Virginia State University
Glenville State University	West Virginia University (WVU)
Marshall University	West Virginia Wesleyan College
New River Community and Technical College	WVU Center for STEM Excellence
Northern Kentucky University	WVU Entrepreneurship
Randolph Macon College	WVU Institute of Technology
STEM Entities, Industry, and Other Education Partners	
4H	MATRIC (acquired by AVN in January 2023)
Appalachia Regional Educational Laboratory	Mountain Leverage
Appalachian Promise Alliance	National Aeronautics and Space Administration's Electronics Research Center
ASCEND WV	National Energy Technology Laboratory
Barbour County Economic Dev. Authority	National Research Mentor Network
Boy Scouts	Northern WV American Chemical Society
Carnegie Foundation	Preston County Economic Development Authority
Chemical Alliance Zone	Research Apprenticeship Program
Chemours	Science Gateways Community Institute
Coalfield Development	Solvay
Covestro	SRI International
Dow Chemical	Statler
Early STEM Engagement for Minority Males through a Network of Minority Serving Institutions (NSF INCLUDES Design and Development Launch Pilot)	STEM Learning Ecosystems Community of Practice/STEM Funders Network
Education Alliance	STEMconnector
Espinosa	Stockmeier Urethanes
Established Program to Stimulate Competitive Research (NSF)	TechConnect
First Ascent	Tiger Woods Foundation
Generation West Virginia	Toyota
GlobalMindED Inclusive Success Network	Urban Resources Development Corporation
Governor's STEM Council	West Virginia Academy of Science
Green Analytics	West Virginia Department of Education
Green Bank Observatory	West Virginia Geological and Economic Survey
High Rocks	West Virginia Higher Education Policy Commission's Division of Science and Research
Health Sciences and Technology Academy	West Virginia Jobs Network
InspectionGo Academy	West Virginia Network for Educational Telecomputing
Kanawha Valley American Chemical Society	West Virginia Space Grant Consortium
KY-WV Louis Stokes Alliance for Minority Participation	West Virginia Water Research Institute
Leidos	WV Institutional Development Award (IDeA) Network of Biomedical Research Excellence

3.2.4 Steering Committee Survey

The evaluation team administered a comprehensive Steering Committee survey in March 2019, March 2020, April 2021, March 2022, February 2023, and June 2024. The survey was revised in 2023 to align with the network's focus on institutional teams for Years 5 and 6, whereas in Years 1–4, the network focused on working groups. Therefore, some survey items are not comparable across all years.

The updated version of the survey asked members to rate the status of the Steering Committee through 10 statements about Steering Committee progress and 14 items about their involvement as Steering Committee members, as well as two open-ended items to solicit feedback about the 24 items and/or their ratings and, for 2024, an open-ended item about envisioning success for the future.

A total of 16 Steering Committee members responded to the online survey in June 2024. However, three submissions were blank and therefore were excluded from the analysis. Of the remaining 13 respondents, 85 percent joined the Steering Committee more than a year ago and 15 percent joined within the past 6 months.

Steering Committee Progress

Table 7 presents descriptive statistics regarding the Steering Committee's progress overall for survey items common across Years 1–6 (2019–2024), items across Years 5–6 (2023–2024), items common across Years 1–4 (2019–2022), and items common across Years 3–4 (2021–2022). In the June 2024 column with mean scores, for the 10 survey items that were common across Years 1–6 (eight items) and Years 5–6 (two items), all showed a decrease from February 2023. However, seven of the eight items show increases from Year 1 to Year 6. Figure 2 presents a visual depiction of how the mean scores fluctuated for these eight items across Years 1–6.

Items common across Years 1–6. As noted above, respondents reported lower mean scores in 2024 compared with 2023 for the eight items that were common across Years 1–6 (2019–2024). Responses for these items were still positive, with the mean score for two items at or above 3.50 on a 4-point scale (1 = *Not started*, 2 = *Beginning/early stage*, 3 = *Making progress*, 4 = *Fully achieved*), and all eight items above the mid-point of 2.5, indicating that progress was being made. The highest rated item at 3.75 was that the Steering Committee meets sufficiently regularly; the lowest rated item at 2.83 was that Steering Committee members have a clear understanding of the network's next steps.

I think of the Steering Committee as more of a sharing/communication group rather than decision-making group at this point. – Steering Committee Member

Items common across Years 5–6. This section of the survey also included two items added in Year 5 (2023) and included in Year 6 (2024): *The Steering Committee maintains a clear vision for the First2 Network and Meetings are structured to ensure that Steering Committee business is completed*. Mean responses for these items were also lower in 2024 compared with 2023 but still positive at 3.33 and 2.92, respectively.

Figure 3 presents 2024 (Year 6) response percentages for the items related to Steering Committee progress.

Table 7. Steering Committee Progress Item Descriptive Statistics From the Steering Committee Survey Years 1–6

	March 2019 (Y1)			March 2020 (Y2)			April 2021 (Y3)			March 2022 (Y4)			February 2023 (Y5)			June 2024 (Y6)		
	N	Mean	SD	N	Mean	SD	N	Mean	SD									
Items Common Across Years 1–6 (2019–2024)																		
The right people serve on the Steering Committee.	11	3.37	0.65	13	3.31	0.48	10	3.50	0.53	10	3.70	0.48	10	3.50	0.53	12	3.42	0.67
The Steering Committee meets sufficiently regularly.	11	3.91	0.30	13	3.77	0.44	10	4.00	0.00	10	3.90	0.32	10	3.90	0.32	12	3.75	0.45
The Steering Committee provides oversight and governance of the First2 Network.	11	2.73	0.65	13	3.46	0.78	10	3.50	0.53	10	3.10	0.57	10	3.50	0.53	12	3.25	0.74
The Steering Committee has agreed upon a decision-making process.	11	2.91	0.70	13	3.38	0.87	10	3.70	0.48	10	3.20	0.79	10	3.40	0.70	11	3.36	0.67
Steering Committee members trust one another.	11	3.27	0.65	13	3.46	0.66	10	3.70	0.48	10	3.30	0.68	9	3.67	0.50	12	3.50	0.67
Communication within the Steering Committee is constructive.	11	2.91	0.70	12	3.42	0.67	10	3.60	0.52	10	3.20	0.79	10	3.70	0.48	12	3.33	0.99
Steering Committee communications are timely.	11	3.09	0.83	13	3.23	0.60	10	3.50	0.53	10	3.10	0.74	10	3.40	0.52	12	3.33	0.65
Steering Committee members have a clear understanding of the network's next steps.	11	2.64	0.51	13	2.77	0.60	10	3.30	0.67	10	2.90	0.32	10	3.10	0.57	12	2.83	0.84
Items Common Across Years 5–6 (2023–2024)																		
The Steering Committee maintains a clear vision for the First2 Network.	N/A	N/A	N/A	10	3.60	0.70	12	3.33	0.99									
Meetings are structured to ensure that Steering Committee business is completed.	N/A	N/A	N/A	10	3.50	0.71	12	2.92	0.79									
Item Common Across Years 1–4 (2019–2022)																		
The Steering Committee has developed a clear vision for the First2 Network.	11	2.82	0.42	12	3.17	0.58	10	3.50	0.53	10	3.00	0.00	N/A	N/A	N/A	N/A	N/A	N/A
Item Common Across Years 3–4 (2021–2022)																		
The Steering Committee is successfully adapting programmatic efforts to meet COVID-19 challenges.	N/A	N/A	N/A	N/A	N/A	N/A	10	3.70	0.48	10	3.30	0.68	N/A	N/A	N/A	N/A	N/A	N/A

Figure 2. Steering Committee Progress Item Mean Scores Across Years 1–6

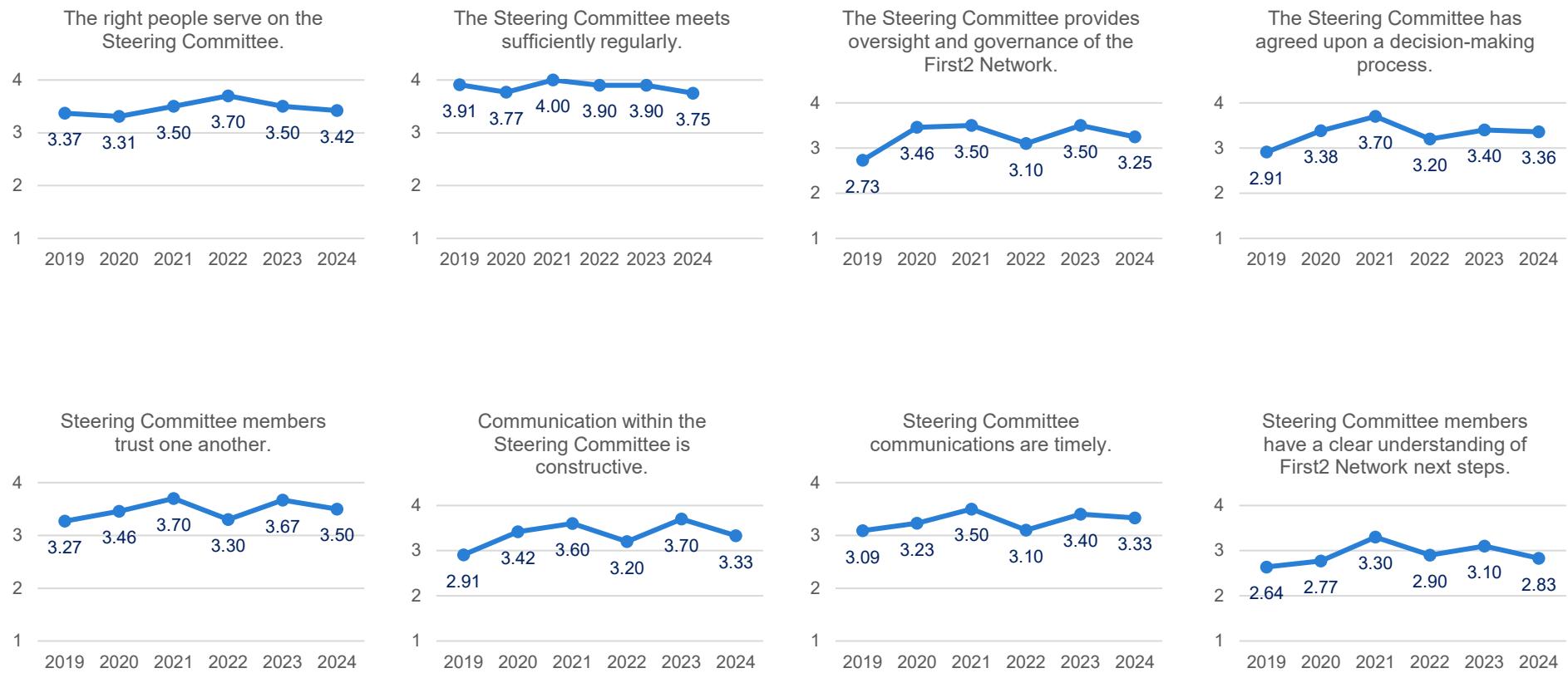
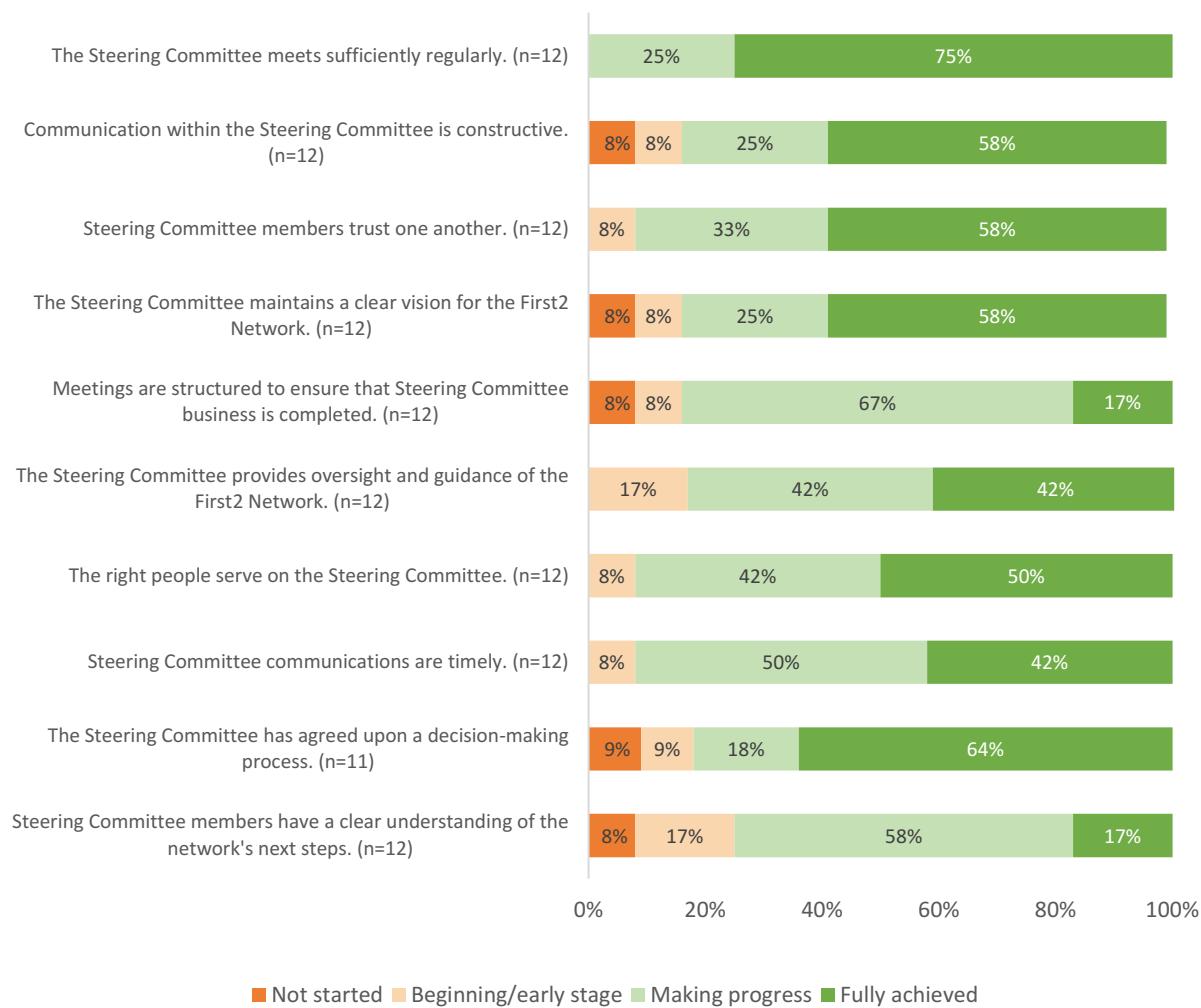


Figure 3. Steering Committee Progress Item Response Percentages From the Year 6 Steering Committee Survey (June 2024)



When asked to share any comments about their ratings for these 10 items, three individuals responded. Their verbatim comments follow.

- *I just joined and had to miss many meetings last semester because the committee meetings were while I was in class. Therefore, I don't feel comfortable answering.* [This respondent did not rate any of the 10 items.]
- *I think of the steering committee as more of a sharing / communication group rather than decision-making group at this point.*
- *All busy individuals are trying their best to meet and fulfill the common goals of the network.*

Steering Committee Roles

Respondents were also asked to rate 14 items¹ about their involvement as a Steering Committee member. Table 8 presents descriptive statistics for survey items common across Years 1–6, items common across Years 5–6, items common across Years 1–4, and items common across Years 3–4. In the June 2024 mean score column, for the 14 survey items that were common across Years 1–6 (eight items) and Years 5–6 (six items), all showed a decrease from February 2023. Furthermore, seven of the eight items show decreases from Year 1 to Year 6. Figure 4 presents a visual depiction of how the mean scores fluctuated for these eight items across Years 1–6.

Items common across Years 1–6. As noted above, respondents reported lower mean scores in 2024 compared with 2023 for the eight items that were common across Years 1–6 (2019–2024) related to their Steering Committee roles. Responses for these items were still positive, with the mean score for two items above 3.00 on a 4-point scale (1 = *Not started*, 2 = *Beginning/early stage*, 3 = *Making progress*, 4 = *Fully achieved*), and six items at or above the mid-point of 2.5, indicating that progress was being made. The highest rated item at 3.33 was that they understand the responsibilities associated with Steering Committee membership; the lowest rated item at 2.00 was that they help to onboard new First2 Network members.

Items common across Years 5–6. This section of the survey also included five new items that asked respondents about their roles on institutional teams and one new item that asked whether respondents consider involvement on the Steering Committee to be a worthwhile investment of their time. Responses for these items were also lower in 2024 compared with 2023 but still positive, with means ranging from a high of 3.67 (*I lead an institutional team*) to a low of 2.83 (*I help the First2 Network determine how to coordinate the work of institutional teams*). Steering Committee members responded positively (mean score of 3.18) to the item that asked about committee membership being a worthwhile investment.

Figure 5 presents Year 6 response percentages for the items related to Steering Committee roles. Note that between 0 percent and 75 percent of respondents rated items as not applicable (N/A), indicating that they did not perceive those items to be relevant to their involvement as a Steering Committee member. This may indicate a need to further clarify Steering Committee roles and responsibilities.

When asked to share any comments about their ratings for these items, one individual responded:

- *I just joined and had to miss many meetings last semester because the committee meetings were while I was in class. Therefore, I don't feel comfortable answering. [This respondent did not rate any of the 14 items.]*

And, for Year 6 (2024), respondents were asked to describe how they envisioned success for the First2 Network in the future (i.e., next year, 5 years from now, and 10 years in the future) for

¹ This set of items included an N/A option if respondents did not think that a particular item was relevant for their involvement as a Steering Committee member. Any N/A ratings were excluded when calculating means and standard deviations but were reported in the response option percentages.

students, network members, and community partners. Five individuals responded and their verbatim comments follow.

- *Money is the key to First2's success. It supports on-campus initiatives and student involvement to help promote First2's mission. First2 needs to find a sustainable funding source.*
- *Success will look like transitioning to a non-profit led by High Rocks, and finding sources of funding to continue the work of the network.*
- *Systematically improve retention rates in STEM programs by applying student driven change ideas and institutionalize the ones proved working. Make a difference in our institutions and in our state. Producing more leaders among students and faculty members.*
- *We will achieve our goals of increasing STEM graduation. Our state's institutions will have enacted policies based on what we have learned and underserved students will find the institutions supportive.*
- *The First2 continues to engage students [and] faculty to make systemic change. The First2 Network is funded.*

Steering Committee Survey Summary

Respondents rated all 10 items about the Steering Committee's progress lower in 2024 than they had in 2023. Furthermore, they also rated all 14 items about their Steering Committee roles lower in 2024 as well. While this may seem discouraging, it should be noted that different individuals with different perceptions may respond each year, with differing levels of knowledge about the First2 Network in general and the Steering Committee specifically. Additionally, scores are likely to be lower than in prior years because of shifts in the roles and responsibilities of institutional members. For example, the lowest rated item at 2.00 was that they help to onboard new First2 Network members. This low rating is expected given that the Steering Committee, while comprised of institutional representatives, does not require institutional members to participate in onboarding others; this task is reserved for the First2 Network principal investigators.

Table 8. Steering Committee Role Item Descriptive Statistics From the Steering Committee Survey Across Years 1–6

	March 2019 (Y1)			March 2020 (Y2)			April 2021 (Y3)			March 2022 (Y4)			February 2023 (Y5)			June 2024 (Y6)		
<i>In my role as a Steering Committee member ...</i>	N	Mean	SD	N	Mean	SD	N*	Mean	SD									
Items Common Across Years 1–6 (2019–2024)																		
I understand the responsibilities associated with my Steering Committee membership.	11	3.00	0.45	13	3.38	0.65	10	3.70	0.48	9	3.56	0.73	10	3.90	0.74	12	3.33	0.78
I help make decisions about the direction of the First2 Network.	11	3.09	0.70	13	3.54	0.52	8	3.50	0.53	9	3.00	0.71	10	3.50	1.08	10	2.90	0.99
I help make decisions about the processes the First2 Network uses to conduct its work.	11	3.09	0.70	13	3.31	0.63	9	3.33	0.71	9	2.89	0.93	10	3.50	0.98	9	2.78	0.97
I help to keep First2 Network members accountable to one another.	11	2.91	0.54	12	3.00	0.60	10	3.00	0.67	9	2.89	0.60	10	3.30	1.06	5	2.60	0.89
I help the Steering Committee determine how to track the First2 Network's progress.	11	2.73	0.65	13	2.85	0.69	10	3.20	0.79	9	3.00	0.00	10	3.20	1.03	7	2.43	0.98
I contribute to decisions about how to onboard new First2 Network members.	11	2.64	0.92	13	3.00	0.58	9	3.33	0.71	7	2.86	0.69	10	3.30	1.06	8	2.50	1.07
I help to onboard new First2 Network members.	11	2.64	1.03	12	3.17	0.58	9	3.33	0.87	8	2.88	0.84	10	3.50	1.27	3	2.00	1.73
I champion the First2 Network by communicating with others in the State and elsewhere about its work.	11	3.36	0.51	13	3.85	0.38	10	3.60	0.70	9	3.67	0.50	10	3.50	0.97	9	3.11	0.78
Items Common Across Years 5–6 (2023–2024)																		
I lead an institutional team.	N/A	N/A	N/A	10	4.40	0.52	6	3.67	0.52									
I keep abreast of institutional team activities.	N/A	N/A	N/A	10	3.70	0.82	11	3.64	0.51									
I keep up to date on what institutional teams are learning.	N/A	N/A	N/A	10	3.60	0.97	10	3.20	0.63									
I help the First2 Network determine how to coordinate the new knowledge that institutional teams generate.	N/A	N/A	N/A	10	3.70	1.06	6	2.83	0.75									
I help the First2 Network determine how to coordinate the work of institutional teams.	N/A	N/A	N/A	10	3.30	1.06	6	3.00	0.89									

	March 2019 (Y1)			March 2020 (Y2)			April 2021 (Y3)			March 2022 (Y4)			February 2023 (Y5)			June 2024 (Y6)		
<i>In my role as a Steering Committee member ...</i>	N	Mean	SD	N	Mean	SD	N*	Mean	SD									
My involvement as a Steering Committee member is a worthwhile investment of my time.	N/A	N/A	N/A	10	3.80	0.92	11	3.18	0.98									
Items Common Across Years 1–4 (2019–2022)																		
I lead a working group.	11	3.36	1.36	9	3.78	0.44	6	3.80	0.41	4	4.00	0.00	N/A	N/A	N/A	N/A	N/A	N/A
I keep abreast of working group activities.	11	2.82	0.60	13	3.92	0.28	10	3.40	0.70	10	3.60	0.70	N/A	N/A	N/A	N/A	N/A	N/A
I keep up to date on what working groups are learning.	11	2.73	0.47	13	3.23	0.44	10	3.10	0.74	10	3.10	0.57	N/A	N/A	N/A	N/A	N/A	N/A
I help the network determine how to coordinate the work of Improvement Teams.	11	2.18	0.87	11	2.82	0.60	9	3.22	0.97	9	3.22	0.67	N/A	N/A	N/A	N/A	N/A	N/A
I help the network determine how to coordinate the new knowledge that working groups generate.	11	2.27	0.91	13	3.00	0.58	9	3.00	1.00	10	2.80	0.42	N/A	N/A	N/A	N/A	N/A	N/A
Item Common Across Years 3–4 (2021–2022)																		
I help to support First2 Network programming adjustments to address COVID-19 challenges.	N/A	N/A	N/A	N/A	N/A	N/A	10	3.50	0.71	8	3.38	0.52	N/A	N/A	N/A	N/A	N/A	N/A

* N/A responses were excluded for the calculation of means and standard deviations, so the n's shown in this table may differ from those shown in figure 5.

Figure 4. Steering Committee Role Item Mean Scores From the Steering Committee Survey Across Years 1–6

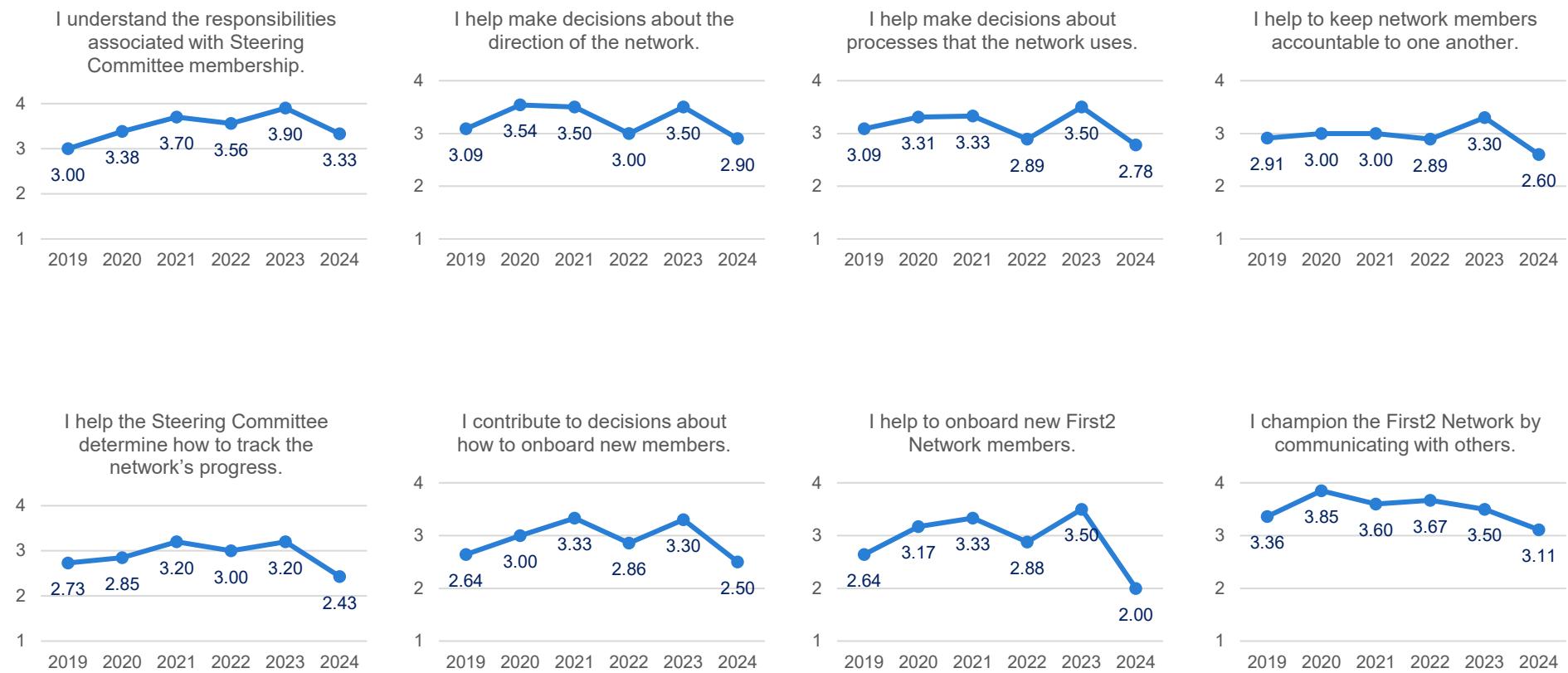
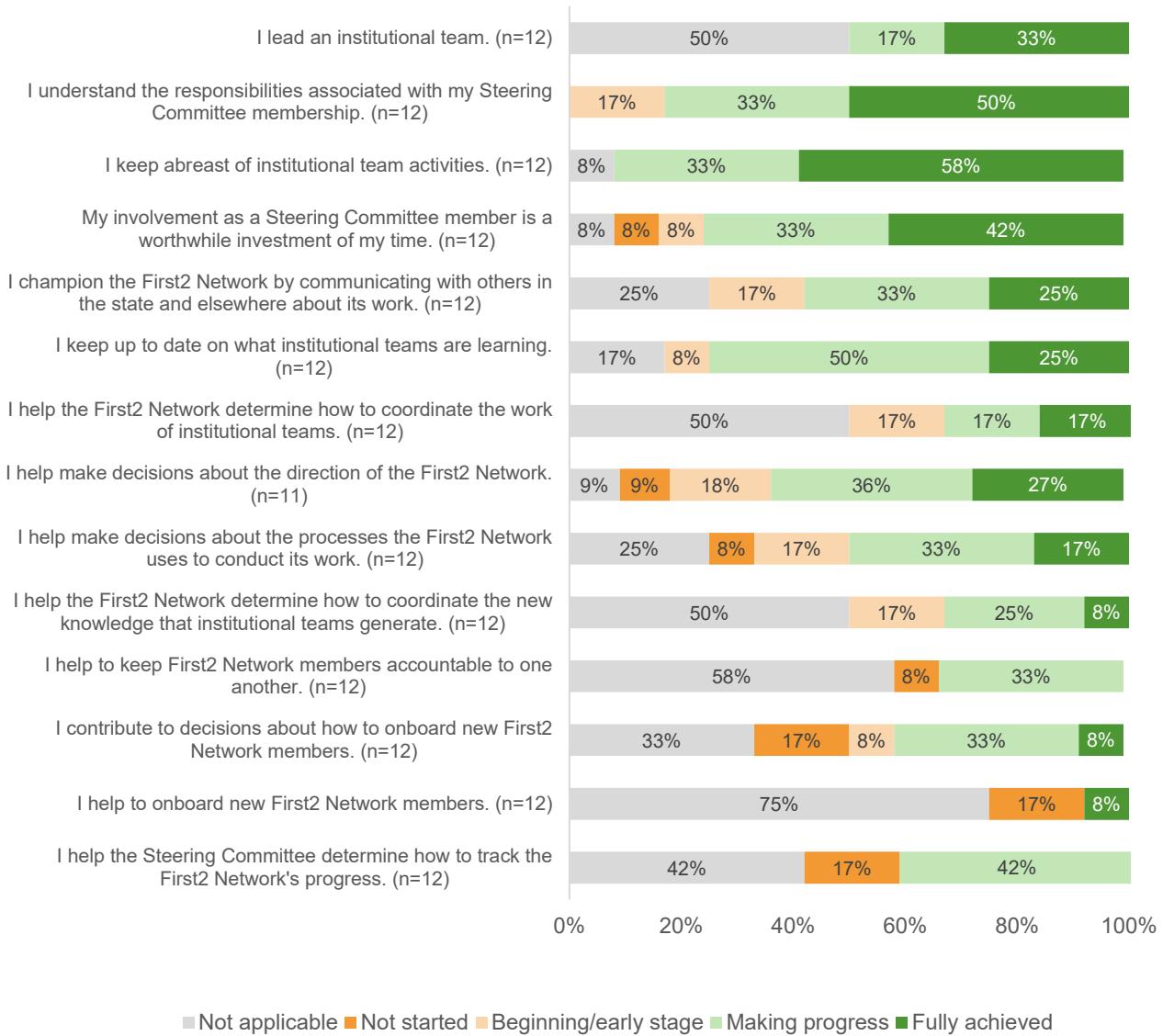


Figure 5. Steering Committee Role Item Response Percentages From the Year 6 Steering Committee Survey (June 2024)



3.2.5 Steering Committee Focus Group

In February 2024, the evaluation team conducted a 45-minute virtual group interview during one of the monthly Steering Committee meetings with all members who were present for that meeting. A total of 11 individuals participated in the interview. Major topics included the evolution of the Steering Committee, facilitating and challenging factors, suggestions for improvement, most important accomplishments, and the achievement of Steering Committee and network goals. Responses are organized by these broad categories.

Steering Committee Evolution

One interviewee noted that the structure of the Steering Committee membership had remained relatively unchanged since the previous year when the Steering Committee membership had transitioned from working group members to institutional team members. This individual also noted that new members have joined the Steering Committee this year (several of whom participated in the interview).

Another individual concurred, "I didn't feel that there was a transition," and went on to note "small increments of change but not a big overhaul." According to this individual, the Steering Committee is undergoing continuous improvement.

When asked about onboarding new members to the Steering Committee this year, one individual noted that the onboarding team came to her university "and I think that was helpful" so that administrators and faculty "could get a feel for what First2 is, a bigger feel for what First2 is."

Facilitating and Challenging Factors

Facilitators. In discussing improvements in Steering Committee operations, one interviewee mentioned liking the current structure of meeting for an hour twice a month—once for a business meeting and once for a "deep dive," which "allows you to focus on something very well and thoroughly." This individual commented, "I think it forces us to be very targeted and strategic in the use of our time." Another individual reflected that several of the business meetings have been "extraordinarily dense" and likened them to "drinking from a fire hose!"

Another interviewee commented that First2 Network leadership and backbone individuals "are doing a better job now of scaffolding what's due" from Steering Committee members. "There are a lot of things that you're responsible for in the reporting and the PDSAs [Plan, Do, Study, Act] and I think that the Steering Committee is doing a better job of foreshadowing, if that makes any sense, ... it's not all of a sudden on you" and due immediately.

I think things are tried, and if they work, they continue, and if they don't work, something else is tried and I feel like it's ... improving in a good direction. – Steering Committee Member

We've got some people from the Academic Success Center and Student Support Services that are interested in what we're doing. I think that onboarding meeting we had last fall really helped get people from those departments interested in what we were doing. – Steering Committee Member

Challenges. Several challenges emerged throughout the interview, including the ongoing need to ensure that new members have a clear understanding of First2 Network goals and responsibilities and the ongoing efforts to streamline and clarify the First2 website structure.

Suggestions for Improvement

One new Steering Committee member asked whether, at this point, the Steering Committee had a term for members, adding “for example, a chair of a department is only a chair for so many years. So if you have someone who is your institutional liaison or whatever, are they only appointed for so many years and then someone else steps in?” This individual suggested that rotating institutional team responsibilities among members may help with work flow and coordination within the teams. Another suggestion focused on circulating agendas and materials prior to Steering Committee meetings, “especially when a major decision is to be made.”

Most Important Accomplishments

Several interviewees identified what they viewed as the most important accomplishments of the Steering Committee over the past year. One individual noted having new members as evidence of success related to the goal of learning among institutional teams. Another suggested that adding new institutions was a great accomplishment. A third interviewee confirmed that the revised meeting structure had been an important accomplishment (one business meeting and one deep-dive meeting each month). Yet another individual noted that the recent First2 convening “was pretty amazing.”

That [recent First2 convening] was probably my favorite one that they've had so far. I think I really got a lot out of it. And the people I dragged [to it] kicking and screaming got a lot out of it, and said “Oh yeah, we'd do this again.” – Steering Committee Member

Achievement of Goals

Steering Committee goals. When asked about Steering Committee goals,² one individual noted that “we’re trying to build a system that can sustain and continue to grow” and get legislation passed “to benefit all of our different institutions.” According to this individual, “I see the change from when First2 started years ago when I was involved, and I feel like we’re on a better track of things.” However, this individual also noted that there is still confusion about where to locate specific resources because “things are in 50 places for 50 different things.”

After the interviewer verbalized the Steering Committee’s goals, one individual noted that the Steering Committee was making progress on those, but acknowledged not knowing earlier what

² Steering Committee goals include coordinating work and learning among institutional teams, keeping abreast of network learnings and issues, contributing to a network vision and strategic thinking, contributing to decision making, and serving as a public face for the network.

those specific goals were and not finding anything on the First2 website that provided any further information about the Steering Committee or its goals.

First2 Network goals. During the interview, members were asked about three of the First2 Network goals. When asked about the status of partnership development, one individual responded, noting having a “completely different lens” [not faculty] and how having individuals from various institutional roles involved can help distribute responsibilities and can cover responsibilities that faculty members may not be able to do. For example, including individuals with more of a background with/ responsibility for student success and academic affairs “would be nice … especially if we’re thinking of what are the policy changes we could go and request, or how to really help some of these other institutions get some things off the ground.”

When asked about the status of infrastructure and leadership, one of the newer members reflected that efforts were underway to expand their institutional team to “a much deeper and more rich institutional team” than having it previously “siloed to one individual.” “I would say definitely better than we were a year ago.”

Another new member concurred, stating “I think we’ve had a lot of improvement as well, just because we’re now officially an institution with First2, whereas before there were just a few faculty members just kind of working with First2.” Regular institutional team meetings have been occurring at this institution since last semester. In addition, this interviewee described a retreat that was to be held in March 2024 for their science and math faculty where discussions will take place about “things we can do to help incoming freshman be better prepared for their courses.”

When asked about the status of a culture of learning (with shared metrics, PDSAs, and best practices for improving STEM persistence) and what success would look like for the Steering Committee, several interviewees provided insights.

One individual identified two measures of success:

1. Regular attendance at meetings and willingness to engage would be indicative of success, adding “People wanting to attend the meetings is a success, right? It’s not a ‘Oh, I don’t have time for this,’ but ‘I need to engage in this.’”
2. Institutionalizing the PDSAs currently under exploration so that improvement science becomes part of institutions’ practices (e.g., having people report, “We decided that this really worked and we’re going to make it part of the system, and the dean has agreed to fund it”).

I do think we've made significant ground, probably over the last 4 months.... We've really been able to ... realize some of the areas where we needed improvement still, and we've been able to iron out some much more efficient communication efforts internally and appoint some others in charge of making sure certain things are distributed, and different things of that nature. – Steering Committee Member

And we plan to have people from the Academic Success Center and Student Support Services [at an upcoming retreat] and some students also there at that meeting to help give feedback, so we're excited for it. – Steering Committee Member

Another individual commented, “I would love to see [the Steering Committee] remain a place where we have a representative from our different institutions coming together and we could spend a little bit more time talking about what we’re doing at our institutions and solving problems together.” For the overall success of the network, this individual added, “Seeing these institutional teams more than acknowledge that our institutions [are] being looked upon as a core effort at every college and university is something that should be done, bringing people together to test ideas to improve student success, collect data, and see what’s worth moving forward.”

A third interviewee commented, “I think it’s given us an opportunity to recruit more people at the institutional level and bring them into the fold and that’s been really good.” However, this individual also noted that the former working group structure did bring people together across institutions who were doing the same job where they could “hash out what’s working, what’s not working, get advice from each other.” Re-instituting such role-alike conversations across institutions on an occasional basis “might be helpful” in sharing information such as how often institutional teams meet, topics of discussion, meeting structure, and how faculty are recruited.

Two additional members added what success would look like to them via the interview chat:

Success with improvement science:

We have powerful stories on the website, with data and story combined, based on our PDSA work and the way it percolates through the network.

Success 5 years from now looks like:

1. *Lots of capacity to implement high-impact practices. We are seeing new collaborations and a proposal writing partnership this year. This would continue beyond the grant funding.*
2. *I would still see diverse institutional teams devoted to improving STEM student success at the different institutions.*

Steering Committee Group Interview Summary

In sum, participants noted that the structure of the Steering Committee had remained relatively unchanged since the shift the year before from working groups to institutional teams, although there have been new members who were onboarded to the Steering Committee this year. The current structure of two meetings per month (one business meeting, one deep dive) is fostering more productive and strategic use of members’ time, and efforts to keep members apprised well in advance of task deadlines have lessened the pressure of immediate deadlines. Ongoing challenges being addressed are ensuring that network members, in general, and Steering Committee members, specifically, have a clear understanding of network and Steering Committee goals and responsibilities. Several accomplishments were identified as most

We've been around for a long time now, but in terms of creating institutional teams that work together to do it at the institutional level, this is the second year of that and I'm interested in hearing what Steering Committee members, especially those who have been with us for a while, if they think that is gaining any traction this year or [if we] still have lots of obstacles. – Steering Committee Member

important for the Steering Committee, including having new members on the committee, new institutions in the network, and the Steering Committee meeting structure.

There was general agreement that progress was being made on both the Steering Committee goals and the First2 Network goals. Several members specifically noted improvements underway at their institutions in terms of strengthening their institutional team efforts. Others noted that meeting attendance, institutionalizing PDSAs, and expanding the network even further were all ways to measure network success.

3.2.6 Institutional Team Survey

A total of 91 institutional team members responded to the online survey in March 2024. Of those, 20 answered only the first one or two items and so those surveys were excluded from analysis. Of the remaining 71 respondents, all (100 percent) confirmed that they were members of a First2 Network institutional team. Nearly two-thirds (62 percent) were students, 31 percent were faculty members, and 7 percent were administrators. Respondents were from the following nine sites, as shown in table 9.

Table 9. Response Count for the Institutional Team Survey

Institution	Number of Respondents	Percentage of Total*
West Virginia University	19	27%
Fairmont State University	14	20%
West Virginia University Institute of Technology	12	17%
University of Charleston	8	11%
Marshall University	6	9%
Blue Ridge Community and Technical College	4	6%
Glenville State University	4	6%
Shepherd University	3	4%
Eastern Kentucky University	1	1%
TOTAL	71	100%

* Percentages may not total 100 percent due to rounding.

Perceptions About the First2 Network

Respondents were asked to rate five items about their perceptions of the First2 Network. Responses for those items were fairly positive, with mean scores for two items above 4.00 on a 5-point scale (1 = *Insufficient* to 5 = *Fully sufficient*). For all respondents, the highest rated items at 4.04 were the First2 Network progress in supporting network students and meeting network goals. For students, the highest rated item at 4.05 was First2 Network progress in meeting network goals; for non-students, the highest rated item at 4.08 was First2 Network progress in supporting network students. The lowest rated item at 3.61 (all respondents), 3.57 (students), and 3.69 (non-students) was the First2 Network onboarding process for network members. Table 10 presents frequencies (response option percentages) and descriptive statistics (number, mean, and standard deviation) by respondents' member type.

Respondents were given an opportunity to share comments about their ratings for these five network items. Fifteen individuals provided feedback; these verbatim comments are provided below under the categories of positive, mixed, negative, and neutral.

Positive:

- *Though I am new to this Institute, I have been given a good opportunity to serve as a team member of this First2 team.*
- *I know we're in the early stages, but I've very much appreciated First2 support thus far! Delays are because of us and not at all due to lack of support!*
- *The onboarding meetings are great!*
- *It's hard to give an accurate rating because our group on campus is so new, but we have definitely been supported adequately so far.*
- *I find the First2 Network to be sufficient in all aspects related to supporting students. I feel more supported and understood since joining the network.*

Table 10. Descriptive Statistics and Response Option Percentages for First2 Network Items About the First2 Network

Items	Group	Descriptive Statistics			Response Option Percentages*				
		n	Mean	Std. Dev.	Insufficient (1)	Barely sufficient (2)	Somewhat sufficient (3)	Mostly sufficient (4)	Fully sufficient (5)
Support provided by the First2 Network to your institutional team	All Resp. Students	71	3.90	0.96	3%	6%	17%	48%	27%
	44	3.84	1.08	5%	7%	18%	41%	30%	
	Non-Std.	27	4.00	0.73	0%	4%	15%	59%	22%
First2 Network process for communicating with your institutional team	All Resp. Students	71	3.86	1.10	6%	6%	17%	41%	31%
	44	3.82	1.02	5%	2%	27%	39%	27%	
	Non-Std.	27	3.93	1.24	7%	11%	0%	44%	37%
First2 Network onboarding process for network members	All Resp. Students	70	3.61	1.12	7%	7%	24%	40%	21%
	44	3.57	1.19	9%	7%	25%	36%	23%	
	Non-Std.	26	3.69	1.01	4%	8%	23%	46%	19%
First2 Network progress in supporting network students	All Resp. Students	70	4.04	0.89	0%	7%	16%	43%	34%
	44	4.02	0.93	0%	7%	21%	36%	36%	
	Non-Std.	26	4.08	0.85	0%	8%	8%	54%	31%
First2 Network progress in meeting network goals	All Resp. Students	70	4.04	0.91	1%	4%	17%	43%	34%
	44	4.05	0.96	2%	5%	16%	41%	36%	
	Non-Std.	26	4.04	0.82	0%	4%	19%	46%	31%

* Percentages may not total 100 percent due to rounding.

Mixed:

- I feel like the network is often times slow about communicating with our institutional team, especially on PDSAs, which can sometimes make that process a bit painful. I also think the onboarding process can be overwhelming for faculty and students [who] are new to the network. Despite some things mentioned above, the network seems to stay true to their mission in supporting the students.*
- There has been a bit of confusion that is now getting sorted out.*
- The First2 Network does a really good job of supporting students who are engaged, but it's sometimes difficult for new students to become engaged. There's so many moving parts in the network and it can be confusing for new students coming in.*

Negative:

- It is very difficult as a faculty member to communicate with High Rocks about budget and students. The network also keeps having various required meetings, check-ins, etc. that just add to our time commitment without actually being useful for us.*
- Communication with the network is sometimes lacking. All year, we have struggled through PDSA coaching due to a lag in email responses within the network.*

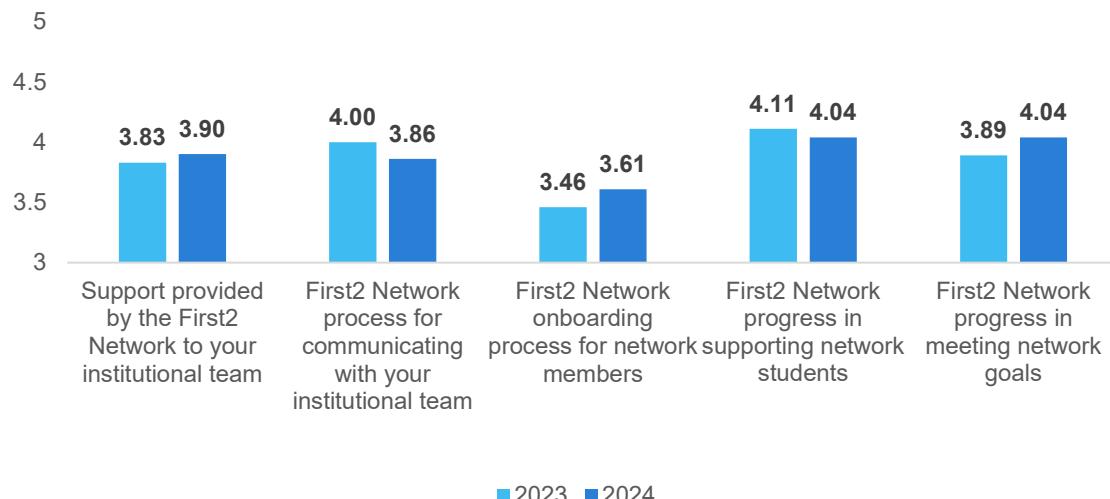
- Priorities have changed as new grants are replacing the original NSF funding. I do not feel these new priorities help students at smaller institutions. This grant was originally designed to break down barriers and help increase STEM retention through research and student/faculty interaction – I don't think it does this anymore. At smaller institutions, it just adds more stress and responsibilities our students aren't ready to deal with. That is why 70–80% of our students leave the network after their first semester being involved.
- Communication is not something well done at all, especially with WVU Tech. [A First2 leader] informed us of a possible change in position (i.e. Scholar Tier 1; Scholar Tier 2.) however did NOT inform any of the leaders or students that the deadline had already came and went. This is just one of many examples that communication for others does not happen inside the network.
- Although I am new to the program, there seems to be a double standard in that the network demands quick responses from participants, but then delays (or fails entirely) in responding to participant emails.

Neutral:

- Our First2 Network is very new, but so far, this is how I feel about it.
- While I am a member, some of these questions I can't answer. Or should answer "not observed" or "not applicable."

All responses were compared across the five items about perceptions of the First2 Network; 2023 and 2024 responses for these items were fairly positive, with increased mean scores for three items. The highest rated item in both 2023 and 2024 at 4.11 and 4.04, respectively, was for the First2 Network's progress in supporting network students; the lowest rated item at 3.46 and 3.61, respectively, was for the First2 Network onboarding process for network members. Figure 6 presents mean scores for both years.

Figure 6. Mean Score by Years 2023 and 2024 for First2 Network Items About Their Institutional Teams



Perceptions of Their Institutional Team

Respondents were then asked to rate seven items about their perceptions of their institutional team. Responses for these items were slightly higher, with mean scores for three items for all respondents above 4.00 on the same 5-point scale. For all respondents at 4.26, students (4.12), and non-students (4.50), the highest rated item was the extent to which students are given leadership opportunities in their institutional team. The lowest rated item at 3.75 (all respondents), 3.80 (students), and 3.68 (non-students) was their institutional team onboarding process.

Table 11 presents frequencies (response option percentages) and descriptive statistics (number, mean, and standard deviation) for all respondents and by students and non-students.

Table 11. Descriptive Statistics and Response Option Percentages for First2 Network Items About Their Institutional Teams

Items	Group	Descriptive Statistics			Response Option Percentages*				
		n	Mean	Std. Dev.	Insufficient (1)	Barely sufficient (2)	Somewhat sufficient (3)	Mostly sufficient (4)	Fully sufficient (5)
Institutional team process for sharing information with the First2 Network	All Resp.	71	3.93	0.93	4%	0%	21%	48%	27%
	Students	44	3.93	1.00	5%	0%	25%	39%	32%
	Non-Std.	27	3.93	0.83	4%	0%	15%	63%	19%
Your institutional team onboarding process	All Resp.	69	3.75	0.98	3%	7%	23%	45%	22%
	Students	44	3.80	1.07	2%	11%	21%	36%	30%
	Non-Std.	25	3.68	0.80	4%	0%	28%	60%	8%
Progress in supporting students at your institution	All Resp.	70	4.07	0.89	0%	7%	14%	43%	36%
	Students	44	4.02	1.02	0%	11%	16%	32%	41%
	Non-Std.	26	4.15	0.61	0%	0%	12%	62%	27%
Progress in meeting your institutional team goals	All Resp.	69	3.97	0.87	0%	6%	22%	42%	30%
	Students	44	4.00	0.94	0%	9%	16%	41%	34%
	Non-Std.	25	3.92	0.76	0%	0%	32%	44%	24%
Extent to which your institutional team is working together collaboratively	All Resp.	70	4.09	1.09	3%	9%	11%	31%	46%
	Students	44	4.00	1.16	5%	9%	11%	32%	43%
	Non-Std.	26	4.23	0.95	0%	8%	12%	31%	50%
Extent to which your institutional team is connected to the First2 Network	All Resp.	70	3.90	0.90	0%	9%	20%	44%	27%
	Students	44	3.89	0.97	0%	11%	18%	41%	30%
	Non-Std.	26	3.92	0.80	0%	4%	23%	50%	23%
Extent to which students are given leadership opportunities in your institutional team	All Resp.	69	4.26	0.85	1%	3%	9%	42%	45%
	Students	43	4.12	0.96	2%	5%	12%	42%	40%
	Non-Std.	26	4.50	0.58	0%	0%	4%	42%	54%

* Percentages may not total 100 percent due to rounding.

Respondents were given an opportunity to share comments about their ratings for these seven items. Twelve individuals provided feedback; verbatim comments are provided below, categorized by positive, negative, and neutral.

Positive:

- *The First2 Network does well in coordinating and engaging with the institutions of the students.*

Negative:

- *Our institutional team is large and we do struggle at times finding meeting days/times when all can meet. Also, students have many opportunities outside of First2 at our institution and many of the supports (e.g., tutoring, access to undergraduate research, first gen office, etc.) were in place at our institution prior to the formation of the First2 Network. At times, First2 feels redundant for us.*
- *There seems to be a misconception about the role students play in the Institutional team. It seems to students that administrators are meeting without student leaders. With this student leaders are caught off guard when faculty mentions other conversations that student leaders were not part of. In campus quarterly check in, faculty stated that the institutional team met a high number of times; however, student leaders were only invited to maybe four of these meetings.*
- *I feel like maybe it is because our team is new but we struggle at times. I feel as though students are not always invited to meetings, and it seems like we have to request to meet with the team. I feel like students should always have a seat at the table when it comes to our institutional team because the network was designed for students. I feel like as a team we could better communicate with each other and also the network. Right now I do not know how much our team shares with the network and so I feel as though it would be nice if our team gave regular updates among ourselves as well as among the network. I feel as though sometimes it also feels like students are one part and the faculty are another, this may be due to having a fairly new team. It may be beneficial for the institutional team to have some social events in order to feel more connected with each other, and really focus on the student-faculty connections.*
- *We only have 4 faculty members regularly involved in the institutional team. More join the meetings but only want to be involved when it is convenient or makes the campus look good. A very small group of faculty and 1 somewhat involved director does all of the work.*
- *Small campuses are very busy.*
- *Institutional team meets and makes decisions without the presence of student leaders.*
- *Many students that aren't with a certain "circle" inside the WVU Tech First2 team do not really get opportunities and are not reached out to. It is very easy [to] be ignored and slip through the cracks. I and several others have taken a sort of "backseat" to the network, simply just sitting in the background and collecting our hours and paycheck.*
- *I feel like the First2 Network and my current First2 club student leaders do not communicate information well. Information is discussed last minute, there are no check ins, and there is misinformation. I feel the only reason the institutional team has done "well" thus far is due to our advisor for the club.*

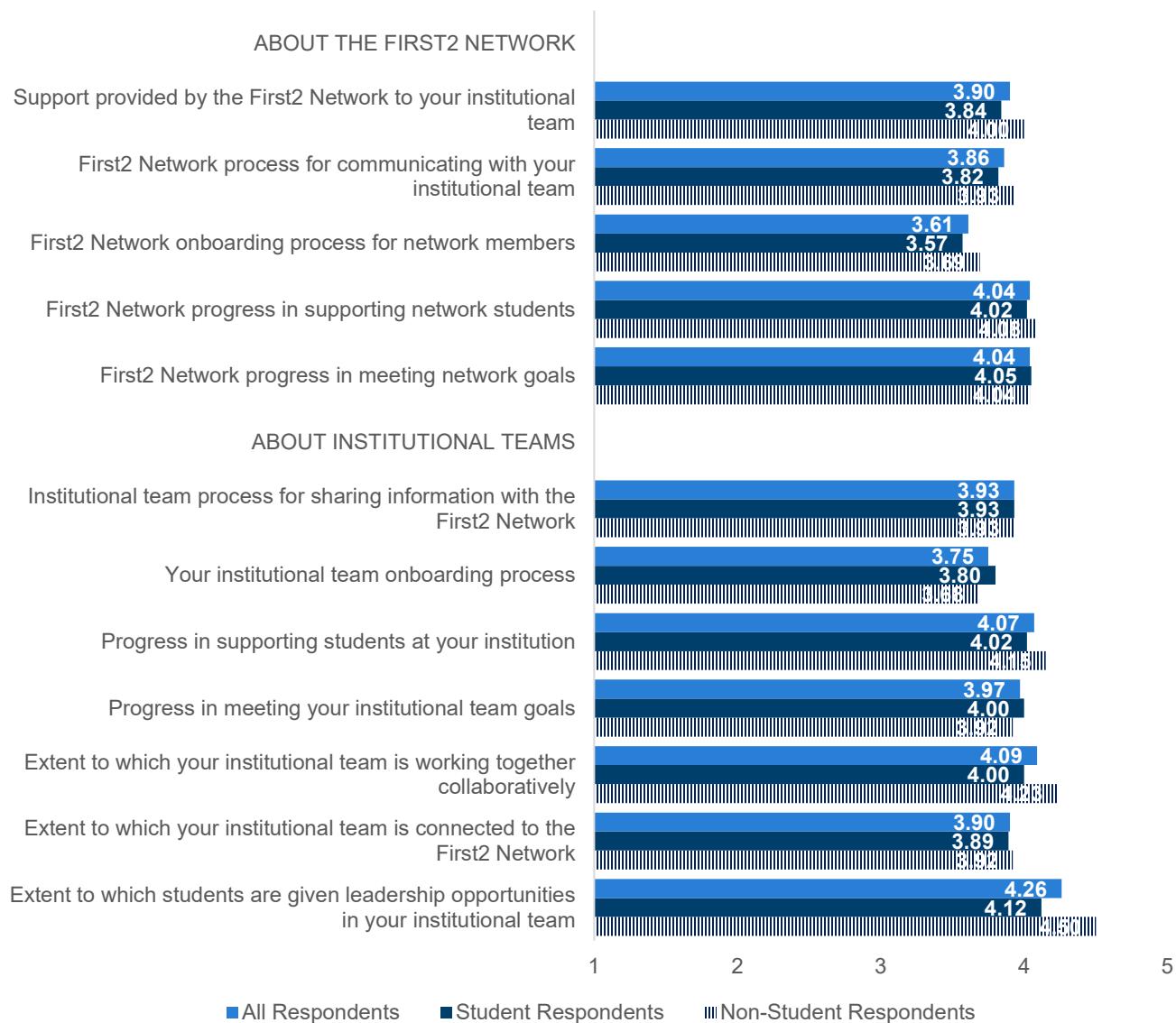
Neutral:

- *We are very new to the network—just about a month—it is hard to judge some of these things.*
- *Our First2 Network at Shepherd University is very new. I have not had time to really experience these yet.*

Figure 7 presents a visual depiction of the mean scores for each of the five items about the First2 Network and the seven items about the institutional teams by participant status. In general, students most often had lower ratings than non-students (for four of the network items and four of the institutional team items).

The greatest differences between student and non-student responses were for the extent to which students are given leadership opportunities in your institutional teams (0.38 difference between students and non-students). The smallest differences between student and non-student responses were for one network item and one institutional team item: (1) First2 Network progress in meeting network goals (0.01 difference between students and non-students), and (2) institutional team process for sharing information with the First2 Network (no difference between students and non-students).

Figure 7. Mean Scores by Students, Non-Students, and All Respondents Status



Institutional Team PDSAs

Finally, respondents were asked to rate 17 items about their perceptions of their institutional team for each of the Plan, Do, Study, Act (PDSA) cycles (five items for Plan and four each for Do, Study, and Act). Responses for these items were mostly positive, with mean scores for 16 items for all respondents above 4.00 on a 5-point scale (1 = A weakness to 5 = A strength); respondents could also select an “I don’t know” option if they were unsure about a particular item. For all respondents, the highest rated item at 4.38 was that the institutional team determines whether the improvement strategy being tested should be adopted, adapted and re-tested, or abandoned (Act); this was also the highest rated item for students at 4.46. For non-students, the highest rated item at 4.43 was that the institutional team uses PDSA cycles to spur improvement in testable iterations (Plan). At 3.95 (all respondents) and 3.93 (students), the lowest rated item was that the institutional team refers to the First2 Network driver diagram to help identify problems of practice to address (Plan); for non-students, the lowest rated item at 3.76 was that the institutional team members ask questions of those affected by the work about what the data mean (Study). Table 12 presents frequencies (response option percentages) and descriptive statistics by member type.

Table 12. Descriptive Statistics and Response Rates for PDSA Items by Member Type

Items	Group	Descriptive Statistics				Response Option Percentages*					
		n	Mean	Std. Dev.	A weakness (1)	More a weakness than a strength (2)	Neither a weakness nor a strength (3)	More a strength than a weakness (4)	A strength (5)	I Don't Know**	
Plan	All Resp. Students	68	4.23	0.82							
	43	4.19	0.89								
	Non-Std.	25	4.29	0.71							
The institutional team agrees to focus upon a shared aim.	All Resp. Students Non-Std.	71 44 27	4.32 4.29 4.36	0.96 1.01 0.90	1% 2% 0%	4% 5% 4%	10% 9% 11%	23% 25% 19%	51% 52% 48%	11% 7% 19%	
The institutional team conducts research to clarify and further specify problems of practice prior to identifying/assessing strategies for addressing those problems.	All Resp. Students Non-Std.	71 44 27	4.12 4.13 4.11	0.99 1.08 0.81	3% 5% 0%	0% 0% 0%	18% 18% 19%	24% 23% 26%	37% 43% 26%	18% 11% 30%	
The institutional team refers to the First2 Network driver diagram to help identify problems of practice to address.	All Resp. Students Non-Std.	71 44 27	3.95 3.93 4.00	1.10 1.12 1.09	4% 5% 4%	4% 5% 4%	17% 18% 15%	30% 30% 30%	34% 34% 33%	11% 9% 15%	
The institutional team uses PDSA cycles to spur improvement in testable iterations.	All Resp. Students Non-Std.	71 44 27	4.35 4.30 4.43	0.88 0.94 0.79	1% 2% 0%	1% 2% 0%	11% 9% 15%	25% 30% 19%	49% 48% 52%	11% 9% 15%	
The institutional team makes decisions about PDSA measurement that balance rigor and feasibility.	All Resp. Students Non-Std.	71 44 27	4.25 4.24 4.27	0.93 1.01 0.77	1% 2% 0%	3% 5% 0%	13% 11% 15%	28% 27% 30%	45% 50% 37%	10% 5% 19%	

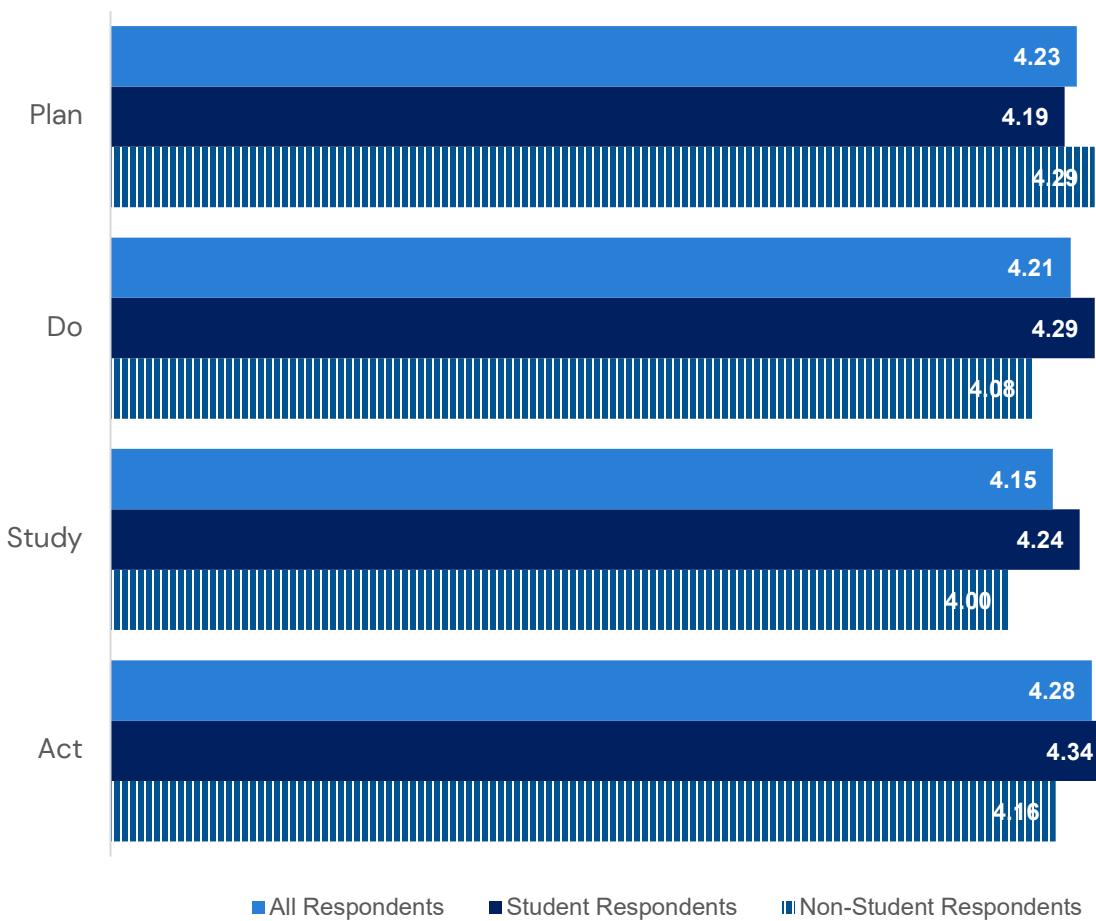
		Descriptive Statistics				Response Option Percentages*					
Items	Group	n	Mean	Std. Dev.	A weakness (1)	More a weakness than a strength (2)	Neither a weakness nor a strength (3)	More a strength than a weakness (4)	A strength (5)	I Don't Know**	
Do	All Resp. Students Non-Std.	62 38 24	4.21 4.29 4.08	0.82 0.80 0.85							
The institutional team uses PDSA forms to record expected outcomes of each improvement strategy implemented.	All Resp. Students Non-Std.	70 43 27	4.30 4.30 4.30	0.84 0.85 0.87	0% 0% 0%	0% 0% 0%	20% 21% 19%	17% 19% 15%	44% 47% 41%	19% 14% 26%	
The institutional team establishes processes for collecting, organizing, analyzing, and synthesizing data during PDSA cycles.	All Resp. Students Non-Std.	70 43 27	4.27 4.34 4.14	0.88 0.88 0.89	0% 0% 0%	4% 5% 4%	11% 9% 15%	27% 26% 30%	43% 49% 33%	14% 12% 19%	
The institutional team helps staff at our institution to implement improvement strategies for addressing problems of practice.	All Resp. Students Non-Std.	70 43 27	4.15 4.28 3.96	1.01 0.97 1.04	0% 0% 0%	7% 7% 7%	16% 9% 26%	20% 21% 19%	43% 47% 37%	14% 16% 11%	
The institutional team consistently collects data on a short list of indicators to measure results from the improvement strategies implemented at our institution.	All Resp. Students Non-Std.	69 43 26	4.10 4.27 3.82	1.06 0.93 1.22	1% 0% 4%	7% 5% 12%	13% 14% 12%	23% 21% 27%	41% 47% 31%	15% 14% 15%	
Study	All Resp. Students Non-Std.	60 38 22	4.15 4.24 4.00	0.79 0.80 0.76							
The institutional team analyzes data collected about improvement strategies and compares them to projections developed in the Plan step.	All Resp. Students Non-Std.	69 43 26	4.16 4.19 4.10	1.01 0.98 1.09	1% 0% 4%	4% 7% 0%	15% 12% 19%	22% 23% 19%	41% 42% 39%	17% 16% 19%	
The institutional team members ask questions of those affected by the work about what the data mean.	All Resp. Students Non-Std.	69 43 26	4.02 4.17 3.76	0.98 0.95 1.00	1% 2% 0%	4% 2% 8%	16% 9% 27%	29% 33% 23%	30% 35% 23%	19% 19% 19%	
The institutional team considers the extent to which the analyzed data do or do not represent progress toward the overall aim.	All Resp. Students Non-Std.	69 43 26	4.27 4.31 4.20	0.82 0.79 0.89	0% 0% 0%	1% 0% 4%	15% 16% 12%	26% 26% 27%	39% 42% 35%	19% 16% 23%	
The institutional team shares findings in ways that take account of the needs of our institution, the network, and its members.	All Resp. Students Non-Std.	69 43 26	4.24 4.32 4.09	0.88 0.88 0.87	0% 0% 0%	4% 5% 4%	12% 9% 15%	29% 26% 35%	41% 47% 31%	15% 14% 15%	

Items	Group	Descriptive Statistics			Response Option Percentages*						
		n	Mean	Std. Dev.	A weakness (1)	More a weakness than a strength (2)	Neither a weakness nor a strength (3)	More a strength than a weakness (4)	A strength (5)	I Don't Know**	
Act	All Resp. Students Non-Std.	60 39 21	4.28 4.34 4.16	0.78 0.80 0.74							
The institutional team determines whether the improvement strategy being tested should be adopted, adapted and re-tested, or abandoned.	All Resp. Students Non-Std.	69 43 26	4.38 4.46 4.24	0.88 0.90 0.83	0% 0% 0%	3% 5% 0%	13% 9% 19%	17% 14% 23%	51% 58% 39%	16% 14% 19%	
The institutional team decides what should be adjusted and studied next, if the improvement strategy needs to be adjusted.	All Resp. Students Non-Std.	69 43 26	4.20 4.26 4.10	0.89 0.89 0.89	0% 0% 0%	1% 2% 0%	22% 19% 27%	20% 21% 19%	42% 47% 35%	15% 12% 19%	
The institutional team decides whether the improvement should be tested in new contexts and/or at larger scales, if the improvement strategy is successful.	All Resp. Students Non-Std.	69 43 26	4.26 4.30 4.19	0.87 0.91 0.81	0% 0% 0%	1% 2% 0%	19% 19% 19%	20% 16% 27%	44% 49% 35%	16% 14% 19%	
The institutional team iteratively tests what related processes or supports are needed to ensure that effective improvement strategies produce improvements reliably.	All Resp. Students Non-Std.	68 43 25	4.27 4.31 4.21	0.89 0.92 0.86	0% 0% 0%	3% 5% 0%	15% 12% 20%	21% 21% 20%	43% 47% 36%	19% 16% 24%	

* Percentages may not total 100 percent due to rounding. ** Excluded from mean and standard deviation calculations.

Figure 8 provides a visual depiction of the mean subscales for the Plan, Do, Study, and Act cycles for all respondents (blue bars) and by students (dark blue bars) and non-students (patterned bars). Students' ratings were higher for three of the four PDSA cycle subscales (Do, Study, and Act) and lower for the Plan subscale. Figure 9 provides a visual depiction of the mean scores for each of the PDSA items for all respondents (blue bars) and by students (dark blue bars) and non-students (patterned bars). Notably, students' ratings were higher for 12 of the 17 items (one Plan, three Do, four Study, and four Act). Students' ratings were lower for four of the Plan items; one Do item was equal.

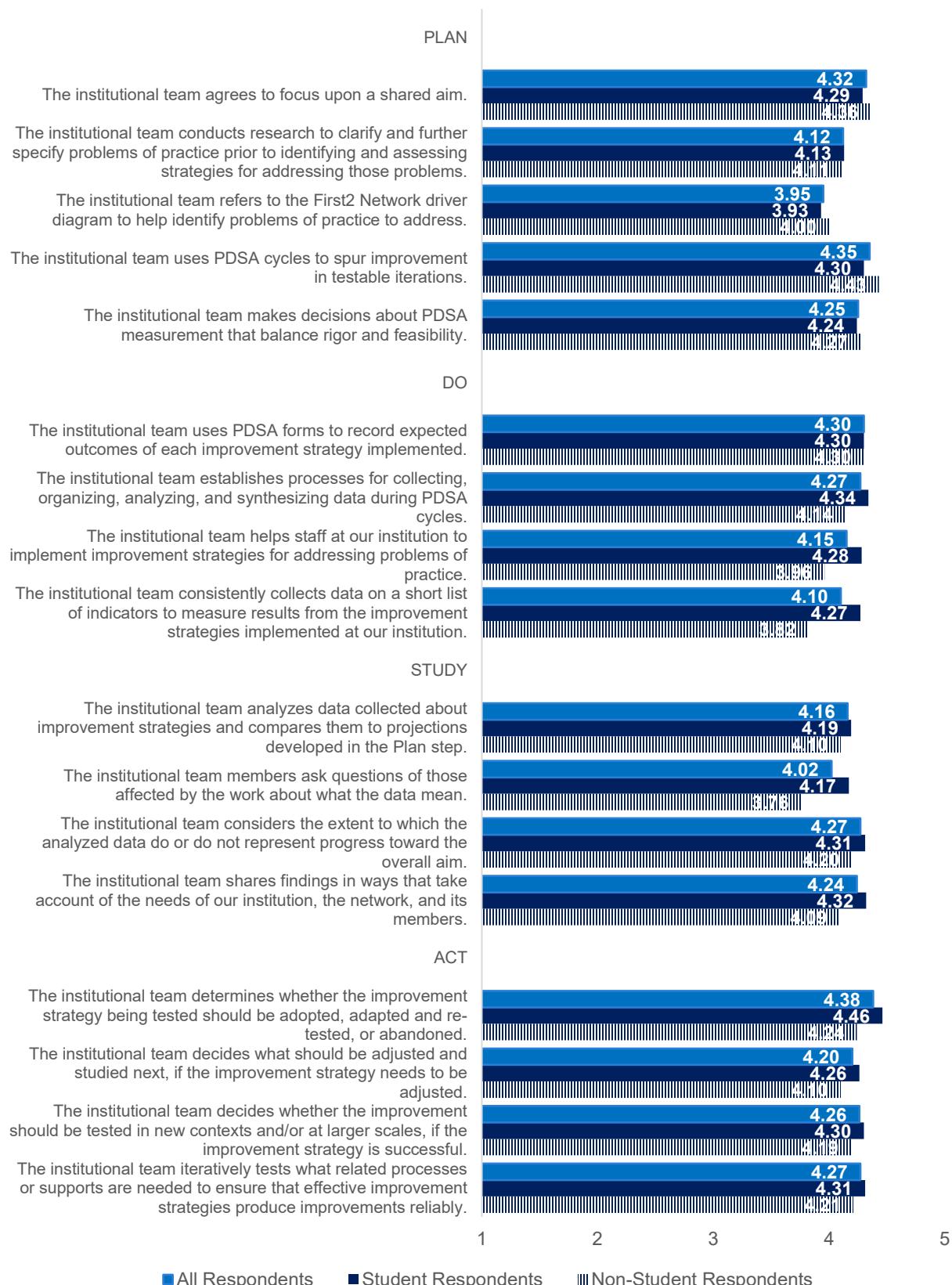
Figure 8. PDSA Mean Scores by Students, Non-Students, and All Respondents Status



Respondents were given an opportunity to share comments about their ratings for these 17 items. Five individuals provided feedback; their verbatim comments are provided below:

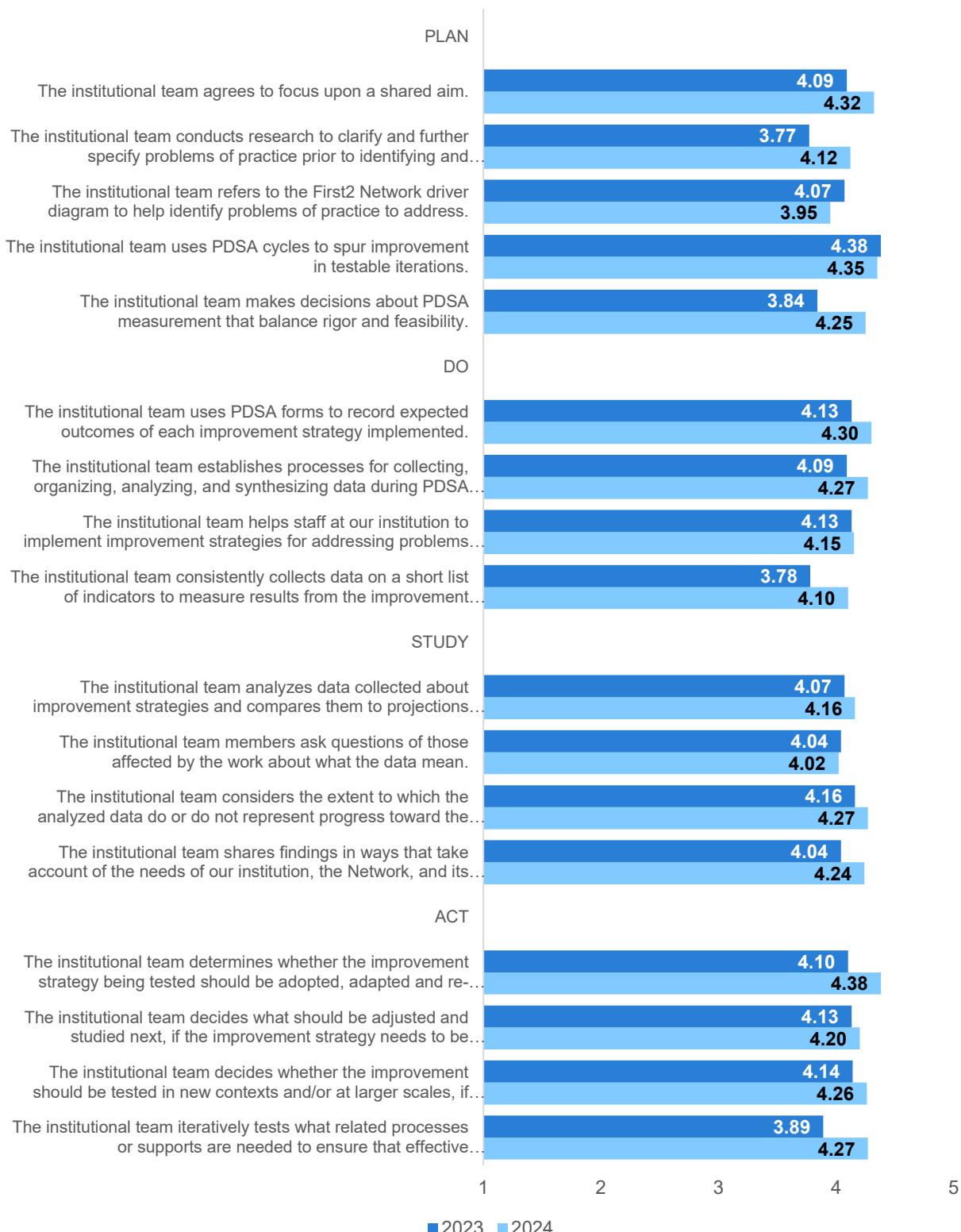
- *PDSAs should be internalized and adapted to the specific goals of the institution. Most faculty do not attempt PDSAs because they are too complicated to set up, hard to fit into the required boxes and omit important quantitative data.*
- *Coaching for a PDSA can [be] challenging as [the] PDSA team does not respond promptly to emails.*
- *We are very new and haven't completed a PDSA cycle.*
- *The ratings were kind of confusing on what exactly "more a weakness than a strength" means in many contexts of [the] questions asked.*
- *Our First2 Network is very new [and] I have not had the chance to see us complete a PDSA yet.*

Figure 9. Mean Scores by Participant Type for PDSA Items From the Institutional Team Survey



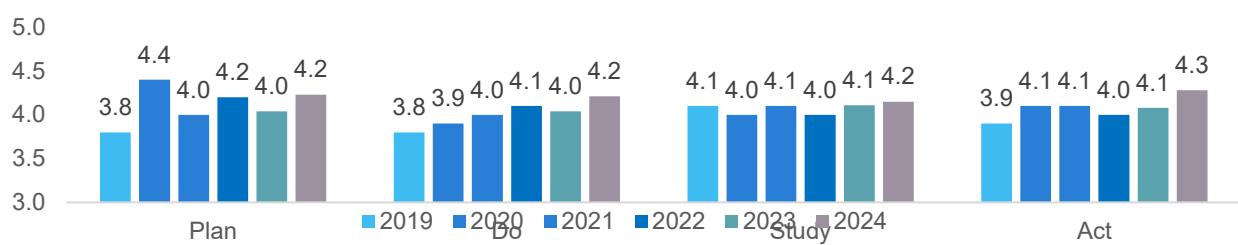
Additionally, when comparing across years 2023 and 2024, responses for these items were mostly positive, with mean score increases for 14 items. The highest rated item in 2023 at 4.38 was that the *institutional team uses PDSA cycles to spur improvement in testable iterations* (Plan) and the highest rated item in 2024, again at 4.38, was that the *institutional team determines whether the improvement strategy being tested should be adopted, adapted and re-tested, or abandoned* (Act). The lowest rated item at 3.77 for 2023 was that the *institutional team conducts research to clarify and further specify problems of practice prior to identifying and assessing strategies for addressing those problems* (Plan); for 2024, the lowest rated item at 3.95 was that the *institutional team refers to the First2 Network driver diagram to help identify problems of practice to address* (Plan) (see figure 10 for more details).

Figure 10. Mean Scores by Year 2023 and 2024 for PDSA Items From the Institutional Team Survey



Finally, figure 11 presents a visual depiction of overall progress for PDSA survey items across Years 1–6 (2019–2024). As noted above, items across Years 5–6 (2023–2024) asked members to rate their experience with PDSA items as an institutional team rather than as participants within a working group; for that reason, the evaluation team did not make comparisons. However, the patterns across the 6 years of the grant show First2 Network’s strength in sustaining PDSA efforts with overall mean scores above 3.5, on average. Specifically, by 2024, overall Do, Study, and Act scores common across Years 1–6, all showed a slight annual increase.

Figure 11. Overall Mean Scores by Year for PDSA Scales From the Institutional Team Survey



Institutional Team Survey Summary

In sum, respondents had positive perceptions about the First2 Network, especially for its progress in supporting network students and meeting network goals. They had similar perceptions about their institutional teams, again especially for progress in working together collaboratively, supporting students, and giving students leadership opportunities. Their perceptions about PDSAs showed little variation among the Plan (mean of 4.23), Do (mean of 4.21), Study (mean of 4.15), and Act (mean of 4.28), indicating that all four cycles were viewed, on average, as more of a strength than a weakness. Furthermore, in comparison with the past year’s ratings, the institutional team PDSA scores increased slightly, indicating more positive perceptions of these activities as strengths.

3.2.7 Institutional Team Group Interviews

In June 2024, the evaluation team conducted six 1-hour virtual group interviews (one per site for Fairmont State University, Glenville State University, Shepherd University, University of Charleston (UC), West Virginia University, and West Virginia University Institute of Technology); the other institutions declined to participate (Blue Ridge Community and Technical College, Marshall University, and Eastern Kentucky University). A total of 23 institutional team members participated; individual institutional team participation included the following:

• Fairmont: 3 participants	• UC: 4 participants
• Glenville: 1 participant	• WVU: 5 participants
• Shepherd: 4 participants	• WVU Tech: 6 participants

Major topics included evolution of the institutional team over the past year, institutional team purpose and goals, facilitating and challenging factors affecting PDSAs, key outcomes, systems-level changes, sustainability efforts, student focus and engagement, student leadership opportunities, institutional team collaboration, suggestions for improvement, and the most beneficial support from the First2 Network and additional support needed (given the time constraints, not all sites were asked all questions). Responses are organized by these categories.

Institutional Team Evolution

All six sites identified a number of ways in which their institutional teams had grown or changed over the past year. Several universities saw an increase in team membership, including faculty members, students, and staff from an academic support center and student support services. Specifically, one interviewee described their site's institutional team as the "Dream Team" and noted that individuals are becoming more empowered in their decision making. Another university worked toward having at least one faculty member from each department, some of whom were experienced with the First2 Network and others who were not. Yet another university described personnel changes, including adding another member and transitioning two new students to the team as the two former students had either graduated already or were going to graduate and so stepped down.

I think we're figuring out our division of labor and figuring out whose responsibility is what. And that's actually our next step. We're emailing right now, talking about getting together, and figuring out who's in charge of what PDSA. Instead of a team effort, we have to have one driver for each of those things, so that way things don't fall between the cracks.... So we're figuring it out. We're dropping a few balls here or there, but I think we're picking up other balls and making sure that those aren't dropped. – Institutional Team Member

Two sites were rather unique in their circumstances. One university started the institutional team in March 2024 and has since expanded that team of three faculty members by adding two students, a dean, another faculty member, and two TRIO [Upward Bound, Talent Search, and Student Support Services] staff. Staff from the other university noted that additional faculty and the director of a STEM collaborative have started participating in institutional team meetings but reflected that a university-wide academic transformation initiative has limited their ability to focus on institutional team responsibilities. One interviewee commented, "At times it felt like

there wasn't any capacity to do what needed to be done for the institutional team, although we did it. But it led to us feeling extremely overwhelmed, as well as uncertain, about what the future held for our department, for colleagues, and for ourselves."

Institutional Team Purpose or Goals

When asked to articulate the institutional team purpose or goals, four of the sites focused more on the concept of maintaining their current efforts. For example, one interviewee wanted to "maintain our forward movement and to do some PDSAs that had value for us or for our institution." An interviewee from another site was "striving for ways to increase mostly retention of first-gen students more than recruitment." Interviewees from a third site mentioned "figuring out how we're going to make it sustainable on our campus and take the best parts of First2, keep them, and then see how we can support our version ... our shift is how do we fund it, how do we support it, and how do we keep it, keep the best parts going that fit for us." And an interviewee from a fourth site wanted the following:

- *To make sure that First2 works, to make sure that it works for the students, to make sure that it's advantageous for the students to participate. To help them through not only the first 2 years but all 4 years so they know that they have somebody to rely on, whether it be other students or whether it be faculty and staff.*

Another site was more focused on a "primary goal of building a First2 Network on campus," while the remaining site was looking to expand the support provided to network students to the entire student population.

The thing we've done the best is supporting our student scholars; I think we've done a really good job of that. And then we've been starting to think about ... how do we expand that to helping more students at our university because that's the end goal... Most of the things that we've been doing that are successful have been helping our ... specific scholars. And so we need to [take] the next step, and we've talked about a few different ways to do that, how to spread that out to other students. – Institutional Team Member

Facilitating and Challenging Factors Affecting PDSAs

Facilitators. Two themes emerged as the facilitating factors supporting institutional team PDSA efforts. The first was the coaching provided by the First2 Network. Interviewees from multiple sites noted that while it is often difficult to schedule the coaching sessions, those discussions were helpful to fine-tune the PDSAs. Several illustrative quotes follow:

- *Especially discussing the surveys, just coming up with the questions ... I feel like I didn't have to do that from scratch by myself, so that was very useful to me.*
- *Working with the coach and sitting down and having an explanation of what this should look like. I think that's been really useful.*

That meeting [coaching session] was super useful in terms of having some other people with ideas to bounce ideas off of ... so getting in the room with them is always really helpful. – Institutional Team Member

The PDSA template was another facilitating factor for several sites. One interviewee noted that having the template is helpful because it provides a lot of information about what others have done. Another individual was “a huge fan” of PDAs because they formalized “how things are working and what we might want to change or do better in the future.”

One person shared the following:

- *Historically, we plan big, but we don't really have a focus. We'll say we want to do this amazing thing, but we don't actually have goals laid out and timelines and everything. And the PDAs are amazing for actually making us go through the entire planning process. And so I think one thing that we're all going to take away from this is learning how to do this, teaching others how to do this, and really getting ... everything working with this concept of these PDAs because I think that it's going to be amazing when we can actually start talking about here's where we are, where we're at, as opposed to us just saying, we have this great idea ... and we never actually have a plan on how to do it.*

Challenges. All six sites identified specific issues that served as challenges to their PDSA efforts. More common barriers included implementation delays related to coaching and the ubiquitous issue of too few people to do the work and not enough time to get everything done. Several sites provided detailed examples about coaching issues they had encountered, as noted below in the following quotes:

- *When I was following the protocol on requesting a coaching session, it said on the template to look at the calendar, which I thought it was great to have a calendar to check what will work the best. And what I found was that the calendar was not updated at all. So it was sort of like, I just picked a day and crossed my fingers and I hoped that that day will work. And it did, so that's why I said that was sort of lucky. If I hadn't just picked one day, that could have been a point where I said, "Well, I'm going to stop here." And it probably wouldn't have gotten further than what it did in a timely manner.*
- *In the beginning of the year, the PDAs and the coaching started out as being really intense and overwhelming and beyond.... There was a point where I was like, "Well, I already have IRB [Institutional Review Board] approval for this, so if you don't want to approve it as a PDSA, or if you want me to make all these changes, then I'm not going to submit it as a PDSA, I'll do something else." And then they're like, "Okay, no, no, no." ... But I just had [a] PDSA closeout and that closeout was so short and so quick and so I think they have taken the feedback that we've given them and modified things through the year.*
- *The coaching became an issue for us in the fall with our very first impromptu lecture. It was submitting an email, waiting to hear back.... Actually, what ended up happening is we didn't get pre-coaching before we were able to do the ... lecture because we didn't hear back.... It was ... and it continues to be ... a challenge with the coaching. Just getting a quick return on emails when we submit for coaching, hearing back something.*

I actually like the PDSA format ... it gives me a good way to document what we're doing. So I like them in a sense because I feel like it's how you do research anyway, so I think it's good practice for the students as well. – Institutional Team Member

Several sites shared insights related to a lack of time and too few people to carry out the work:

- *The things that hinder are just my own schedule ... I can have the best ideas in the world, but having the time to see them through, follow them through, and implement them, I don't know.*
- *You really have high expectations for yourself and your engagement in this PDSA and then just work gets in the way and it just keeps getting pushed to the back burner. And it's not that you don't recognize that this is valuable, but it's like I've had on my [calendar] here to take a closer look at the data every week for the past 2 months. It's just something else more critical with a shorter timeline keeps coming up. And so I just keep pushing it off, pushing it off, and it's now summer and I still don't have time. There are just only so many hours in the week. And that, I think, is what's frustrating for me. It's not that I don't want to, it's not that I'm deliberately just ignoring it, it is just that busy.*

Interviewees across sites identified a number of challenges that were unique to their institutions. For example, one site discussed how being a large university made it difficult to respond to a “lot of asks” coming from the First2 Network with short deadlines. One interviewee commented, “You can't just keep asking us for things and it's like, “we need it now” or “we need it yesterday.”

Another challenge to PDSA efforts was perceived to be requiring too many survey items for each PDSA. One individual noted that their students had “survey fatigue,” not only from participation in PDSAs but in the First2 Network in general.

Other challenges included a lack of internal accountability on following up on the status of their PDSAs, getting students involved in the PDSA activities, internal communication delays for promoting events, and delays related to Institutional Review Board practices.

Key Outcomes

Three outcome themes emerged across two sites each. One focused on improvements within respective institutional teams. For example, one site discussed having “done a better job of holding regular meetings” and having students become more involved in their institutional team meetings, and how they are working now toward more defined roles and expectations for members, as well as more accountability.

Another site noted their institutional team reset and started over, leading to “a great team ... we all work together really well.” One interviewee commented, “I just feel like I have a much better picture, a clear sense of what we want to accomplish, what we're trying to

We are really expanding our representation from different programs ... I also think we are trying to find out the best thing that works—how do we recycle things, how do we improve, modify, or [on] what area we have to focus. So I guess those are the things right now [that] our team is working on and I'm really excited. – Institutional Team Member

I think all of us have really, really grown our knowledge of what it is we're trying to do. And so I think looking toward next year, I really think we're going to be able to use that and better everything that we were able to do this year. – Institutional Team Member

accomplish than when I was first involved in this. And it really does lead to and go back to a good team dynamic."

The second theme focused on PDSA efforts. As an interviewee at one site noted, "The PDAs have been the inspiration to put in motion things that have been talked about for a long time," and went on to describe a PDSA planned for next year that provides students with both math and physics support. An individual from another site noted that while faculty are interested in helping students do better, they are not "necessarily going to jump on and direct an activity," so their institutional team is building up to five modules over the summer to implement as PDAs in the fall, focusing on time management, email etiquette, note-taking skills, and similar topics.

The third theme focused on increasing engagement within respective campuses. One site described how they have refined their communication efforts to target specific audiences rather than the entire campus. "So I

think we're doing a much better job now of communicating with the people [who] actually should be hearing about this, not the broader campus, but focusing on them and trying to engage them and inviting them." Another site noted increased "crosstalk" among campus departments, as well as expanding team members' access to a wider STEM community, including both faculty and students.

An outcome noted at one site focused on First2 student accomplishments—such as two students winning Barry M. Goldwater Scholarships, one student collaboratively working with faculty to carry out research about First2 students' research experiences and then co-authoring a manuscript currently out for review, and students becoming empowered through First2 involvement.

Other unique outcomes included getting a campus club started at one site, adding a first-generation question on one site's student application form, and creating a Student Success Center at another site where students can meet and work together in small or large groups. Illustrative quotes follow:

- *I think one of the things that hindered getting the club up and running is we don't do, and have never done, a Summer Research Immersion Program. And so our students have never gone through anything like that so they didn't have that inroad into First2. So getting them up and running and really understanding how things work, it took time.*

I mean, we've never had a real relationship with TRIO [Upward Bound, Talent Search, and Student Support Services], for example, and this is allowing us to actually have a relationship and for the first time for the sciences to actually build up a relationship with CME [computer science, math, and engineering] because even though they are sister departments, if doesn't mean that we've actually had a good relationship with them. They've done their thing; we've done our thing. This actually forces us to have at least some linkage between us. – Institutional Team Member

Through the years, I think the students really have gained a lot of authority over their, I don't know, trajectory.... It's really refreshing seeing that we've had some real power players in terms of leadership and seeing them develop. – Institutional Team Member

- *The other big thing that is super-duper exciting is we're actually creating a room, a space for students, which is something that's been desperately needed, but joining First2 and having the PDSAs and the funds has actually allowed that to move forward.*

Systems-Level Changes

Several sites identified systems-level changes that were already occurring or that they were working toward. Two sites identified existing changes, as illustrated in the following quotes:

- *I think one of our newest PDSAs is actually a really creative way of getting students involved in PDSA work, as well as advocating for first-generation students. And that has to do with our LEAD center and evaluating the effectiveness of tutoring for students. So, yeah, I think that's something that has come out because we have all of these things in place and we are reflecting on what we need and what could be useful.*
- *It's already had results. The work that First2 did to get students to be able to reclaim the Promise Scholarship, for example. That would be one.*

Two other sites identified systems-level changes that were underway. One interviewee from a site described their focus on ensuring departmental representation and bringing in staff from administration and other student support services.

This individual also described a student-generated suggestion for having network students serve as ambassadors to other student clubs and noted their team's desire for each faculty member to carry out 1- or 2-month-long PDSAs. Another site was focused on seeing a full year of campus club engagement.

Another aspect that our students came up with very recently was that they like to have some sort of an ambassador for each and every student club that we have on campus. Rather than we recruit people to First2 Network, they would be a part of their, let's say mechanical engineering club or electrical engineering club. So they would still be a First2 Network member and being there and talking to them saying, "This is what we are doing, why don't we do something similar for mechanicals?" They [non-network students] might come back and visit [the] First2 Network, they don't necessarily [have to] be a member of it, but at least they would be able to understand what the PDSA is, what we are trying to achieve. – Institutional Team Member

Sustainability Efforts

When asked to describe efforts undertaken by each institutional team related to sustaining their efforts after First2 Network funding/support ended, each site has unique descriptions of their sustainability strategies. One institution has aligned their First2 work with their Foundational STEM Collaborative, given its shared goal of helping students persist with their STEM majors, and they are researching the possibility of student directors taking on AmeriCorps positions to replace their current network-funded financial support.

Another site identified numerous tactics to support sustainability, including determining the impact that First2 is having on their students, synthesizing and presenting results to institution administrators, and writing grants to sustain some components currently covered by network funding (such as a recent NSF Scholarships in Science, Technology, Engineering, and Mathematics Program [S-STEM] proposal).

A third site focused on finding alternative sources of funding for students, trying to balance faculty workloads so they can carry out change ideas without financial compensation, institutionalizing PDSA coaching so external support is unnecessary, institutionalizing PDSAs, expanding the campus club to all STEM students via a STEM Council, and joining forces with their current NSF S-STEM undertaking.

An interviewee from the fourth site noted that their institution was working through sustainability plans and noted, "I think with what we have developed or planned for this next year, that's really going to help set us up. I don't know that we're quite there yet, but we are much more aware of it." Specific ideas mentioned included a service-oriented mission, faculty research and professional development, more student leadership ("take more ownership ... and really start to lead the way and then we become more of the support system").

Interviewees from the fifth site identified several things they were pursuing, including additional grants, visiting the capitol to talk with legislators about funding, and researching the possibility of having student positions funded through AmeriCorps. Similarly, the sixth site noted pursuing grants, including partnering with other institutions for an NSF S-STEM proposal and an Appalachia Regional Commission grant focusing on jobs, job placement, and career opportunities. Furthermore, one interviewee noted that because the campus club is now a formal club on campus, institutional funds are available to help support activities.

Student Focus and Engagement

Student focus. Institutional teams were asked how they kept a conscious focus on students at the center of their work. All six sites reported an explicit focus on students, and two themes emerged across the sites. The first focused on the importance of student voice to inform and drive the work of the institutional teams. Illustrative quotes follow:

- *We've all been very inclusive of the students. We really want to hear their voices.*
- *I think this team does really great with the students. I think this is the highlight of our team ... trying to gather their voice before making any decisions.*
- *So we are very much student-driven ... we really listen to what they want to accomplish.*

The second theme focused more specifically on the work undertaken at each site on the PDSA efforts:

- *Every one of our PDSAs is student centered and since the PDSAs are the work of the group, it's hard not to be student-centered.*
- *I'm always running ideas by them to make sure, "Is this a good idea? How should we do this?" Because there's no point in enacting any idea that students think isn't going to be worthwhile.*

We're institutionalizing the concepts that First2 [brought about]. The building blocks are there, so we're trying to put them back into [our] control and how can we fund that and make it sustainable. – Institutional Team Member

I will say that the majority of the things that we do are led by the students. We have input on it, but they took the lead, they led the meetings, they led the events. So I don't even see this as our thing that students join us on. I actually kind of see it as the students' thing that we join them on because they've taken such a large role in that. – Institutional Team Member

- *All of the change ideas are about students, so I would say the goal of improving things for students is behind all of the decisions and plans we're making.*

Student engagement. Institutional team members across sites shared a variety of ways in which students were engaged with their teams. All six sites confirmed that student directors were encouraged to attend institutional meetings, yet nearly all sites noted that this was a challenge, given students' busy schedules and commitments. Across sites, there was a continuum of no student involvement, to sporadic student involvement, to continual student engagement.

Several interviewees mentioned specific strategies that they were employing to help address the issue of limited student engagement in institutional team meetings, including holding those meetings in conjunction with campus club meetings and scheduling institutional team meetings based on student director availability. Several sites explicitly stated that all First2 students are welcome to attend institutional team meetings, but noted such attendance was rare.

Other types of student engagement varied across sites and included such things as having faculty attend campus club meetings to secure student input; asking for student feedback via email communications; involving students in planning, leading, and implementing PDSAs; and having students present at network conferences. A few illustrative quotes follow:

- *While [the students] might not be involved in the implementation [of PDSAs], I know especially this next cycle, the PDSAs, a lot of them came directly from their feedback. So they might not be the muscle behind it, but they are the thought behind it.*
- *At the few club meetings we've had, we've actually had students who are club members who have come up with ideas that have shaped how we've organized and communicated with the other students on campus.*
- *I would say that over half of what we got done wouldn't have gotten done without them [the students], and that is pretty darn amazing.*

Student Leadership Opportunities

Student leadership. Institutional teams were asked to describe ways in which students had been given or taken leadership opportunities. All six sites provided numerous examples of various leadership opportunities, which mostly focused on student director opportunities. Examples include involvement with First2 Network conferences (attending and presenting), PDSA involvement, planning/facilitating campus events, holding campus club roles, serving as mentors, collecting and analyzing student input via surveys, conducting research for publication, receiving Goldwater Scholarships, political advocacy for First2 and the Promise Scholarship at the State and national capitols, and serving as conduits to connect First2 with other campus programs. A few illustrative quotes follow:

- *I mean, those Goldwater scholars ... you have to show leadership. These are exemplary leaders throughout the Nation.*
- *First of all, you have students who may have never even seen the State capitol or the Capitol in Washington, DC, and now they're learning about how government works. And then they're talking with legislators or ... the legislator's representative.*

- We do have students who are going to be mentoring during the workshop that we have prior to the fall incoming class. We've got a couple of First2 students [who] are going to be mentoring those students and kind of shepherding them through that process.

Perceptions of students as partners. When asked if students taking on those leadership opportunities had influenced their perceptions of students as partners in the network, most sites provided positive examples.

The general consensus was that students rose to and exceeded expectations when given the autonomy to take on leadership roles and that seeing students' accomplishments helped them ensure that students' voices were included now as a way of doing business (i.e., embedded within practices at their respective campuses). A few illustrative quotes follow:

- I was scared of giving them authority, that this thing would just collapse, but actually I just sit back and see what they do.... I don't know if all of us have felt that, but them gaining authority throughout the way was really very ... lovely to see, really cool to see.
- We're not trying to change the students to fit in with the way things are. It's like we're trying to change the way things are to meet the students where they are so that they can succeed. Because they're not going to succeed if we don't meet [them] where they are.
- I know that First2 has created a big shift in my thinking because when I first started, it was not including the students in any of the decision making ... it was, we're going to do what's best for the students. That was my mindset.... But now, it's just, it's the first thing, that's the first thing we ask, "Can [students] join us for this?" It is now part of the way I process and think, and I look around the room in my meetings that I'm in, and I go, "Where are the students? Where's the student voice here?" So that has really shifted for me a lot.... But I also have recognized that while we want them to join us, it's hard to get them to engage.... So now it's our job to make them use their voice. We're getting them there, we're involving them, now it's time to train them to use that voice.
- The main ways that I think [this] has changed my view of leadership, it has been through the directors, because they're the ones that have the most impact and the most connection with us as faculty.... Basically every single student we've had who's been president has just taken it on like all the different things that they can do, they want to do, and they go above and beyond. And then that makes me realize, "Oh, these are things that students could be doing, these are things that students should be doing." How do we make it so that the ... success stories of last year turn into our ... success stories of next year? How do we take the things that the students are doing well and try and replicate it? ... So I definitely think that some of our students have been great role models for us in terms of what can our students be doing and what should they be doing. It's just [that] we need to figure out how to spread that to other students, how to scale it up.

I can say that I changed it totally because ... I was so fearful about giving [students] more [responsibilities] ... and then we ended up giving more and more, and now it opened my eyes on how you can give students autonomy and they will succeed.... I saw how they can flourish. It changed the way I deal with other students. – Institutional Team Member

Institutional Team Collaboration

When asked to describe their team's level of collaboration or interaction among members, three themes emerged—a focus on meeting operations, a focus on campus engagement, and a focus on engagement with the First2 Network.

Three sites reflected on how their teams met and communicated, noting such things as meeting more regularly, having more members on their teams, and how email messaging was a predominant method of communication among members.

I will say we've done a better job of holding regular meetings, that was something that the Steering Committee recommended to us. And also having the students ... be more involved in institutional team meetings, and they have been. And that's been productive, I think. I think [there] could still be better communication between the faculty and the students, but I think it's been better in the last year because we've been including them in all our activities or our meetings. – Institutional Team Member

One interviewee, in reflecting on the institutional team's interactions over the year, noted, "This is actually physically a team that is meeting and planning and figuring out who's doing what in the division of labor. And so we have transitioned from a team on paper to an actual team."

Three sites focused on their engagement with the First2 Network:

- *I think anytime that you can work closely with other institutions, when you're in that same population, it is helpful. You learn from each other.*
- *I think this summer, especially, has opened my eyes to how we can connect with the wider First2 Network, because going to the conference and meeting other people and hearing their ideas and how their PDSA cycles have worked ... has been amazing, really beneficial.*
- *We were able to attend ... the first-gen in West Virginia [conference].... We actually sat with a bunch of the First2 leadership team at that conference, and so it was a neat way to collaborate when we would have some discussions. So that was one way that I didn't anticipate we would interact with them and work with them.*

Finally, two sites also focused on their teams' engagement with their respective campuses, as illustrated by the following quotes:

- *I would say the thing that has impressed me the most is the level of engagement now. I think we have gotten better at communicating with the rest of the campus. We now update the entire college twice a year on what First2 is doing. And I think we're doing a better job of bringing more folks into functioning roles in First2 ... as opposed to informational things. So all of us got in front of the faculty and presented and updated them on the PDSAs, what we were planning to do, and then this last month we got there and said, "Here's what we've done. Here are the data and here's what we're planning on doing in the fall." So we're getting better at communicating and we're getting better at engaging more people.*
- *It is really great to get to spend the time and it's relationships and connections that benefit us in our roles and benefit students. And so I do like the fact that while it's more*

things to add to the calendar ... it's also very beneficial in forcing us to connect for the benefit of the whole university and our students.

Suggestions for Improvement

When asked what ideas they had for enhancing the work of their institutional teams, three common themes emerged, along with a number of idiosyncratic suggestions. Four of the sites specifically mentioned their desire to not only increase faculty and administrator involvement with the institutional team but also to better utilize each individual's specific expertise. A few illustrative quotes follow:

- *I always think it's great to get as many faculty involved as well.... I do think we need buy-in from everyone for sustainability.*
- *I think being more strategic about tapping people's strengths and skill sets and engaging the new faculty as they come in, because this is great work for them for P and T [promotion and tenure] and service to the institution.*
- *Having more people involved would be nice ... expanding the team.... I don't know exactly what that would look like, but, yeah, figure out where their expertise can fit in better for us.*

Two sites focused on increasing student involvement with the institutional team:

- *I would love to see the formal meetings as a means for communication between the two groups because we have the student club and we have the institutional team. And there's overlap, but it's not 100 percent.*
- *I would definitely like to be able to have our students in on our institutional meetings, so I'm hoping that, with their schedules, we can find some time that's common to everyone because I think it's important.*

And two sites focused on ways to improve their institutional team infrastructure (i.e., better onboarding for new members, assigning specific roles to team members, and clarifying roles and expectations):

- *I think that one of the things that I've run into is, as a student, it's not necessarily knowing what the, I guess "rules" is a strong word, but how an institutional team is necessarily 100 percent supposed to work, what we are supposed to be there for, and what we should respond to and that kind of thing.... Just communicating what we should be doing and what the expectations are, I think, is really important.*
- *We could have done better with onboarding.... Just in terms of things we should be doing in the future is better assigning roles to people so that people know how they specifically can contribute.*

A number of other suggestions were identified across sites, including a campus depository for institutional team materials, increased accountability for PDSAs, expanding services to all

One of the PDSAs that we had for this coming year was coffee chats with faculty. And part of the goal with that is to get faculty more involved in, not the direct planning of everything, but the helping of everything.... We're trying to get a dedicated time [to talk with faculty].... We can talk about different aspects of what we're trying to achieve with the PDSAs that particular semester, and how they can be involved without having to be massively involved.

– Institutional Team Member

students, and providing leadership opportunities for more students. In addition, one site focused their suggestions at the First2 Network level, suggesting fewer requirements for faculty and student feedback in general, and fewer student requirements specifically.

First2 Network Support

Most beneficial support.

Members across institutional teams identified numerous examples of the most beneficial support provided to them by the First2 Network. The most commonly mentioned supports were the responsiveness of the First2 Network in trying to address issues raised by network members, the network conferences and the opportunity to interact with members across sites, the PDSA support and coaching, and the financial support. A few illustrative quotes follow:

- *But what was most helpful is they provided a little bit of grace and flexibility with us on timing and the opportunity to make revisions [on the last proposal]. I think they knew we were still getting our feet planted and our bearings, and so we really appreciated that and we were able to put together something that I think was very positive and in the right direction. So that was a nice support to have from them.*
- *The most valuable interaction with the network was at the conference when some of us [across sites] were talking ... and voicing a lot of these concerns because we had to voice them as we're planning on moving forward.... And then a lot of just finding out that there are a lot of similar issues on different campuses and just being more blunt, and that feedback being received very openly, at least at that moment, made me feel very heard.*
- *Actually the money that supported us, even though the money isn't a lot, it keeps me like, "Well I'm getting paid. I better do this. I have to get this done." But again, you're really doing it for the students. The little bit of money we get does help a little bit.*

Other supports included the on-site visit by First2 staff to provide onboarding and an overview of the network and the institutional team check-in visits held in October 2023 and February 2024. A few illustrative quotes follow:

- *It was so beneficial when [First2 staff] came to campus to have these moments where she would explain the First2 Network. Do you remember the onboarding thing? ... I think that was so impactful, at least for me, when they came.... They would go ... over the First2 Network, how this idea started, when the first grant was submitted.... So every time that the First2 Network comes to us, it's very beneficial.*

I've always viewed First2 as being very responsive. So here's an example.... They let us know that the quarterly report is coming.... And First2 ... said, "Okay, we're going to do a better job of helping you. That's the goal, ... but now you have to schedule this meeting so we can help you." ... But then that imposes one more meeting on us that we're trying to do, but they are listening ... and they are trying to help us navigate this. It just sometimes backfires in a way. But, having said that, after the stress of scheduling that meeting was over, we had the meeting, it was very useful, we could figure out what goes into these things and now we have a system.... So I will never complain about [the] First2 Steering Committee and their Executive Committee and what they're trying to do. They are listening, they really are listening.... But never would I ever say that the leadership team has not been responsive and hasn't tried to do really good things. – Institutional Team Member

- *The institutional team check-ins, I think, have been useful.... Getting a better understanding of what the team is doing and needs to be doing, that was very helpful. Part of the leadership group got together with each institutional team and did a check-in and went over "How are things going? Remember this is the list of things that you're supposed to be working on. This is what we need." And that was helpful.*

Additional support needed. When asked what additional support was needed from the First2 Network, the most frequently mentioned topics were a reorganization of the network website and Google Drive, and better communication about upcoming deadlines and changes.

A few illustrative quotes follow:

- *I find that file management is a little bit confusing, because even on the First2 Network page, like the overview site and everything, I can't find anything to save my life.*
- *Yeah, a better place to house our documents and go through them and store them. I mean, yeah, that whole system is not user-friendly at all, and it can be frustrating because then you can't find a document you've used before.*
- *There's a lot of things that they want and there's a lot of due dates that they're like, "We want this now." ... And just better communication.... So they just made a calendar and I think the calendar is going to help; it's linked in through the First2 Network website.*
- *Just better forewarning of deadlines and expectations. And I know sometimes it comes up on them as well, and I know they're putting in place a calendar, but it just feels like last-minute requests. It's tough.*
- *I think better transparency and especially when they're making changes across the board would be helpful. We've found out that the network was changing the way scholar positions were going to work between this year and next year, and I told my students about that.... And then I mentioned that to our First2 leadership and they were surprised that I had seen it. Especially if this is going to happen between spring and fall, this isn't something that we can wait until the May conference to talk about, this is something that should be brought up because not every student goes to that [conference], not every faculty goes to that.*

I feel like I have to say this every year, reorganize the Google Drive, or kill it. And same thing for the First2 website—reorganize it or kill it. The website and the Google Drive, revamp them or kill them, I don't care which. – Institutional Team Member

Miscellaneous

At the close of each session, interviewees were asked whether they had any additional comments to share about their experiences with their institutional teams. Several individuals responded; their comments focused on the First2 Network in general or on their teams:

- *Hopefully, it'll be beneficial to us and ... to the institution, and eventually beneficial to West Virginia ... and hopefully it'll be a role model for the United States.... People can copy from us and try to learn from us what we have done for 5, 6, 7 years.*
- *I genuinely think that joining First2 and working with the larger First2 Network has been an overwhelmingly positive experience in terms of learning new things and things that we can improve about our school and what's going on in the wider, I guess, West Virginia STEM atmosphere. I think it's been amazing, wonderful.*
- *I think that we just have a great team this year and with the planning meeting that we had back in May, I feel a lot better about the coming year that we've already got plans in place for what's going to happen.*
- *I think it's a small group, but I think it's been a big learning curve for all of us. Even me, even as involved as I've been in the First2 Network, this is very different than being involved in, say, the faculty-student engagement working group.... I think we have a better idea of what we need to do, and we'll make next year maybe run ... smoother.*

I would just like to say that as much as we get frustrated from time to time with things, this has been an amazing experience working with people from all over the state. And we don't say that enough.... What an opportunity to network with all of these wonderful people from all of these institutions and being able to get together and meet and be together once a year. That is such a valuable experience. That spring convening is probably one of the times where I really, really appreciate what happened that previous year.... And so I've watched the growing pains. I've been involved with this, in some form, from its inception.... So I have watched this thing evolve from a little spark ... to this synergy that has become First2. – Institutional Team Member

Institutional Team Group Interview Summary

In sum, participants across all six institutional teams had evolved or grown over the past year. The cross-cutting goal of supporting first-generation students and maintaining those efforts was clear across sites and all sites reported a conscious focus on students, with numerous leadership opportunities for student directors. The most common facilitating factors for PDSAs were coaching and the PDSA template provided by the First2 Network, while the most common challenges were implementation delays related to coaching and not having enough people involved to complete all the tasks in a timely manner.

Key outcomes across sites included improvements in institutional team operations, PDSAs underway or completed, and better communication and sharing about the network within each campus. Systems-level changes were identified at both the network and campus levels, and all sites had clear sustainability strategies planned or underway. Suggestions for improving institutional teams included increasing faculty/administrator involvement and better utilizing members' expertise, increasing student involvement in the institutional team, and improving team infrastructure. Participants recognized the responsiveness of the First2 Network

leadership as the most beneficial support and suggested that reorganization of the network website and Google Drive, as well as better communication about deadlines, were the areas most in need of additional support.

3.2.8 Conference Feedback Forms

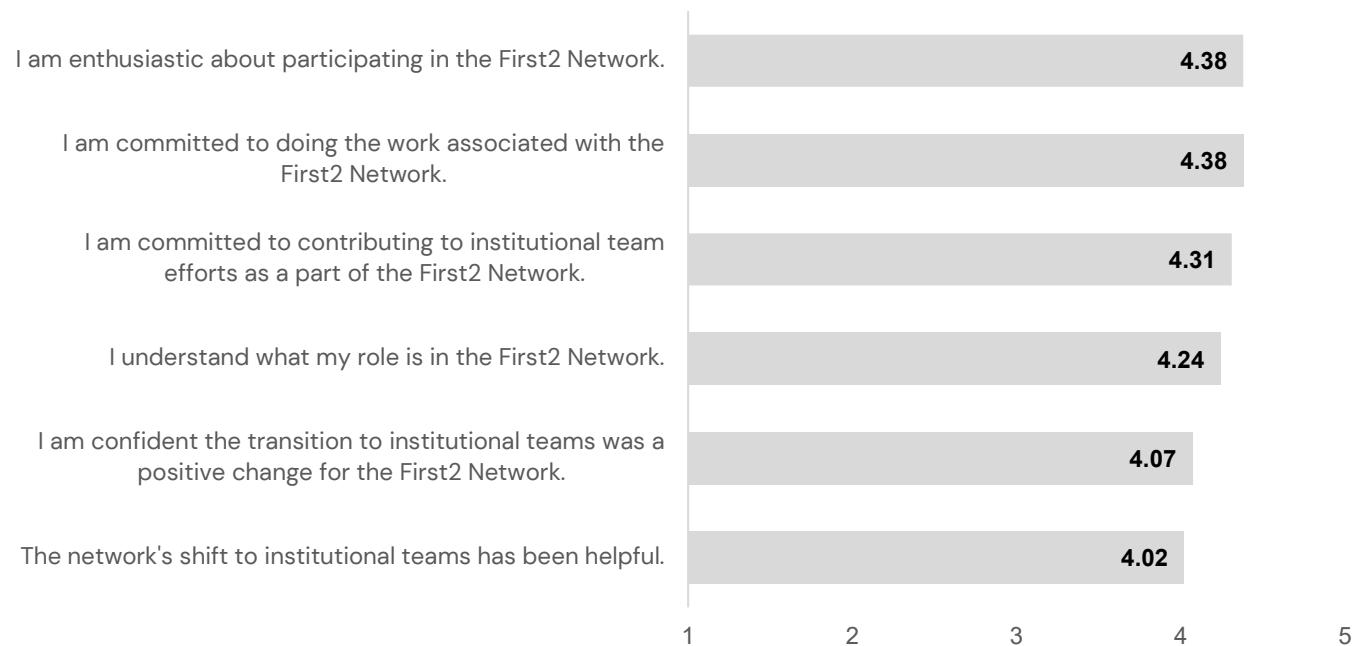
Participant feedback is secured following each First2 Network conference via an online survey. During Year 6, First2 hosted a virtual fall conference November 17–18, 2023, and an in-person spring conference May 16–18, 2024.

November 2023 Results

A total of 55 respondents completed the online survey. More than half of the respondents (62 percent) were members of an institutional team within the First2 Network, 13 percent served on the First2 Network Steering Committee, 11 percent were new to the First2 Network, 9 percent were network members but not involved in any institutional team, and 6 percent were aware of the First2 Network but were not involved. Seventy-five percent were students, 16 percent were educators, 6 percent were staff/administrators, and 4 percent were nonprofit/government/other.

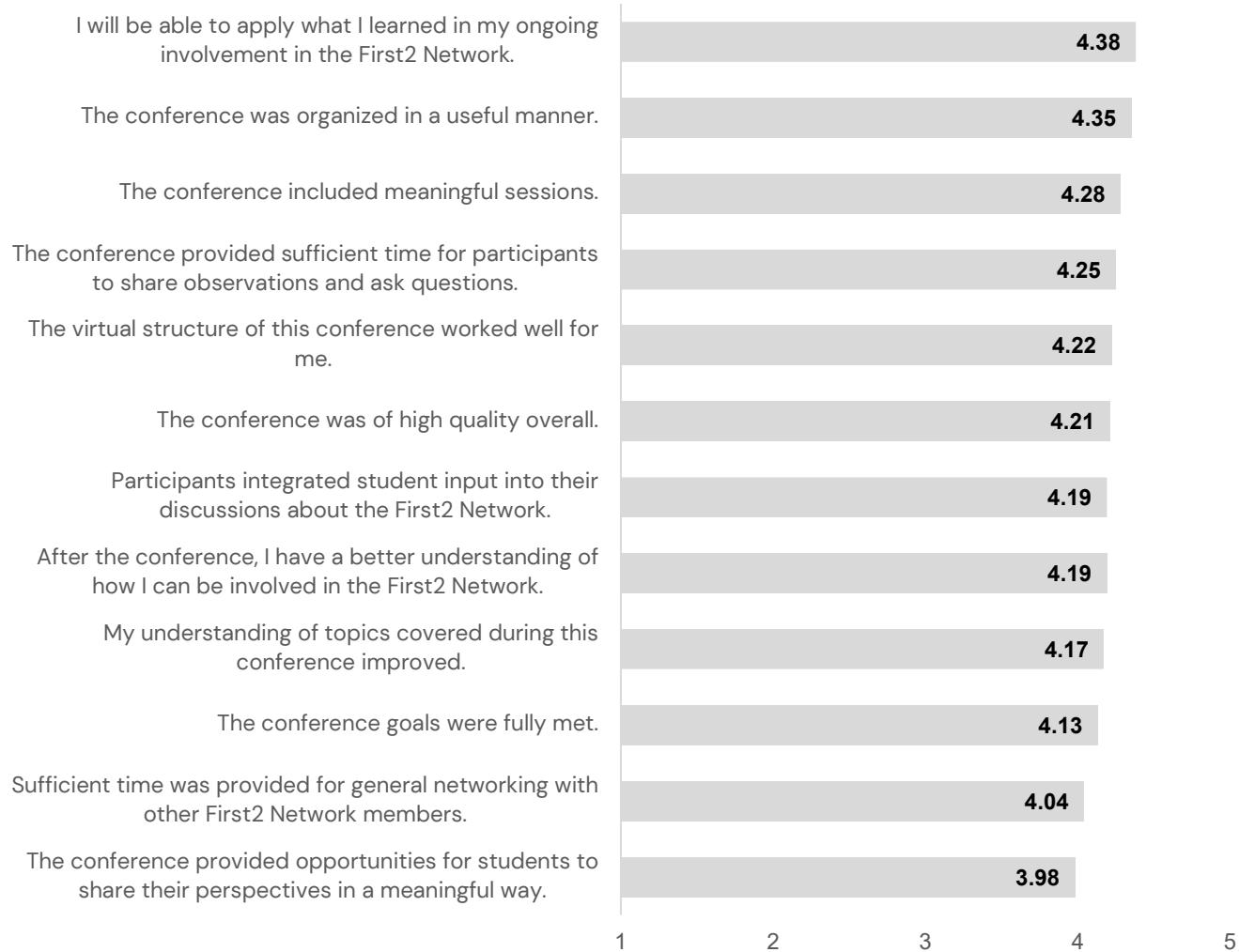
Participants were asked to rate six items about the First2 Network. Responses for all six items were very positive, with mean scores above 4.00 on a 5-point scale of *Strongly disagree* (1) to *Strongly agree* (5). The highest rated items at 4.38 were that they are enthusiastic about participating in the First2 Network and they are committed to doing the work associated with the First2 Network. The lowest rated item at 4.02 is that the network's shift to institutional teams has been helpful. Figure 12 shows the item response means.

Figure 12. First2 Network Item Mean Scores for the November 2023 Conference



Respondents were asked to rate 12 items about the conference. Eleven of these items had mean scores above 4.00. The highest rated item at 4.38 was that they would be able to apply what they learned in their ongoing involvement in the First2 Network. The lowest rated item at 3.98 was that the conference provided opportunities for students to share their perspectives in a meaningful way. Figure 13 shows the item response mean scores.

Figure 13. Conference Item Mean Scores for the November 2023 Conference

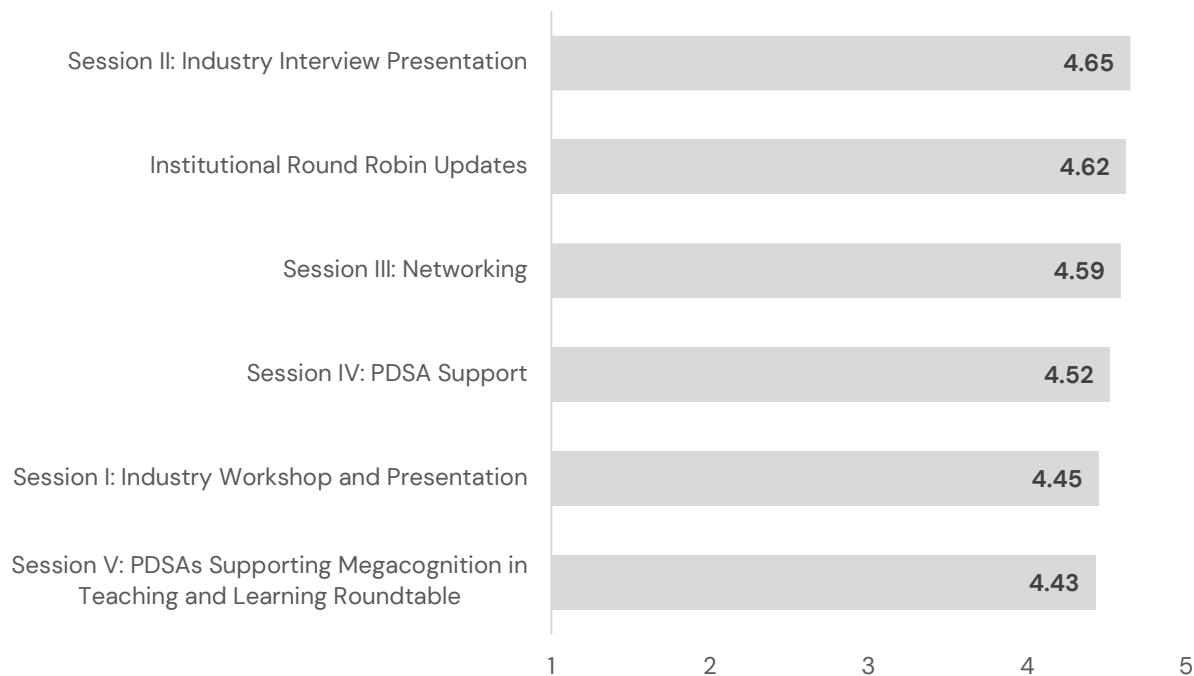


Respondents were also asked to rate the value of each of the conference sessions they attended. Responses for all six sessions were quite positive, with mean scores above 4.40 on a 5-point scale of *Not at all valuable* (1) to *Very valuable* (5) (respondents could also select a *Did not attend* option if appropriate for any particular session). The highest rated session at 4.65 was Session II (Industry Interview Presentation); the lowest rated session at 4.43 was Session V (PDSAs Supporting Metacognition in Teaching and Learning Roundtable). See figure 14 for item mean scores.

In the final section of the feedback form, respondents were asked to provide comments for five open-ended prompts. When asked to identify the high point of the conference, 35 individuals responded, with the most common themes including the institutional team updates (including what PDSAs each institution was working on), networking opportunities and sessions, and the graduate breakout room. A few illustrative quotes follow:

- *A high point was definitely seeing the institutional updates in the beginning. I loved being able to see what other campus were successful in, especially as a new First2 member.*
- *I always appreciate the networking of the conferences, especially for industry.*
- *The high point of this conference for me was the Graduate Breakout Room.*

Figure 14. Session-Specific Item Mean Scores for the November 2023 Conference



When asked to identify what did not work as well, 35 individuals responded. The most common themes were timing issues, feedback on specific sessions, and overall positive comments:

- *Timing. The day that most students are forced to leave to go home for break is not excellent timing.*
- *I wish that [the] Thanksgiving travel weekend was not selected for the dates because, as a student, this made me have to completely reschedule travel I have had booked for months with just a few weeks' notice.*
- *The portion about MyNRMN [National Research Mentoring Program] was a little long. It was great information, especially about the resume builder, which I will be using.*
- *The meta cognition session seemed a little long and awkward in the beginning.*
- *Everything worked well overall.*

When asked what additional information was needed related to their work within the First2 Network, 24 individuals responded, with the most common theme being that no additional information was needed. A few respondents mentioned needing more information about the network and a few wanted more information about ongoing PDSAs. Similarly, 20 individuals provided responses when asked what support was needed from the network for them to become more involved, with the nearly universal theme being that no additional support was needed. One individual said, "I would like to see how to get more involved so that I can apply for leadership positions in the future."

The final prompt provided respondents an opportunity to make any other comments about the conference. Twenty-three individuals responded, with all indicating either that they had no other comments or providing a positive comment. A few illustrative quotes follow:

- *I really enjoyed this conference as usual! I was so happy to see many First2 members and folks interested in the network. Thank you for hosting!*

- *The conference was a vast improvement over previous iterations that I've attended. I think all the sessions were super helpful, and I really enjoyed hearing what everyone had to say. It was definitely a good use of my time.*
- *Best conference yet in my 3 years of First2! I feel like I learned a lot and all the sessions were interesting. I wish the breakout room on grad school had a little bit more time. I really liked that it wasn't just breakout rooms the whole time.*
- *I really enjoyed the conference. It was a great way for someone like me, who is very new to First2, to learn from those who are experienced and have been involved before.*

May 2024 Results

The West Virginia Jobs Network conference was held May 15–17, 2024, and the First2 Network conference was held May 16–18, 2024. A total of 40 respondents completed the online feedback form. The results are summarized below.

Nearly half of the respondents (45 percent) were members of an institutional team within the First2 Network (about half of these respondents were students), 15 percent served on the First2 Network Steering Committee, 15 percent were new to the First2 Network, 13 percent were network members but not involved in any institutional team, and 13 percent were aware of the First2 Network but not involved. Thirty-eight percent of the respondents were staff/administrators, 27 percent were students, 19 percent were educators, 11 percent were nonprofit/government/other, and 5 percent were industry representatives or industry partners.

Respondents were asked to indicate all the sessions they attended. The results are shown in table 13, indicating fairly high participation rates across sessions.

Participants were asked to rate six items about the First2 Network. Responses for all six items were positive, with mean scores for three items above 4.00 on a 5-point scale of *Strongly disagree* (1) to *Strongly agree* (5). The highest rated item at 4.30 was that they are enthusiastic about participating in the First2 Network; the lowest rated item at 3.77 was that the network's shift to institutional teams has been helpful. Figure 15 shows the item mean scores.

Figure 15. First2 Network Item Mean Scores for the May 2024 Conference

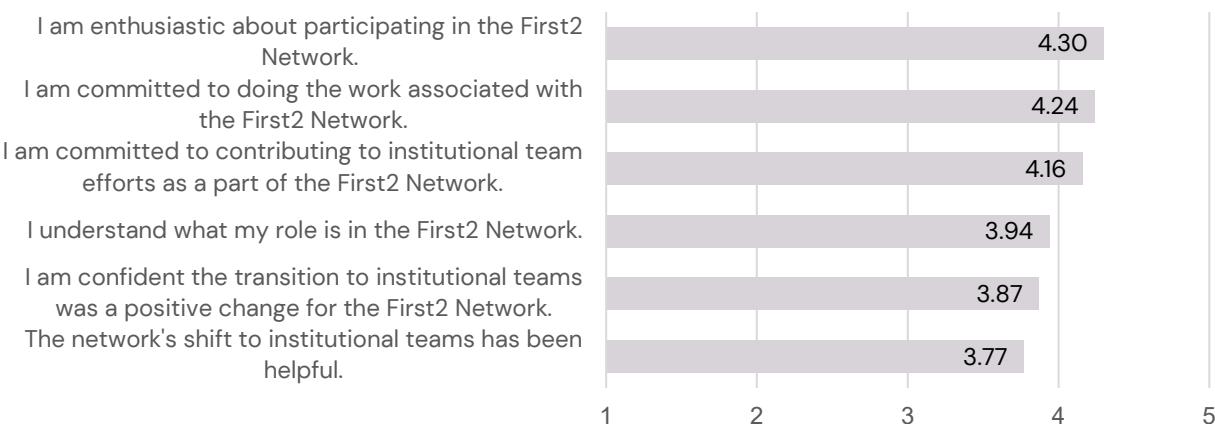
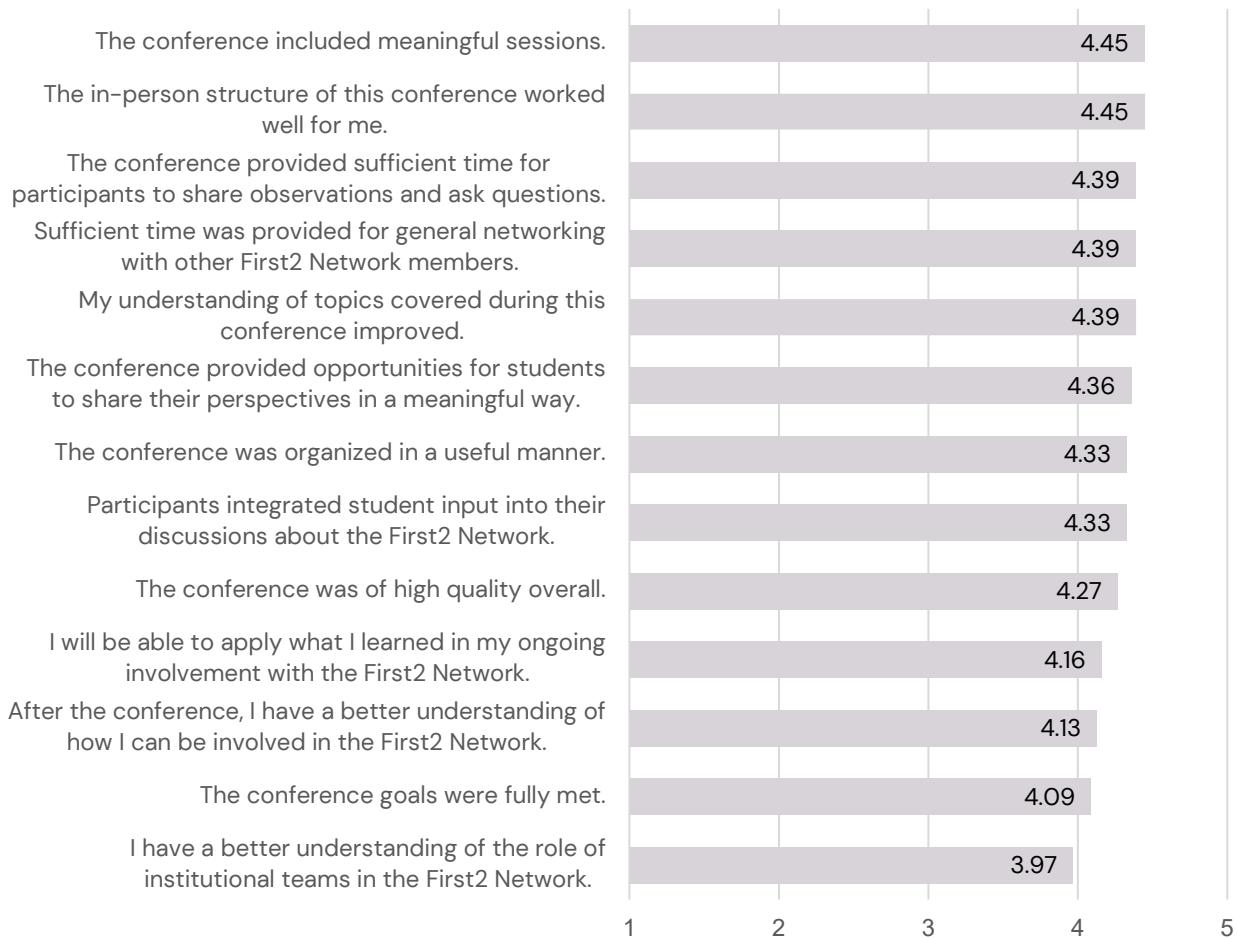


Table 13. Session Participation Rates for the May 2024 Conference

Day	Time	Session	Participation Rate
Wednesday, May 15	2:00 – 4:30 p.m.	West Virginia Jobs Network (WVJN) Steering Committee	5%
	5:00 – 5:30 p.m.	Welcome and Opening Session	18%
	5:30 – 6:00 p.m.	Introductions	18%
Thursday, May 16	9:00 – 9:15 a.m.	Welcome and Opening Remarks	33%
	9:15 – 10:00 a.m.	Introduction to the WV Jobs Network and the First2 Network	40%
	10:00 – 11:00 a.m.	State of the Workforce	40%
	11:30 a.m. – 12:15 p.m.	Resilient Leadership: Leading With Compassion	40%
	1:15 – 1:30 p.m.	First2 Network Welcome and Opening Remarks	53%
	1:30 – 2:30 p.m.	Landscape of Remote Work	55%
	2:30 – 3:00 p.m.	Power Skills	50%
	3:15 – 4:00 p.m.	Concurrent Session: Building Better Workplaces in WV	23%
	3:15 – 4:00 p.m.	Concurrent Session: Professional Development Series PDSA at WVU	23%
	4:00 – 5:00 p.m.	Concurrent Session: Mentoring and Mock Interviews Session	25%
	4:00 – 5:00 p.m.	Concurrent Session: Headshots	10%
	4:00 – 5:00 p.m.	Concurrent Session: Listening Session	25%
	5:00 – 6:00 p.m.	Career Connector Mocktail Networking Hour	38%
Friday, May 17	9:00 – 9:30 a.m.	Welcome and Agenda	65%
	9:30 – 10:30 a.m.	Tech Industry and Employer Panel	65%
	10:30 – 11:30 a.m.	Concurrent Session: One-on-One Snack Break	48%
	10:30 – 11:30 a.m.	Concurrent Session: Trends in Workplace Development	35%
	11:30 a.m. – 12:00 p.m.	Collective Impact	48%
	1:00 – 2:00 p.m.	Concurrent Session: Finding Paid Internships	15%
	1:00 – 2:00 p.m.	Concurrent Session: Appalachian Culture Survey	28%
	1:00 – 2:00 p.m.	Concurrent Session: Headshots	5%
	2:00 – 3:00 p.m.	Concurrent Session: Carnegie Summit Take-Homes & Future Resources	13%
	2:00 – 3:00 p.m.	Concurrent Session: PDSA Idea Exchange	48%
	2:00 – 3:00 p.m.	Concurrent Session: WVJN Debrief and Exit Steering	10%
	3:30 – 4:00 p.m.	Concurrent Session: Math Anxiety PDSAs	20%
	3:30 – 4:00 p.m.	Concurrent Session: Policy Advocacy Training	15%
	3:30 – 4:00 p.m.	Concurrent Session: Efficacy of an Embedded Student PDSA	28%
	4:00 – 4:30 p.m.	Concurrent Session: Faculty/Advisor Coaching	15%
Saturday, May 18	4:00 – 4:30 p.m.	Concurrent Session: Policy Advocacy Training	20%
	4:00 – 4:30 p.m.	Concurrent Session: Small Campus Struggles	30%
	4:30 – 5:00 p.m.	Concurrent Session: Faculty/Advisor Coaching	8%
	4:30 – 5:00 p.m.	Concurrent Session: Policy Advocacy Training	23%
	4:30 – 5:00 p.m.	Concurrent Session: Sustainability Support	18%
	5:00 – 6:00 p.m.	CPOs and Other Barriers to Success	45%
	9:00 – 9:15 a.m.	Welcome and Poster Introduction	58%
	9:15 – 10:15 a.m.	All Institutions PDSA Student-Led Poster Session	63%
	10:30 – 11:30 a.m.	Concurrent Session: Affinity Groups Breakouts	35%
	10:30 – 11:30 a.m.	Concurrent Session: Faculty/Advisor Coaching	10%
	11:30 a.m. – 12:00 p.m.	Concurrent Session: Engagement With Student Success Offices	23%
	11:30 a.m. – 12:00 p.m.	Concurrent Session: UC Impromptu Lectures	25%
	12:00 – 1:00 p.m.	First2 Network Steering Committee	43%

Respondents were also asked to rate 13 items about the conference. Twelve of these items had mean scores above 4.00. The highest rated items at 4.45 were that the conference included meaningful sessions and that the in-person structure of the conference worked well for them. The lowest rated item at 3.97 was that they had a better understanding of the role of institutional teams in the First2 Network. See figure 16 for item mean scores.

Figure 16. Conference Item Mean Scores for the May 2024 Conference



In the final section of the feedback form, respondents were asked to provide comments for five open-ended prompts. When asked to identify the high point of the conference, 23 individuals responded, with the most common themes including the networking opportunities (in-person, meeting network members, and conversations and interactions) and specific sessions (workshops, PDSAs, student panels, and the state-of-the-workforce presentation). A few illustrative quotes follow:

- *The high point for me personally was being able to finally meet all of the people that I collaborate with within the First2 Network in person and make real-life connections. It was also great to share ideas more easily with them.*
- *I liked that we were not confined to sitting in institutional teams. This fact, and the overall structure of the conference, allowed for more networking and meeting people from other institutions than previous conferences.*
- *The high point of this conference was all of the different session options that allowed for flexibility in selecting what was most relevant to you within your role in the network.*
- *Sharing information about the PDSAs, particularly when led by students.*
- *State-of-the-Workforce and Power Skills presentations.*
- *The panels were awesome. I think panels provide a great way for people to interact. The remote work and the one with First2 students were my favorite.*

When asked to identify what did not work as well, 20 individuals responded. The most common themes were overall positive comments and the distance to the conference site; other comments were idiosyncratic in nature:

- *Honestly, everything worked really well for me. In-person conferences are so much better than virtual ones. Interacting with people and brainstorming ideas are only possible in an in-person setting.*
- *The only issue for me was the location because it was a pretty far distance from my home.*

When asked what additional information was needed related to their work within the First2 Network, 16 individuals responded, with the most common theme being that no additional information was needed. A few respondents needed more information about the network in general; other responses were idiosyncratic in nature. A few illustrative quotes follow:

- *How is everything interconnected and what exactly is my role?*
- *Understanding who does what within the organization (resources and specific contacts).*

Similarly, 15 individuals provided responses when asked what support was needed from the network for them to become more involved, with the most common theme being that no additional support was needed. Several respondents requested more information and communication; other responses were idiosyncratic in nature. A few illustrative quotes follow:

- *A bit more information and communication about what needs to be done.*
- *[There is] always a need for more timely communication but it is getting better.*

The final prompt provided respondents an opportunity to make any other comments about the conference. Nineteen individuals responded, with the majority providing some type of positive comment. A few illustrative quotes follow:

- *I loved that there was more than one session occurring at a time, instead of just having one session and that is the one you had to go to for the whole conference. Having that option made it easier for me to be able to find the content and presentations that I was most interested in, and that also built my own institutional team.*
- *This conference was the best First2 conference I have been to after 4 years in the network. The WV Jobs Network and First2 should continue having joint conferences because I feel that the presence of both greatly enhanced the conference.*
- *The network members make the conference. Sharing what they have done fires me up to try things. The student PDSA presentations were awesome.*
- *I am impressed with the integration of our students in the operation of the network. It is an excellent example of getting our students to "co-create" the programmatic activities and requirements for student participation.*

Conference Feedback Summary

In sum, participants provided positive feedback about the two conferences, with most of the rated items higher than 4.00 on a 5-point scale. For the November 2023 conference, the lowest rated item at 3.98 was that opportunities were provided for students to share their perspectives in a meaningful way; for the May 2024 conference, the lowest rated item at 3.77 was that the network's shift to institutional teams has been helpful.

3.3 Systems Targeted by the First2 Network

Across Years 1–6, ICF used Latham’s framework³⁸ for evaluating change in human service delivery systems to understand the ways in which the First2 Network influences West Virginia systems to improve the persistence of rural, first-generation STEM students. The framework conceptualizes systems as pathways (progression through school levels and STEM programs, in this case) and structures (such as State education policies, resource flows, relationships and connections, and power dynamics). Positive systems change, in the context of the First2 Network, involves improvements to structures (such as establishing incentives for using STEM instructional practices that increase persistence) and to pathways (such as increasing coordination between State K–12 and higher education subsystems to ensure that rural, first-generation students have adequate math preparation to succeed in STEM majors).

During Year 6, the evaluation team conducted an analysis of documents to understand the improvements to structures, specifically those implemented by First2 Network to improve the quality and scalability of the network and to garner support and resources to sustain the network beyond the current grant cycle. A review of institutional team quarterly reports, meeting agendas and notes, and First2 Network newsletters provided key indicators of the network’s increased pathways through capacity and connections.

In this framework for assessing systems change, ICF follows Latham’s framework by types of pathway improvement—increased pathway capacity and increased pathway connections.

3.3.1 Increased Pathway Capacity

During Year 6, backbone efforts continued to provide the First2 Network with capacity support around fostering a sustainable infrastructure to help First2 reach the network’s overall aims.

Two new backbone positions were instituted this year. First, a new First2 program coordinator was named to lead communication/develop relationships among stakeholders, ensure that network activities support strategic plan goals and objectives, and serve as a mentor to emerging backbone leaders. Secondly, a communications coordinator was hired and a communications team was established for the purpose of helping to grow the network by planning and disseminating communications internally and externally through, for example, monthly newsletters and a series of one-pagers for potential members and partners. An organizational chart was also developed to communicate the roles of the network’s support team more clearly. Network members also conducted onboarding sessions for more than 125 institutional team members to introduce them to and familiarize them with the network’s organizational structure, improvement science efforts, and other network practices. A First2 staff member noted that the onboarding sessions are “the crucial bridge that transforms a new team member from a stranger to a productive and engaged contributor” and that the experience “accelerates the learning curve, fosters positive relationships, and ensures that the institutional teams understand their role and feel invested in the collective success of the network.”

The network has undertaken a number of other strategies toward sustaining their efforts after current funding/support ends. For example, the First2 Network bolstered the efforts of institutional teams by implementing activities supported by supplemental funds for

incentivizing higher education teams. Seven institutions submitted “institutional advancement” proposals that required the inclusion of a sustainability plan, all of which have been accepted by First2 leadership. Additionally, the network hired a graduate student to analyze network growth and predict the sustainability of that growth once the current support concludes. Furthermore, members of the network’s sustainability team are proactively seeking future funding and working with member institutions on grant submissions. For example, the support provided to several higher education institutions on the development and submission of two NSF grant proposals has “strengthened network partnerships and enhanced the network’s capacity for future grant submissions.” Member institutions have also increased their support to the network in ways such as allocating staff time for First2 tasks and even accepting improvement science work as evidence of scholarship for faculty advancement.

For example, institutional teams were the focus of a 2-day leadership workshop in which 17 First2 student leaders and several faculty and staff participated. Topics included communication, collaboration/team building, critical thinking, and decision making. Participants discussed leadership styles and qualities and how to further their understanding of leadership roles and network focus areas. Students noted that the training was “very insightful,” it helped improve their skills, and it exposed them to “a number of facilitation styles and leadership techniques.” The network is also developing a leadership training toolkit. Additionally, a focus of one of the onboarding sessions is student leadership and success.

Selected examples of additional sustainability efforts follow:

- Long-term planning retreat in January 2024 focused on sustainability efforts, network priorities, progress toward supplemental award goals, and a sustainable year-round budget.
- Submission of a congressionally directed funding request for the support of 2026 work.
- Learning about effective sustainability practices and structures through participation in the National INCLUDES Hub’s Sustainability Consultancy.
- Requirement of a 30 percent funding match for member campuses who requested funding for the 2024–2025 school year.

In the area of advocacy, the network’s policy agenda guides national-, State-, and higher education administrator-level policy efforts. This year, the network focused on two legislative priorities—addressing obstacles to retaining/regaining the Promise Scholarship and the collection of first-generation status on college admission applications. Although the second priority did not gain traction, these efforts helped to maintain the network’s visibility and legislation related to the Promise Scholarship that was approved by the Governor. First2 Legislative Ambassadors also engaged with State lawmakers regarding First2 initiatives, proposed legislation related to the Promise Scholarship, and “decisions that may affect the retention and persistence of STEM students” during a visit to the State capitol in February 2024. The network also discussed collaborations with other alliances for national policy and legislative work during the National Hub Incubator Community of Practice sessions in which they participated.

3.3.2 Increased Pathway Connections

Connections among members and across member institutions help to foster network efforts and improve network quality, and members rely on these connections to enhance their network experiences. Institutional membership has expanded with the addition of Shepherd University and even beyond the State to Eastern Kentucky University.

Among the various methods used by the First2 Network to maintain and expand connections are publications and presentations that highlight the network's mission and efforts and promote network engagement. For example, Sue Ann Heatherly of the Green Bank Observatory attended the annual meeting of the West Virginia Academy of Science in April 2024. Her presentation, *Impact of a Networked Improvement Community's Interventions on STEM Student Persistence*, focused on how the First2 Network, a high-impact practice learning community, contributes to promising outcomes related to the persistence of STEM majors and retention in their chosen field of study. Samantha Mitchell and Erica Harvey also led a discussion at the Understanding Interventions Conference in August 2023. The session, *Centering a Change Network in Lived Realities*, provided an overview of the First2 Network's shared vision for improving student STEM success and the importance of students as co-creators of solutions to STEM persistence. First2 students were also actively involved in research presentations. During West Virginia University's Fall Symposium, three student scholars presented their research and other First2 students were presenters at conferences both in and out of State, as well as at network conferences. Examples of such presentations by First2 students follow:

- Kudiak, S. (2023, December). *Disruption of the microbiota impact courtship behavior in tsetse flies*. 2023 Fall Research Symposium. West Virginia University, Morgantown, WV.
- Barne, J., Quinones, R., & Casiana-Negroni, A. (2024, March). *Determination and quantification of adulterants and harmful drugs in weight loss supplements*. American Chemical Society National Meeting, Spring 2024, New Orleans, LA.
- Bow, J. & Henson, K. (2024, April). *Continuing osteological research with Fairmont State University's human skeletal collection*. West Virginia Academy of Science Meeting, Glenville State University, Glenville, WV.

Pathways connections were also fostered through First2 Network conferences. A virtual conference in November 2023 with more than 100 participants was focused on Connectivity and Growth through Improvement Science and Mentoring. Participants networked to share change ideas and students attended career development sessions. The National Research Mentoring Network (NRMN), highlighted during the conference, "bolsters local pathways" by connecting mentors and mentees, fostering connections, and allowing users to share information on research and internship opportunities. The network's Industry Advisory Board has taken an interest in this mentoring network effort.

Aimed at highlighting pathways for connecting students to higher education and employment, the First2 Network also held a "co-conference" with the West Virginia Jobs Network at Canaan Valley Resort in May 2024. Attendance was nearly 100 and 28 organizations were represented. Two potential member institutions—Northern Kentucky University and New River Community and Technical College—also participated. Conference sessions focused on institutional

collaboration, STEM industry insights, pathway effectiveness and successes, and PDSA cycles, with students leading more than a quarter of those. Among the oral presentations by First2 Network members were those related to PDSAs, including a PDSA idea exchange workshop and discussion based on PDSAs conducted during the year and related future plans.

Examples of additional conferences attended by network members follow:

- Centering a Change Network in Lived Realities: A Discussion Led by the First2 Network at the Understanding Interventions Conference in August 2023.
- Appalachian Studies Conference in March 2023, at which First2 students conducted a panel session focused on the importance of the identities of first-generation students and building supportive networks for those students. A staff member who attended noted, "By sharing our network knowledge and lessons learned at conferences like this, we make further strides toward large-scale systems change across the region."

During Year 6, the network's dissemination practices through research publications also continued. First2 members prepared and submitted multiple articles for publication. Examples of submitted articles follow:

- Darrah, M., Wheatley, C., & Stewart, J. (Submitted). Growth of a statewide network focused on STEM retention. *Research in Higher Education*.
- Dominguez, K., & Darrah, M. (Submitted). The impact of multiple research experiences on undergraduate students. *Research in Higher Education*.
- Pace, J., Hansen, J., & Stewart, J. (Submitted). Exploring techniques to improve machine learning's identification of at-risk students in physics classes. *Physical Review Physics Education Research*.
- Richards-Babb, M., Gordon, C., Mersing, D., Perrone, T., & Ratcliff, B. (Submitted). Promotion of instructor beneficence and student success through frequent metacognitive reporting. *Journal of Chemical Education*.

Examples of articles that have been published or accepted for publication during Year 6 include the following:

- Christman, E., Miller, P., & Stewart, J. (2024). Beyond normalizing gain: Improved comparison of physics educational outcomes. *Physical Review Physics Education Research*, 20(1), 010123.
- Nemeth, M., Wheatley, C., & Stewart, J. (2023). Comparing introductory undergraduate physics learning and behavior before and after the COVID-19 pandemic. *Physical Review Physics Education Research*, 19, 013103.
- Ogden, L., Darrah, M., & Leppma, M. (2023). Role of grit and other factors in mitigating math anxiety in college math students. *Proceedings of the Forty-Fifth Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (Vol. 2). University of Nevada, Reno. Editors: Teruni Lamberg and Diana Moss, University of Nevada, Reno, pp. 213–221.
<https://www.pmena.org/pmenaproceedings/PMENA%2045%202023%20Proceedings%20Vol%202.pdf> (to be publicly available on November 1, 2024)
- Stover, K., Cowley, K., Gaunt, G., George, O., Henson, K., Liu, T., & Pankey, C. L. (2024). Comparison of on-campus and virtual self-assessment outcomes for incoming

Appalachian STEM undergraduates' first research experience. *Online Learning*, 28(1), 196–215. DOI: <https://doi.org/10.24059/olj.v28i1.3834>

Furthermore, the First2 Network continued to focus on partnerships, which are a core component of pathway connections, to share goals and information and thus create collective action and impact. These connections were evidenced at a range of institutional and statewide events and in sustainability efforts. Illustrative examples follow:

- First-Generation Student Success Conference hosted by the West Virginia Higher Education Policy Commission and the Council for Community and Technical Colleges in April 2024, in which three institutional teams and several First2 staff participated. The event focused on increasing first-generation students' academic success.
- National Research Mentoring Network program, introduced at the fall 2023 First2 virtual conference, now includes a First2 cohort.
- Assistance with an NSF proposal to create student research partnerships among a number of institutions and Green Bank Observatory aimed at building a sustainable pipeline to careers.
- Participation in the West Virginia First-Generation Student Success Conference, organized by the West Virginia Higher Education Policy Commission and the Council for Community and Technical Colleges.

Network partner institutions continued to host campus club meetings each semester. Club members participated in various activities, including those aimed at increasing connections among members and beyond. Examples of such activities follow:

- Members of the University of Charleston campus club attended an American Association for the Advancement of Science S-STEM Conference in Washington, DC, and shared information from the conference with other students at a campus club meeting.
- Members of the West Virginia University Institute of Technology focused on "increasing connectedness within their campus network" and participated in "biweekly group bonding activities."
- Fairmont State University campus club members prepared materials to be shared at a First2 table for the West Virginia Science Teachers Association Conference.

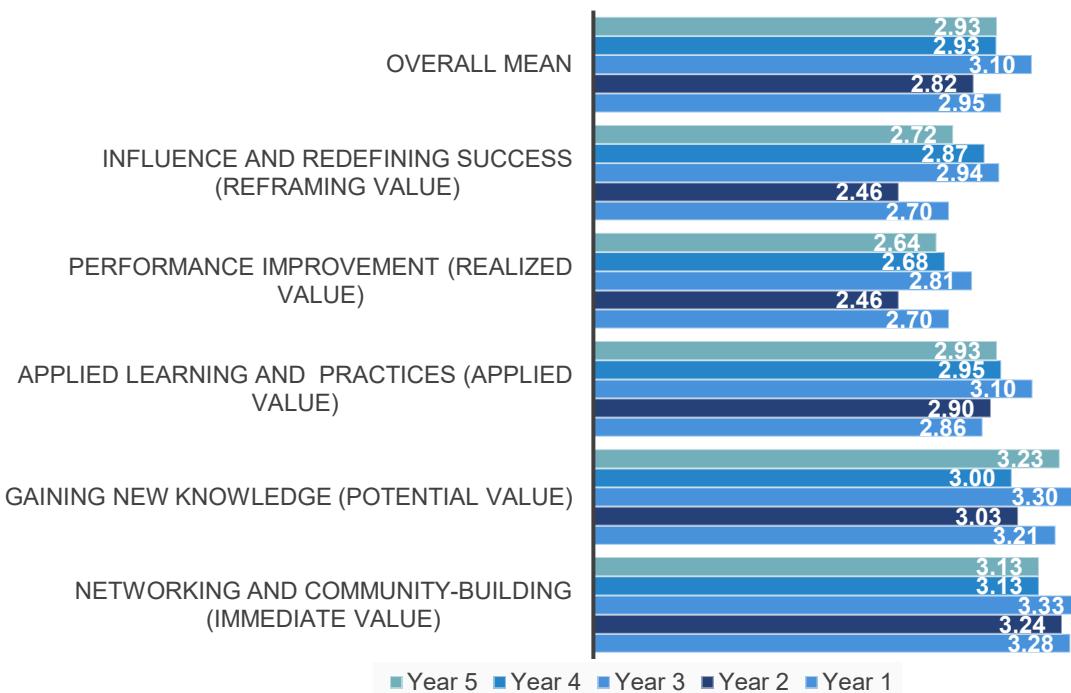
3.3.3 Network Value Survey

To understand systems targeted by the First2 Network for Years 1–5, ICF administered the network value survey annually in June. While not administered in the final year, it is worth noting the Year 1–5 findings. The survey asked members to use a 4-point scale to rate the value of aspects of the network across 23 items across five progressive levels of value to their members over time, each of which is aligned with the five survey sections: (1) activity, (2) output, (3) application, (4) outcome, and (5) impact.

Overall, average ratings of all five components on the network value survey increased slightly or stayed the same across the years (see figure 17) although those who identified as “non-student” had value gains less realized than students over time. Even so, both member groups cited high levels of potential and applied value through their involvement in First2, including internships and leadership in First2 Network activities. Specifically, in Year 5, 83 percent of students used skills obtained through the network to solve problems or issues affecting first-generation student groups and 87 percent of faculty members applied skills or practices learned through the network to accomplish a goal. Finally, at least 2 of 3 members—students and faculty—observed evidence of improvement in key student outcomes that the network is improving.

Additionally, when asked to expand on ratings, members expressed an increased understanding of student needs and voices, specifically students from rural, first-generation backgrounds. One member shared, “Difficulties with this transition include a lack of succession plans for new First2 faculty or staff champions, a lack of institutional incentives for junior faculty to participate in this work, and a lack of research infrastructure in teaching institutions (e.g., ready-made connections with institutional research offices, access to secure survey tools, standard IRB procedures, etc.).” Other comments provided examples of how leadership valued the establishment of greater focus on shared metrics, templates, and coaching support for each campus, but even so, there still exists the lack of a campus Institutional Review Board infrastructure.

Figure 17. Overall Mean Scores From the Network Value Survey Identified by Year



Systems Targeted by the First2 Network Summary

A review of First2 Network supporting documents revealed multiple strategies aimed at improving the quality and scalability of the network during Year 6 and progress toward sustaining the network beyond the current grant cycle. The backbone continued the provision of capacity support, including adding new positions and conducting onboarding sessions, to foster a sustainable infrastructure. Network leaders have mounted efforts to sustain the network beyond the current funding stream. Efforts to sustain and enhance leadership development within the network also continued. Furthermore, connections among members and across member institutions through partnerships, publications, presentations, and conferences helped to promote and improve the quality of the network. Furthermore, tracking multiple years of network member activity and the life cycles of value assessments reveal that, over time, student respondents felt consistently stronger about the effects of the network's performance improvement aspects on their lives. Moreover, all members most value networking and community building, followed by gaining new knowledge and applying learning and practices. This means that members gained insight about who they can turn to for support and acquired new knowledge and skills as part of membership, which is a key system change targeted by the First2 Network.

3.4 Impact of the First2 Network

3.4.1 Social Network Analysis

Social network analysis (SNA) permits the analysis of network size and the number and strength of connections among network members. Ninety network members completed the annual social network survey in December 2023 (compared to 83, 65, 44, 32, and 25 respondents, respectively, in 2022, 2021, 2020, 2019, and 2018) based on their network activity over the past year. The composition of network members' organizations is provided in table 14.

Table 14. SNA Survey Respondent Organizational Affiliation

	Organization Name	Number of Respondents	Percentage of Respondents*
Lead First2 Network Organizations	West Virginia University	32	36%
	Fairmont State University	12	13%
	Green Bank Observatory	1	1%
	Higher Education Policy Commission	1	1%
	High Rocks	3	3%
Other Organizations	Marshall University	7	8%
	WVU Institute of Technology	8	9%
	University of Charleston	5	6%
	Glenville State University	3	3%
	Davis & Elkins College	1	1%
	SRI International	1	1%
	West Virginia Department of Education	1	1%
	Other	5	6%
	Blank	10	11%
TOTAL		90	100%

* Percentages may not equal 100 percent due to rounding.

Of the 90 respondents, 52 percent were female, 24 percent were male, and the remainder selected other, prefer not to answer, or did not respond. Forty-one percent had completed college (either a 2-year, 4-year, doctorate, or professional degree) and 42 percent had some college experience. More than half (51 percent) were 18–24 years of age and were undergraduate students. Nearly half (44 percent) had been at their organization less than a year, 34 percent between 1 and 2 years, and 46 percent for 3 or more years.

Member Engagement

Respondents identified up to 10 members of the First2 Network with whom they communicated on issues relevant to their tasks in the network. For each individual identified, respondents assigned a code describing the level of engagement with each individual (1 = *Less strong relationships* up to 5 = *Strong collaborative ties*). The five levels³⁹ include the following:

1. **Networking:** Aware of the organization, loosely defined roles, little communication, independent decision making
2. **Cooperation:** Shared information, formal communication, somewhat defined roles, independent decision making

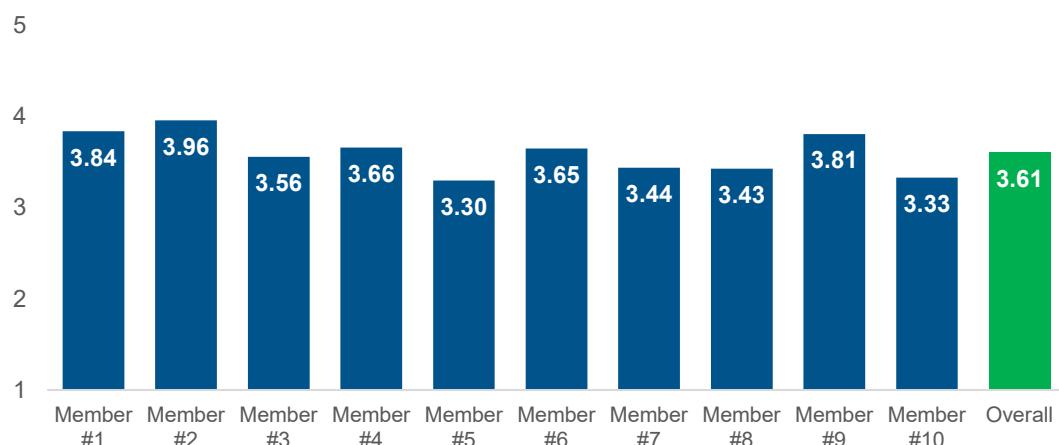
3. **Coordination:** Shared information frequently, defined roles, some shared decision making
4. **Coalition:** Frequent communication, shared resources, shared decision making
5. **Collaboration:** Frequent communication, shared resources, mutual trust, coordination on most or all decision making

The number of individuals identified, along with the average collaborative scores, are shown in table 15 and figure 18. Sixty-five respondents (72 percent) identified at least one individual with whom they collaborated and between 61–10 percent collaborated with 2–10 individuals.

Table 15. Network Members Identified as Collaborators in the First2 Network

Individuals Identified	Number Identified	Average Collaboration Score
1 member	65	3.84, Coalition
2 members	55	3.96, Coalition
3 members	41	3.56, Coalition
4 members	33	3.66, Coalition
5 members	24	3.30, Coordination
6 members	19	3.65, Coalition
7 members	16	3.44, Coordination
8 members	14	3.43, Coordination
9 members	11	3.91, Coalition
10 members	9	3.33, Coordination
Overall Score		3.61, Coalition

Figure 18. Levels of Collaboration by Individuals Identified

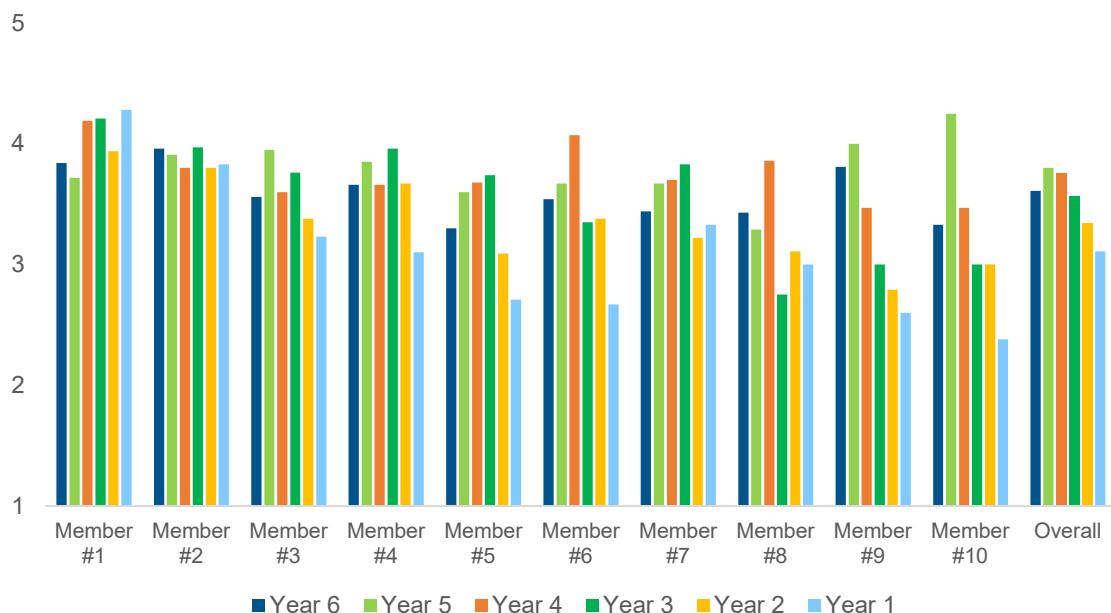


Although in most of the earlier years, the collaboration score was higher for the first individual identified by the network respondents, current results (Year 6) differ. The highest collaboration score at 3.96 is for the second person identified, with 55 individuals providing ratings, followed by 3.81 for the ninth person identified, with 11 individuals providing ratings. Furthermore, there is ongoing fluctuation of the value of the ratings that do not follow previous years' generally decreasing values after the first person identified.

The overall score is 3.61, which falls closest to the Coalition level. Current results indicate a slightly lower level of engagement than the overall score of 3.80 for Year 5 and 3.75 for Year 4, both of which also fell closest to the Coalition level. However, this year's score was higher than the overall scores of 3.56 for Year 3, 3.34 for Year 2, and 3.11 for Year 1, most of which were closer to the Coordination level.

Figure 19 depicts the overall strengthening of the engagements from Year 1 to Year 6, in general, for the members identified as collaborators.

Figure 19. Levels of Collaboration by Individuals Identified by Year



Connections by Year

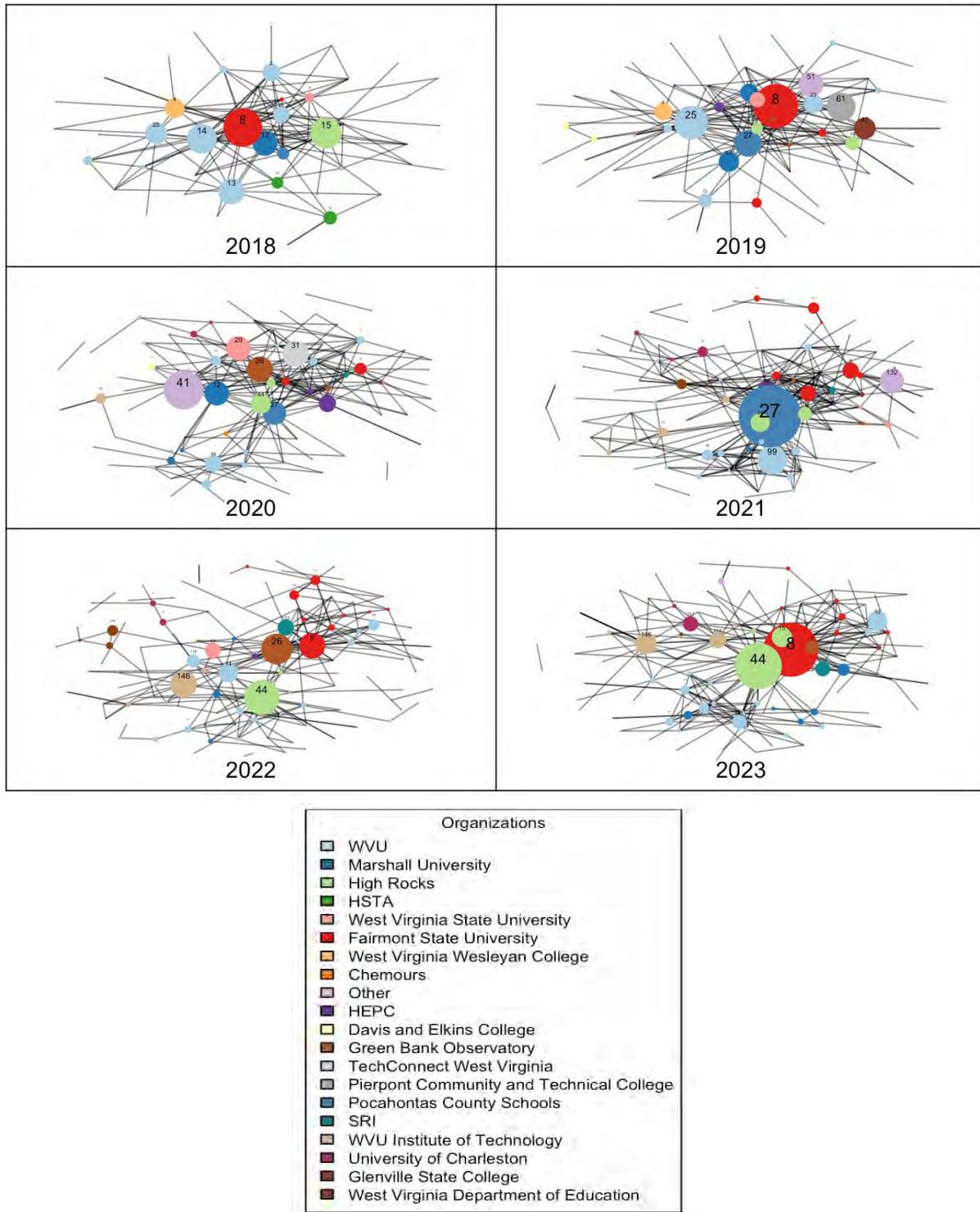
Based on the 90 respondents, the graphs shown in figure 20 depict the connections among those individuals identified as collaborators within the network for Year 6 (2023), as well as for the previous 5 years, for all respondents. Each circle (or node) depicts an individual and the lines (edges) represent the connections among network members. The organizations of individuals most frequently identified are denoted with different colors. These graphs show the growth of the network over time, illustrating not only an increase in identified collaborators, but also in the number of connections that these collaborators have.

Figure 21 depicts the connections among student members in the network for all 6 years, which reveals how students became more connected to one another, not only within their respective campuses, but across campuses.

SNA Summary

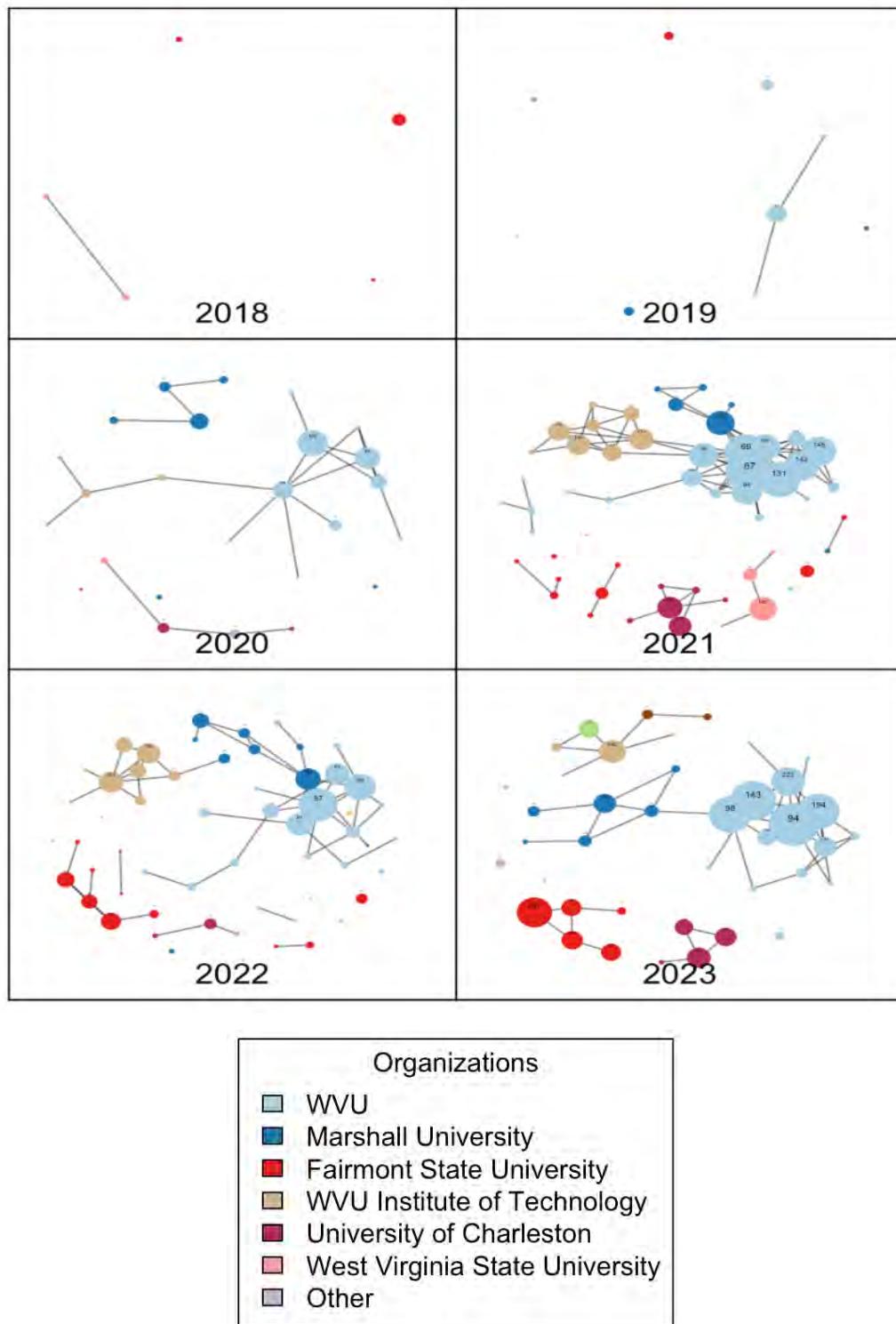
In sum, the trend across years continues in general as the First2 Network has become increasingly more collaborative over time, with increases in the number of unique network members identified as being collaborators, as well as an increased level of collaborative engagement with members overall. Furthermore, student interactions with one another have increased dramatically as the network evolved over time.

Figure 20. SNA Map of Connections to the First2 Network by Year for All Respondents³



³ Graphs provided by Marjorie Darrah and Swayanprajna Swain of West Virginia University.

Figure 21. SNA Map of Connections to the First2 Network by Year for Student Respondents⁴



⁴ Graphs provided by Marjorie Darrah and Swayanprajna Swain of West Virginia University.

3.4.2 Follow-Up Intern Survey

The follow-up intern survey was administered to students who had participated in one of the network's summer immersive research experiences and who had completed the pre/post survey during that experience. The purpose of this survey was to assess the long-term influences of their research experience on their STEM efficacy, identity, and career plans; sense of school belonging; knowledge of research; attitudes and behaviors related to research; personal skills; and research skills. The survey also included other items, such as their current college and STEM major status, the meaningfulness of their summer immersive research experience, whether they remained involved with the network, the research experiences they have completed, their preparation for and interest in conducting STEM research, and any final comments.

In January 2024, the evaluation team sent email invitations to all of the students who had participated in one of the network's summer immersive research experiences between 2018 and 2023, and who had completed a pre and/or post survey during that research experience (and for whom the evaluation team had an email address). Several email messages were sent reminding former interns to complete the survey, students were reminded of the opportunity during the February 2024 First2 all-students' meeting, and the deadline was extended through February 2024.

Table 16 provides information by year on how many students were invited, as well as how many completed a survey, and reflects a total of 32 completed surveys.⁵ Note that many students may have already graduated and may no longer be using the email address obtained during the year of their summer research experience, which may help explain the low response rates.

Table 16. Responses Rates by Year for the Follow-Up Intern Survey

Year	Number of Former Interns Invited	Number of Completed Surveys	Response Rate
2018	8	0	0%
2019	20	1	5%
2020	74	9	12%
2021	53	10	19%
2022	41	12	29%
2023	6	0	0%
TOTAL	202	32	16%

Of the 32 respondents, 88 percent indicated that they were currently attending college. Four students were no longer attending college (12 percent); of these, two reported that they had graduated and two indicated that they needed to pause their college participation. When asked to indicate why they paused their college attendance, they indicated family responsibilities, financial issues, and transportation issues.

Of the 28 students who were currently attending college, 86 percent still had a STEM major. For the four students who no longer had a STEM major, they provided the following explanations:

⁵ Three students had started completing the follow-up survey but progressed only to the point of adding their name and date, and so these cases were excluded from the analysis. Furthermore, three other students completed the follow-up survey but had not completed the pre/post survey and so these cases were excluded as well.

- *I wasn't able to pass the required math courses, but I switched to a STEM minor.*
- *I wanted to study Political Science.*
- *I ended up failing some classes and wanted a new path.*
- *I found a major that is in medicine (Communication Sciences and Disorders) that just better suited me.*

More than 90 percent of the respondents were attending (or most recently had attended) in-State institutions of higher education, as shown in table 17.

Table 17. Colleges Attended (or Most Recently Attended) From the Follow-Up Intern Survey

College or University	Number of Respondents	Percent*
Blue Ridge Community and Technical College	2	6%
Concord University	2	6%
Fairmont State University	4	13%
Marshall University	5	16%
New River Community and Technical College	1	3%
University of Charleston	3	9%
West Virginia State University	2	6%
West Virginia University	10	31%
West Virginia University Institute of Technology	1	3%
Other (Illinois Institute of Technology and Penn State)	2	6%
TOTAL	32	100%

* Percentages may not total 100 percent due to rounding.

Table 18 shows the results for the four subscales of STEM Career, STEM Efficacy, School Belonging, and STEM Identity (on a 5-point scale of *Strongly disagree* to *Strongly agree*), as well as the four subscales of Research Knowledge, Research Attitudes/Behaviors, Personal Skills, and Research Skills (on a 5-point scale of *None* to *A great deal*).⁶ At pretest, the highest rated subscale was for STEM Efficacy at 4.21 (SD 0.51); the lowest rated subscale was Research Knowledge at 3.35 (SD 0.79). At posttest, STEM Efficacy and School Belonging were the highest rated subscales at 4.08 (SDs 0.45 and 0.62, respectively); STEM Career was lowest at 3.65 (SD 0.76). At the recent follow-up, the highest rated subscale was STEM Efficacy at 4.04 (SD 0.79); the lowest rated subscale was Research Attitudes/Behaviors at 3.41 (SD 0.89). Figure 22 depicts the pre/post/follow-up mean scores for all eight subscales.

To investigate whether any of the pre/post/follow-up changes were statistically significant, matched pairs *t*-tests were conducted for each of the eight subscales for pre to post, post to follow-up, and pre to follow-up.⁷ The number of matched pairs fluctuated slightly because not every follow-up respondent had completed both a pre and post intern survey during their research experience.

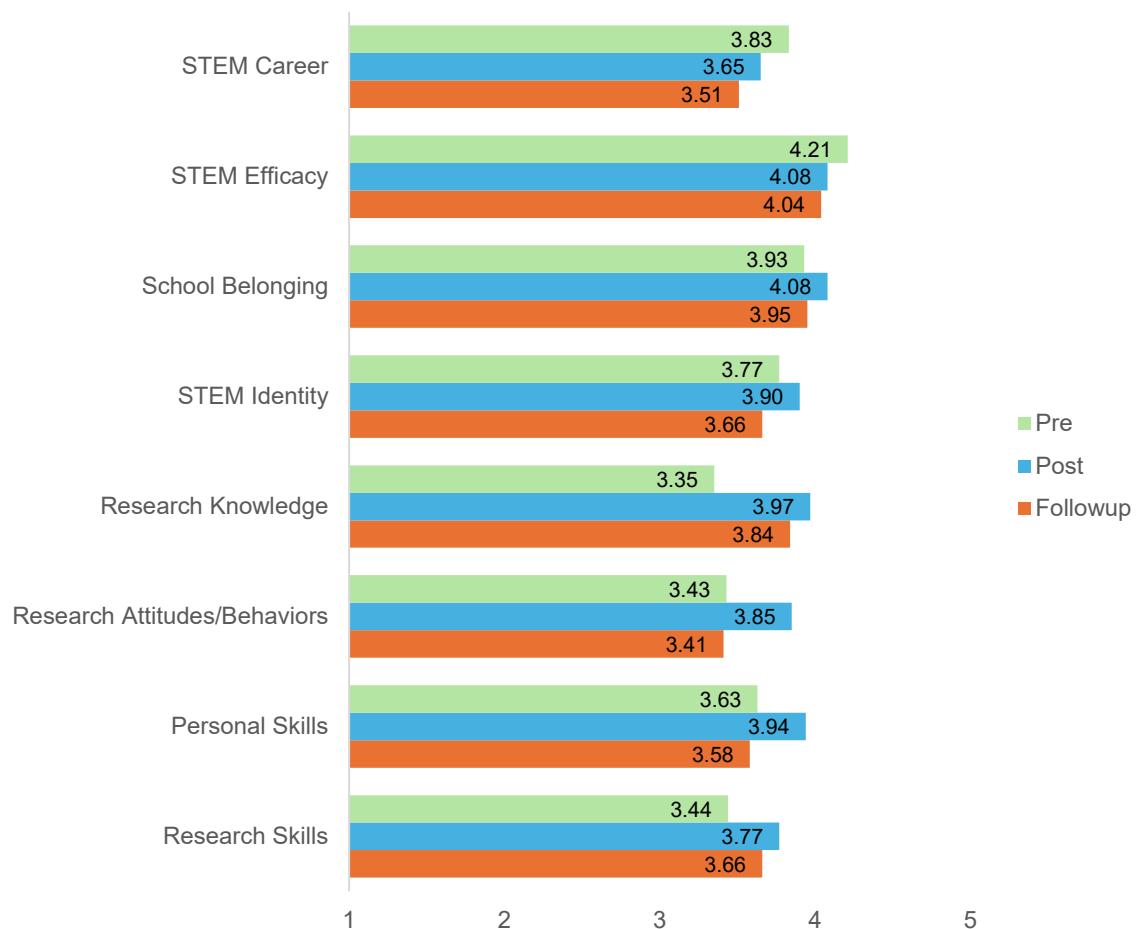
⁶ The survey contained 25 items grouped into STEM Career (8), STEM Efficacy (6), School Belonging (5), and STEM Identity (6); and 37 items grouped into Research Knowledge (8), Research Attitudes/Behaviors (8), Personal Skills (8), and Research Skills (13). Cronbach's alpha reliability estimates were computed for each subscale and for the overall set of rated items. Subscale correlation coefficient values for the follow-up administration ranged from 0.58 (STEM Career) to 0.96 (School Belonging and STEM Identity), with an overall value of 0.96.

⁷ Multiple *t*-tests were used, thus inflating the Type 1 error rate. A significance level of 0.017 (0.05/3) was used instead of 0.05.

Table 18. Pre/Post/Follow-Up Subscale Scores From the Intern Survey

Subscales	Pretest Results			Posttest Results			Follow-Up Results		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
STEM Career	30	3.83	0.55	31	3.65	0.76	32	3.51	0.59
STEM Efficacy	30	4.21	0.51	31	4.08	0.45	32	4.04	0.79
School Belonging	30	3.93	0.55	31	4.08	0.62	32	3.95	1.03
STEM Identity	39	3.77	0.98	31	3.90	1.02	32	3.66	1.17
Research Knowledge	29	3.35	0.79	30	3.97	0.70	32	3.84	0.72
Research Attitudes and Behaviors	29	3.43	0.89	30	3.85	0.96	30	3.41	0.89
Personal Skills	29	3.63	0.86	30	3.94	0.85	31	3.58	0.80
Research Skills	29	3.44	0.82	30	3.77	0.73	31	3.66	0.72

Figure 22. Pre/Post/Follow-Up Mean Subscale Scores From the Intern Survey



The first analysis examined pre to post; this analysis revealed statistically significant results for four subscales, as shown in table 19, in which students' posttest scores were significantly higher than their pretest scores for Research Knowledge, Research Attitudes/Behaviors, Personal Skills, and Research Skills.

Table 19. Pre/Post Matched Pairs Subscale Results for the Intern Survey

Subscales	N	Post Mean	Pre Mean	Mean Diff. (post – pre)	t	df	Sig.
STEM Career	30	3.66	3.83	-0.17	1.32	29	NS
STEM Efficacy	30	4.10	4.21	-0.11	1.24	29	NS
School Belonging	30	4.09	3.93	0.16	-1.55	29	NS
STEM Identity	30	3.90	3.77	0.13	-1.24	29	NS
Research Knowledge	29	4.00	3.35	0.65	-5.94	28	0.000
Research Attitudes/Behaviors	29	3.86	3.43	0.43	-2.77	28	0.010
Personal Skills	29	3.95	3.63	0.32	-2.86	28	0.008
Research Skills	29	3.77	3.44	0.33	-2.58	28	0.016

The second analysis examined post to follow-up; this analysis revealed no statistically significant results for any of the eight subscales, as shown in table 20. None of the follow-up scores were significantly higher or lower than the posttest scores.

Table 20. Post/Follow-Up Matched Pairs Subscale Results for the Intern Survey

Subscales	N	Follow-Up Mean	Post Mean	Mean Diff. (follow-up – post)	t	df	Sig.
STEM Career	31	3.50	3.65	-0.15	1.01	30	NS
STEM Efficacy	31	4.01	4.08	-0.07	0.53	30	NS
School Belonging	31	3.92	4.08	-0.16	0.92	30	NS
STEM Identity	31	3.62	3.90	-0.28	1.42	30	NS
Research Knowledge	30	3.83	3.97	-0.14	1.07	29	NS
Research Attitudes/Behaviors	28	3.40	3.82	-0.42	2.38	27	NS
Personal Skills	29	3.58	3.93	-0.35	1.97	28	NS
Research Skills	29	3.64	3.77	-0.13	0.75	28	NS

The third analysis examined pretest to follow-up; this analysis revealed statistically significant results for one subscale, as shown in table 21, in which students' follow-up scores were significantly higher than their pretest scores for the Research Knowledge subscale.

Table 21. Pre/Follow-Up Matched Pairs Subscale Results for the Intern Survey

Subscales	N	Follow-Up Mean	Pre Mean	Mean Diff. (follow-up – pre)	t	df	Sig.
STEM Career	30	3.54	3.83	-0.29	2.53	29	NS
STEM Efficacy	30	3.97	4.21	-0.24	1.68	29	NS
School Belonging	30	4.01	3.93	0.08	-0.52	29	NS
STEM Identity	30	3.66	3.77	-0.11	0.61	29	NS
Research Knowledge	29	3.81	3.35	0.46	-3.07	28	0.005
Research Attitudes/Behaviors	27	3.43	3.47	-0.04	0.23	26	NS
Personal Skills	28	3.64	3.63	0.01	-0.04	27	NS
Research Skills	28	3.63	3.43	0.20	-1.12	27	NS

Respondents were asked to rate their level of agreement with 11 items related to their summer immersive research experience, using a 5-point scale of *Strongly disagree* (1) to *Strongly agree* (5). Overall, respondents still rated their internship experiences favorably, with nine of the item mean scores near or above 3.50; of those, four were at or above 4.00. Approximately 85 percent or more *agreed* or *strongly agreed* that the experience helped increase their general scientific knowledge (90 percent), helped improve their research skills (85 percent), helped them learn how STEM research is conducted (87 percent), and helped increase their knowledge of research within a STEM field (84 percent) (mean scores of 4.16, 4.13, 4.09, and 4.00, respectively). The lowest rated item with a mean score of 3.03 (44 percent agreement) was that they were more likely to pursue a career in research as a result of the experience. See table 22 for complete details.

Table 22. Response Option Percentages and Descriptive Statistics for Items Related to Their Summer Immersive Research Experience From the Follow-Up Intern Survey

Items	Response Option Percentages*					Descriptive Statistics	
	Strongly disagree (1)	Disagree (2)	Neither agree nor disagree (3)	Agree (4)	Strongly agree (5)	Mean	Std. Dev.
<i>Thinking back to your research experience, please rate your level of agreement for each of the following items:</i>							
The experience helped to improve my research skills. (n=32)	3%	3%	9%	47%	38%	4.13	0.94
The experience helped me to increase my knowledge of research within a STEM field. (n=32)	6%	3%	6%	53%	31%	4.00	1.05
The experience helped me to increase my general scientific knowledge. (n=32)	3%	0%	6%	59%	31%	4.16	0.81
The experience helped me learn how STEM research is conducted. (n=32)	3%	6%	3%	53%	34%	4.09	0.96
The experience helped me see myself as someone who can do STEM. (n=32)	6%	6%	16%	44%	28%	3.81	1.12
I am more likely to pursue a career in research as a result of this experience. (n=32)	13%	19%	25%	41%	3%	3.03	1.12
The things I learned during the experience helped me stay in my STEM major when my coursework was challenging. (n=32)	9%	19%	34%	19%	19%	3.19	1.23
The experience helped me succeed in college. (n=32)	3%	9%	28%	38%	22%	3.66	1.04
The experience positively influenced how I feel about my chosen college. (n=32)	6%	9%	9%	47%	28%	3.81	1.15
I am more certain a STEM major is the right choice for me as a result of the experience. (n=31)	3%	13%	39%	23%	23%	3.48	1.09
I am more certain a STEM career is the right choice for me as a result of the experience. (n=32)	3%	16%	31%	25%	25%	3.53	1.14

* Percentages may not total 100 percent due to rounding.

Table 23 shows that respondents indicated careers in the medical or engineering fields most often (25 percent and 13 percent, respectively) when asked what job or career they expected to have in 5–10 years. When asked whether they had remained involved with the First2 Network since they participated in a summer research experience, nearly half (45 percent) indicated that they had remained involved. Table 24 summarizes the ways in which respondents reported that they had been involved, with specific student roles being the most frequently chosen response (41 percent), followed by campus club membership (31 percent), institutional teams (19 percent), and Plan, Do, Study, Act studies (19 percent) (respondents could select multiple responses).

Table 23. Job/Career Expectations in 5–10 Years From the Follow-Up Intern Survey

Career	Number	Percent*
Aerospace	1	3%
Computer Science	3	9%
Cybersecurity	1	3%
Engineering	4	13%
Environmental Science	1	3%
Forensics	2	6%
Law	1	3%
Marine Biology/Oceanography	1	3%
Medical	8	25%
Nuclear	1	3%
Psychology	1	3%
Science/Research	2	6%
Speech Language Pathology	1	3%
Not Sure/Don't Know	4	13%
Blank/Missing	1	3%
TOTAL	32	100%

* Percentages may not equal 100 percent due to rounding.

Table 24. How Respondents Remained Involved in the First2 Network From the Follow-Up Intern Survey

Roles	Number	Percent*
Institutional team	6	19%
Working groups	1	3%
Student roles (e.g., scholar, director)	13	41%
Member of campus club	10	31%
Plan, Do, Study, Act studies	6	19%
Research presentations	2	6%

* Percentages may not equal 100 percent because respondents were able to select multiple responses.

Respondents were asked in how many other research experiences they had participated in addition to their summer immersive research experience. The most frequent response was 2 (25 percent), followed by 1 (22 percent), 0 (19 percent), 3 (6 percent), 4 (3 percent), and 9 (3 percent); seven respondents did not answer this question (22 percent). The average number of additional research experiences was 1.68 (SD 1.87). Twenty-one respondents provided descriptions of those research experiences, including the following:

- *Research apprenticeships and jobs in different labs.*
- *Was a summer intern at Green Bank Observatory.*
- *Shadowing a doctor and a summer immersion mentor.*
- *Setting up a database to continue logging the data from our summer research program.*
- *I have participated in a research experience with an aircraft that was not getting up to the projected speed, and it was up to the group to figure out how to get the aircraft to get up to that speed.*
- *I have volunteered in a professor's lab during the semester and am currently involved in the INBRE biomedical research program [IDeA Networks of Biomedical Research Excellence].*
- *I was part of biomedical research in my first undergraduate year for a semester.*
- *2+ years of osteological research, including undergrad thesis, civil engineering REU [Research Experiences for Undergraduates] participation.*
- *I did ongoing research at my undergraduate institution for about 3 years with Dr. Sun. I also was an undergraduate research mentor for First2 the year after I did my summer immersion.*
- *RAP [Research Apprenticeship Program], SuRE [Support for Research Excellence], CHEM 497.*

Respondents were asked to respond to three items which asked them how prepared they were for conducting STEM research, how interested they were in conducting STEM research, and how meaningful the summer research experience was for their current educational journey.

On the 5-point scale of *Not at all prepared* (1) to *Very prepared* (5), 19 percent of 31 respondents selected "very prepared" for conducting STEM research now; 39 percent selected "mostly prepared," 32 percent selected "somewhat prepared," 10 percent selected "a little prepared," and no respondents selected "not at all prepared." The mean score was 3.68 (SD 0.91).

On the 5-point scale of *Not at all interested* (1) to *Very interested* (5), 32 percent of 31 respondents selected "very interested" in conducting STEM research now; 23 percent selected "moderately interested," 16 percent selected "somewhat interested," 13 percent selected "a little interested," and 16 percent selected "not at all interested." The mean score was 3.42 (SD 1.48).

On the 5-point scale of *Not at all meaningful* (1) to *Very meaningful* (5), 36 percent of 31 respondents indicated their summer research experience was "very meaningful" to where they are now in their educational journey; 23 percent selected "moderately meaningful," 32 percent selected "somewhat meaningful," 10 percent selected "a little meaningful," and no respondents selected "not at all meaningful." The mean score was 3.84 (SD 1.04).

Respondents were then asked what additional support they needed for conducting STEM research. Twelve individuals provided comments, including the following:

- *Practice in the methodologies associated with gathering data in such research.*
- *More scientific writing experience.*
- *Continued financial support from things like First2 and guidance from professors.*
- *Frequent communication and direction from an advisor.*
- *Mentors with the same interests.*

The last item on the follow-up intern survey asked for any additional comments about their summer research internship and how it may have affected their college experience. Fifteen individuals provided comments, including the following:

- *It wasn't for me. It wasn't very representative of what research truly looks like in the day-to-day and wasn't a good example of what my future in academia would look like. That being said, it was a good place to start. Having a small amount of "research" experience helped me get into a real lab, and that's where I learned how much I dislike the actual repetitive, monotonous nature of research. [It was a] learning experience, I guess.*
- *I met one of my best friends while participating. I came out with more knowledge of science and research, as well as someone who understands it as well.*
- *It was a wonderful experience learning about research but most importantly connecting with faculty before attending classes and familiarizing myself with campus.*
- *I found myself with a group that I have connected with very deeply. I was allowed a space where I could fail, and I could learn from that failure. I was advised on my college experience.*
- *It got me excited for college by doing hands-on activities the summer before my freshman year. It showed me that college is different than high school and that is what I was most excited about.*
- *It totally changed my college experience. I made friends with similar career interests as me and am now very close to them. During the immersion, I became familiar with the college campus and had a better understanding of it and the activities I would be able to be a part of once I came here. I was introduced to the idea of doing research and was able to start working in a research lab earlier than most undergraduate students do. The connections I have made from participating in First2 have given me many advantages and made it easier for me to communicate with my professors and access scholarship opportunities.*
- *I had a lot of fun, made a lot of great memories, and appreciate that the experience got to happen and I was a part of it, even if I didn't stay in my original STEM major. I think that it made me a stronger student overall, and it helped me understand what I was getting into and maybe that I wasn't the best fit for my major, which is okay.*

Follow-Up Intern Survey Summary

In sum, although the response rate for the follow-up intern survey was less than desired (32 respondents, for a 16 percent response rate), the results did yield some meaningful findings. Most respondents were currently attending college and most still had a STEM major. Four of the eight subscales had statistically significant increases in mean scores from pre to post for this group of respondents (Research Knowledge, Research Attitudes/Behaviors, Personal Skills, and Research Skills). Furthermore, the Research Knowledge subscale also had a statistically significant increase from pre to follow-up, indicating that students have continued to increase their knowledge about research.

Respondents still held positive perceptions of their summer immersive research experience, with high ratings (above 4.00) for 4 of the 11 items. Approximately 85 percent agreed or strongly agreed that the experience helped increase their general scientific knowledge, helped improve their research skills, helped them learn how STEM research is conducted, and helped increase their knowledge of research within a STEM field. About half of the respondents remain involved with First2, with student roles (e.g., scholar, director) being the most frequent mode of involvement. Respondents reported participating in two other research experiences, on average, in addition to their summer immersive research experience. Furthermore, they reported being somewhat prepared for and interested in conducting STEM research, and that their summer research experience was still somewhat meaningful to their educational journey.

3.4.3 Student Focus Groups

During March 16–25, 2024, the evaluation team conducted six virtual group or individual interview sessions with college students who were involved in some other capacity with the First2 Network (e.g., campus clubs, student leadership, scholars, mentors). A total of 11 students participated in these feedback opportunities.⁸

One-Word Descriptions and Demographics

As an icebreaker activity, students were asked to provide a one-word description of their First2 Network experience. Figure 23 highlights these responses, with only positive words being mentioned, and two students choosing not to respond.

Several students provided more details about their responses:

- *Connections, because I've just made so many connections here and I've met my best friends.*
- *Transformative. Before I started with the immersion, undergraduate research wasn't even on my radar as a possibility, and it really cemented my interest and confidence in completing a STEM major when I was a little bit unsure of where I wanted to go before I started college.*
- *Impactful, just because First2 was kind of the first group of people I met on campus.... It's just been a good experience to learn about all the things offered on campus and to have that connection with people who were also in the same major.*
- *Eye-opening. It's opened me up to a lot of experiences I don't think I'd ever have otherwise.*
- *Crucial, because I feel like I wouldn't be where I am without First2. I wouldn't be as connected with the people that I am or have the opportunities that I have.*

Students were also asked three descriptive questions to identify whether they were first-generation college-goers, whether they came from a rural background, and whether they still had a STEM major. As shown in the figure 24, 55 percent were first-generation college-goers, 82 percent were from rural areas, and 91 percent had a STEM major.

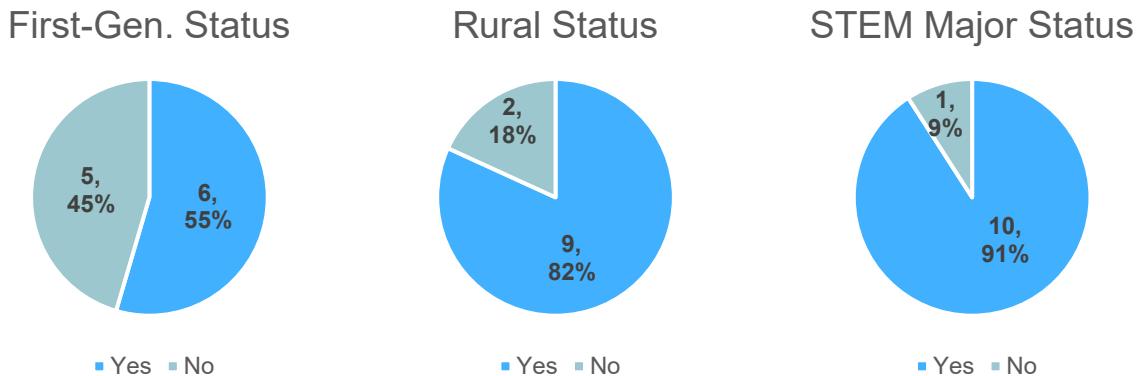
The remaining questions were organized into four categories—students' early experience with the First2 Network, their overall involvement in the network, their research opportunities, and a wrap-up. Responses are organized by question within these categories, followed by a brief summary.

Figure 23. One-Word Descriptions of the First2 Network Experience

transformative
social
impactful
eyeopening
connections
crucial
helpful
networking
supportive

⁸ Given how few students participated, an informal "member check" was held with students participating in the April 21, 2024, First2 Network all-students meeting to determine whether these findings seemed representative of First2 students as a whole. Feedback from that meeting confirmed the salience of these findings.

Figure 24. Summary of Respondent Demographics



Early Experience With the First2 Network

What was the main reason you wanted to become a member of the network? The most frequently mentioned reasons for becoming involved with the First2 Network were the opportunities to have a paid position on campus, get involved in research, and become better connected with STEM faculty and students. A few illustrative quotes follow:

- *I was already doing research, but it was completely unfunded, so I joined to get funding for doing that research.*
- *I felt that having the paid position in the network was beneficial for me because then it meant I was able to support myself a little bit more and not have to have a job off-campus.*
- *I chose First2 and then it's allowed me to do research and all kinds of other opportunities, so I'm glad I stuck with it.*
- *I went to that [summer immersion] and I just kind of really enjoyed it, so I decided to join the actual club once I started college.*
- *I was going into a field that I knew no one in, so I wanted help meeting other people in other STEM degrees and hopefully make friends.*
- *I just wanted to join First2 because I was just trying to get involved on campus, and it seems like an amazing opportunity. And I didn't really know a lot about what it was ... so I joined to see what it was all about, and I'm glad I did.*

What suggestions do you have for sharing this network opportunity with other students? Three themes emerged. The first was to continue the Hometown Ambassadors Program, the second was to provide better clarity about the First2 Network (what it is, what first-generation

I had a friend and she told me how it [First2 Network] was really nothing but beneficial. And also, I was looking for a job that ... was either on campus or virtual. So that was very helpful, and I wanted to do research, and First2 is kind of all about that, so it was really perfect, honestly. – Student Member

Although we did the student ambassadors, where we go and visit the high schools, I feel like maybe if they had a system where they could reach out to every high school, because obviously there's a lot that aren't getting visited. And so, I feel like if they were able to reach those students as well, that would be a good way to recruit. – Student Member

is, and what students are eligible), and the third was to ramp up outreach to high school students, counselors, and teachers (via more visits to high schools, more representation on campuses when high school students visit, and more social media outreach). Several illustrative quotes follow:

- *I'm from one of the smaller campuses for First2 and the impression that I get from a lot of people who are sort of in STEM but are not participating with First2 is they think it's only applicable for first-generation college students and that no one else can [join]. So just making it clear that there's a lot of different criteria that you can fit would probably help.*
- *A lot of students don't understand what first gen is or what First2 is. And so having that solid definition would be much more, I guess, appetizing to students because they don't know what it is. They don't understand first gen is labeled different[ly] at different universities and different organizations.*
- *If someone from First2 would set up at high schools, and just correspond with the high schools on College Readiness Week or whatever, I think that'd be helpful.*
- *But I feel like if they had their own social media that was more ... out there a little bit better, incoming students would know [more about it], that they [First2] could get the word out and more people would apply.*

Overall Experience With the First2 Network

What role do students play in the First2 Network? Participants noted a variety of roles that students fill in the network and were able to detail responsibilities for each role and organize those roles in a somewhat hierarchical manner—for example, participating in campus clubs, participating in summer immersion

experiences as interns, serving as

research scholars (Tier 1 and Tier 2),

serving in a campus club leadership role,

serving as a mentor for a summer

immersion, providing tutoring, serving as

a director, and serving as one of the four

First2 statewide co-chairs. Participants

indicated that scholars may not have as

much interaction with the actual

network but rather more involvement

through the campus clubs. Directors

and co-chairs have more involvement with the First2 Network through additional meetings,

facilitation of student meetings and campus clubs, and are more commonly involved with

campus institutional teams. Several students described their own growth in the network as they

held various student roles. Illustrative quotes follow that are representative of the breadth and

depth of student roles within the network:

- *[Campus club] is a way to get involved on the campus without having to be dedicated to the whole First2 Network, So it's like a smaller scale.*

I can start from the bottom and I guess work my way up. So there's just general club members that are just a member of the club on a specific campus. A step up from that, there's a Tier 1 Scholar, they have to have 50 hours each semester; it's a paid position within the network. Then you have Tier 2 Scholars, they have to have 100 hours each semester. Then you have Student Directors, they have to have 150, and then you have Co-Chairs, which play a big role within the network, and I'm not 100% sure on their hourly requirement, but... I think that's all the roles that students play. – Student Member

- Once you get to directors, you're more involved with the overall network throughout the different colleges.
- So I've been a scholar and a director within the First2 Network.
- I believe the co-chair is the highest level for students and it's more statewide instead of just at your school.

One student commented that students play "a very large role" in the network and "for me, personally, too much of a role" and then provided more contextual details:

- I think it's too much student-driven because on the campus level is where it gets really, really finicky. And whenever you don't have people that know how things should be run, it gets a little much. ... I was the president of the campus club that we had at First2 and whenever you're spread very thin and you don't have a resource, you know, someone that's overseeing it and seeing it directly, it gets a little much and it can be too student-driven from my perspective.

Describe your involvement in helping the network identify and test strategies for better serving rural, first-generation students. There was a range of First2 student involvement in the PDSA activities across institutions. Participants most noted the PDSA requirement associated with the Hometown Ambassadors activity.

Direct involvement in PDAs varied, ranging from none to minimal involvement (such as being responsible for collecting data) to having the campus club at one institution "go over every single PDSA after we get past the data collection stage as a group to give feedback and do some of the data crunching as well." Furthermore, students noted that some PDAs were updates to earlier studies (with modifications as needed), while others were "brand new." Involvement in PDAs ranged from no involvement to involvement in more than a dozen. Topics included the Hometown Ambassadors Program, impromptu lectures, math bootcamp, campus club, bingo, donuts with the deans, and networking dinners. Illustrative quotes follow:

I think First2 students are super encouraged to make changes on their campus or changes that they see as part of our education system. So we do a lot of PDAs, and it's not limited to only student directors [who] can do PDAs; all students are encouraged to do PDAs and another big factor is building community. – Student Member

- I think, last semester, I don't remember their names, but there were people that came from the First2 Network to come and talk to us about all of that [PDAs]. And I learned about it then, but I don't think I've had any involvement or heard of things actually happening. There probably are, but I just haven't been involved, I don't think.
- Quite a few of the PDAs, although they're run by faculty, the students have a part in it. For instance, we're doing a campus change PDA right now where the faculty did all the paperwork for it, but then we're actually going out and doing individual projects related to it.... In total, I've been here for multiple years, so in total probably 12 to 14.
- Last semester or last year, I didn't do any PDAs whatsoever. So this year, it's like, "Okay, we're actually doing some."
- So there's a huge document that you have to fill out, and it's broken down for you so I've filled out some of those.... For bingo, I've worked on all of the behind-the-scenes [activities], putting everything into the Google Drive and all that stuff, as well as ordering all the supplies we need and trying to book a room.

One student described involvement in “a really awesome PDSA” that a new faculty member on their institutional team had brought in from a previous campus (impromptu lectures) and noted, “The PDSA itself was very fun. The PDSA process was very painful.” When asked what made the process painful, the student shared that their PDSA was implemented prior to coaching, given that there were delays in responding to their requests for coaching.

Describe any leadership opportunities you have engaged in through your campus institutional team and other ways you have been involved in your institutional team. There seemed to be a range of involvement of

First2 students with the institutional teams across campuses. Some participants reported that only directors and co-chairs were directly involved with the institutional team at their campus, while others noted that all First2 students were at least invited to institutional team meetings.

Furthermore, some students described leadership opportunities that they have had within their institutional team

specifically, while other students described leadership opportunities within the First2 Network generally (such as leadership training, campus club responsibilities, and First2 presentations). Several illustrative quotes follow:

- *I'm the president of our club, so that's a leadership position, trying to schedule club meetings and different things like that. I've gone to different conferences for the First2 Network and spoke at those, so I guess that's a little bit of leadership.*
- *I have had the opportunity to help plan some of our on-campus club meetings with other directors, but that's usually the extent of my leadership.*
- *Our institutional team consists of the dean of the natural sciences department and then some faculty members. And so being able to talk directly to those people, I mean, that makes me feel like a leader because I'm able to talk to them and tell them what's happening with first-gen students and what we need to do. And so we host our club meetings and then we invite them.*
- *I'm not really much of a leader within the First2 Network, I do more of assistance and background work as a scholar. But participating in the program has encouraged me to apply to more scholarships and apply to accelerated graduate programs and things like that.*
- *We did the summer internship and my first role as a student leader was being a mentor for that, which was super helpful for me getting into the role of student director, and student directors are kind of like the leaders or the connection between faculty, our institutional team, and students on our institutional team. So being that role model and leader has been super fun and super helpful and a big learning opportunity for me.*
- *I really haven't had any leadership within the First2 because I'm only a scholar, but I also did do the mentorship, where I was a mentor for other kids who were in the internship*

We've met a few times this year. They meet without us students though, which can cause a divide. And so whenever we're invited, we show up for the meetings. I guess my personal opinion is that all students in the network should be invited just because as a student director and as a senior, I'm going to graduate. Somebody's got to fill my shoes. And so if we open the door to these students, they can also log in on their timesheet so they can get paid to attend the meetings. But if they're there and they're learning what we do, it'll be easier transition-wise for them to step into a heavier role. You know what I mean? They'll know better what to expect, what they need to do, if they're invited into those spaces. – Student Member

and that really helped me connect with them and be able to teach them the stuff that I learned through the First2 Network.

- *Our role in the institutional team is very minimal. The students have met with the institutional team maybe three times this semester. But the institutional team, sometimes they don't see us as part of the institutional team, so they meet without us. Students are [members of the institutional team], but faculty have trouble recognizing that.*

How much of a voice do you have in the network? Students in general? Responses were

divided as to the degree of voice students had in the First2 Network. About half of the students had positive views of student voice related to the network, their institutional team, and their personal voice.

Illustrative quotes follow:

I feel like, as a network, students do have a big voice because, I don't know, I feel like they kind of highlight how it wouldn't be a network without the students. They need to know what we think in order to improve. – Student Member

- *I feel like a lot of students on our institutional team on campus, just because there's so few of us, anything that we suggest or we say is taken into consideration. But I also think [that], for the network as a whole, they always ask us if we have any thoughts or suggestions. We do a survey at the end of every network meeting, and I feel like when you suggest something or you ask for them to contact you to talk to them, that they really do take it into consideration.*
- *I think there's a lot of opportunities for students to input ideas or their opinions within First2. Students are encouraged to go to all the Steering Committees, and all the bigger committees that make up the First2.... And also, we give opportunities to bring up anything during our all-students meetings and during our student director meetings. So I think a lot of students have a lot of opportunities to input ideas and their voices.*
- *My voice is definitely valuable and heard, especially for our institutional team, our club. The faculty there is constantly asking students for input and we are always asked, even [at the] monthly meetings, "How would you improve this?" We're just constantly asked for our input for things. And we have those opportunities to speak with people in charge and share our thoughts.... We are encouraged to share thoughts and suggestions at many points, especially since so many PDSAs are being worked on and there's always a survey where we can share our voice.*
- *I would say very, very large, very, very big as student director. It's definitely one of the higher up positions in the network and ... I believe you get what you give, you know? Get [back] what you put out. And I try to put out, like being very helpful and have good energy and whatnot. And so I feel like I've been blessed to get that back in return and have my voice to be heard.*

Other students had more mixed perceptions about student voice in the network, within their institutional team, or their personal voice in the First2 Network:

- *Since my campus only has four to six active First2 students at any time, and I'm one of the people who's been there the longest and I'm one of the most senior, I have a pretty significant voice. But in the overall First2, not really anything at all. I don't have any direct contact with the people in charge or anything.*

- *I feel, as a director, I have a strong voice sometimes. And then other times, at my campus and [in] my institutional team, I don't feel like I have a voice because I know there's conversations being had without us. And so I went to a Steering Committee the other day and we had a document looking at the breakdown of funding. And so I was looking at it and I was like, "Well, our campus club is not getting half of what it's supposed to." And so I'm like, "Wow, institutional team, where's that money going?"*
- *I feel like, within the network as a whole, students have a strong voice. I feel like all of us together can get something done. Me, individually, as a scholar, I feel like I have a voice just because [names] are our directors here at [institution], and they're my best friends. And so some of our thoughts kind of resonate together, but ... with our institutional team, ... all the important conversations that need to be had about the club are done behind closed doors without student involvement, which is really hard.*
- *I feel like, as a whole, students have a voice that things get done whenever students draw attention to different issues. But personally, I feel like sometimes if only one student has the issue or whatever it may be, I feel like sometimes it can get overlooked, or maybe it's an opposing view to the network as a whole. So I feel like it depends a little bit on whether or not a personal voice is heard. [For example], they expect us to respond to emails within a timely manner, but we need to hold them to the same standard.*

How, if at all, has your involvement in the network helped you persist with your STEM studies?

Several major themes emerged, with the first focusing on the various research opportunities that the network provided related to their STEM studies. Students also noted the financial support provided by the network, as well as the connections made with faculty and other STEM students:

The campus club—from me coming into it to do the summer program, it introduced me to my campus. I got more comfortable with a lot of the faculty members than I would have as teachers, and I met other STEM students who have been in my support network for years now. So it's made a huge impact for me just because it made me prepared for everything that I would be doing as a STEM student and all the connections with the faculty have led to further connections and me getting research opportunities and just being more comfortable asking them for advice and help. – Student Member

- *I would say, for me, that the only direct impact it's had on my STEM studies is the funding of the research. Other than that, for me, personally, I'm not into the social or even political portions of the network, so it's just a lot more time restrictions for me when I already have a very busy STEM schedule.*
- *Doing the immersion internship, especially, set up a framework for me to start research as soon as I started at school, where I was contacting professors before school started. And right now, with that professor, I'm currently planning out what to do for a master's in science at my university with the same professor that I've been with, and that's definitely a very transformative part of my life.*
- *I really didn't think I would be so into research or shadowing if it hadn't been for First2 that connected me with [faculty members]. So they helped me, encouraged me, and pushed me to connect and find the resources to further my interest in research.*

- *I've done a lot of research with some of my professors, ... and I've built really good relationships with them. It also helps going to tutoring and being able to log that on my timesheet. So just being a student and being able to be paid for that is very nice.*
- *First2 helped me connect with other professors, but the people here, most of them are engineering. The institutional team is mostly filled [with] natural sciences, so I got to connect with other people outside of my degree and I felt that helped me with, if I need help ... I can go to one of them.*

Research Opportunities

What research opportunities have you participated in during your college experience, either within or outside the First2 Network? Each of the 11 students had a different response in describing the research opportunities they have had during their college experience. A few illustrative quotes follow:

- *I've done over 2 years of research in different capacities. I've done research directly with one of my professors at the university. I've done research under a NASA grant, under a SuRE grant. I did research ... over the summer at an REU. And then I've also done a short immersion with First2 for 2 weeks.*
- *I did the short immersion for the 2 weeks before I started college, and then my first year of college, I worked under one of our chemistry professors, just volunteering in her research lab. And then, this year, I worked in a biomedical research lab under the Embry biomedical program.*
- *So the first thing I did was the summer immersion internship.... That was the lab where I think I got most of my main interest in DNA-related sciences, even though that one was a chemistry lab.... After that, I started doing research in my current lab where I mostly do research with pollinating insects and using DNA, eDNA, and stuff like that to identify species. And last summer ... this wasn't technically First2 related, but you could say the confidence to apply and being in the space where I actually heard about opportunities like this through other First2 members, but I attended an REU. And that was something that I did not know existed before talking to other First2 members. I've had the opportunity to go to several conferences. I'm actually heading to one tomorrow [to make a presentation]—the Association of Southeastern Biologists in Tennessee.*
- *I've actually done research with one of my student directors in our club. She kind of started it, and then I just assisted along the way, and now we're co-authors on it. So it was just kind of for me to get my foot in the door of research if I wanted to start it myself next year, just to kind of get a sense of it. It was how STEM persistence changed.*
- *I did the immersion, which was a research internship on its own. So we researched acid mine drainage and an invasive species called Japanese stilt grass, and we were looking at a fungus that lives in the roots of this invasive species that helps it out-compete native species. So that was fun. And then ... I was a mentor for the immersion, so I helped with their research, which they did the same, and we went back to the same Morse Creek.... I've done research with [faculty member], we analyzed hand-washing, I actually did this with [other students], almost 10 years' worth of hand-washing data, and then we compared it post-pandemic and pre-pandemic, and we were able to present that at the West Virginia Academy of Science and [on] Undergraduate Research Day, both of those*

conferences. And then outside of the network, but I feel like the network definitely helped me build my resume to get to this point, last year I participated in the West Virginia INBRE program, where I did research with [faculty] at the Marshall Pharmacy School, creating a new antibiotic for MRSA [methicillin-resistant *Staphylococcus aureus*].

What do you value most from those research experiences?

Students' comments regarding what they valued most from their research experiences included general awareness of what research entails, guidance for career planning, exposure to other STEM fields, and fostering a sense of identity as a scientist.

Illustrative quotes follow:

- *It's opened my eyes to, I like research, but I don't think I'd want to do it as my future career. I think it's being able to meet the different professors and just understand what you have to do to get to where they are, and also just having the different experiences and learning how adaptable you are and how capable you are of taking on that kind of responsibility.*
- *From a research standpoint, I feel that it's just knowing that, "Yes, I can do this and there are ways to do it." And so it was more of that networking situation where you're given opportunities to do things. And I feel like the most valuable part, it wasn't really doing the research, it was knowing, "Yes, I can do it, how to plan it, how to go through with it so I can move forward."*
- *I think it's really guidance for what you want to do after you graduate, ... whether it's grad school, whether you want to go directly into a field, just getting a feeling for both what it's like to be in a research setting and if you liked that particular research.*
- *I feel like it's opened me [up] to a lot of different fields of science. So I've done some medical research, I've done some environmental research, and especially my concentration is in medicine, but the environmental research has really opened me up to the world, and there's so many cool things out there. So I feel like, for me, it helps me better understand the world around me, and it's amazing how all the different things are connected. I really enjoy that, but also, I hate public speaking, but it's helped me get better at that, because I've had to present at different conferences, so a lot of personal growth as well as just enjoying the world around me.*
- *I valued how difficult it was to start a new project, especially starting where you don't know anything about the lab research, and how beneficial[ly] a mentor could help you immerse yourself in the research and fully understand what's going on even though you start out not knowing anything at all.*

It basically just establishes our identity as scientists. I think putting together a research poster [and] hanging it on the wall is a very validating moment. Like, "Oh, I actually am doing something." And we presented at [the] West Virginia Academy of Science and the Undergraduate Research Day at the capitol, and both of those are very fun events. – Student Member

How, if at all, has your involvement in the network helped you persist with your STEM studies? Most students perceived that their research experiences did support or confirm their interest in a STEM major:

- *I was locked in, but the research definitely helped. It just made me more confident, I guess.*
- *I've had my mind made up forever now, but it was more validating—"Yes, I want to work in a lab and this is what I want to do." It wasn't a mind change. And then also just being like, "I think I made the right decision and [I'm] ready to go."*
- *Before I started with the immersion, undergraduate research wasn't even on my radar as a possibility, and it really cemented my interest and confidence in completing a STEM major when I was a little bit unsure of where I wanted to go before I started college.*

How, if at all, did participating in those research experiences influence your confidence in your ability to do STEM coursework? Most students who responded to this prompt perceived that their research experiences had positively influenced their confidence in their ability to do STEM coursework:

- *I think my view would really be where we had to make the posters and write the paper, it was more on the back end of "How do I put this into ... ?" Take myself out of the picture and write this down, just as the facts. I'm more comfortable now writing papers with all that set up just because of the research that I've done.*
- *I think it's really helpful in terms of connecting things and applying things that you learn in class. But also, I am really appreciative of having a mentor now. Before, I had plenty of people that I could go to, but I wasn't really close with anyone. But now that I have one faculty member that I work with closely, I'm able to actually form a relationship and they're kind of like a helping hand whenever I would need one. So that's really helpful.*
- *I feel it definitely has, and then I feel like my professors will look to me to be like, "Okay, can you help this student?" Especially in a lab, they're like, "I know you know how to do this. Can you show them how to use the spectrophotometer?" You know what I mean? I feel like they ask more of me, but that helps me build my confidence, because they trust me enough to show others.*
- *It increased my confidence, [from] not knowing anything to fully understanding what I was doing. So it gave me confidence that I had the ability to learn in a short matter of time and be confident in what I was doing.*

I definitely feel like it's helped me stay within my major. I don't think I would really want to do anything else, but it definitely gives me the boost of like, "Oh, this is hard, but then I get to do something fun." And I really enjoy research. I want to pursue a career in research. That's always been my end goal, and so it's been fun to get out there, and I get to learn different things about research and how to use pipettes and different crazy machinery and learning things as I go. So that way, whenever I get to whatever career I want, or if I go to grad school, I'll have a leg up, because a lot of times you don't get to do research as an undergrad. – Student Member

I think it helps with critical thinking, trying to think about why you're learning what you're learning. And so it's hard when you're in classes, you're like, "Why does this even matter?" And so then when you're in the lab and you can see, "Oh, this relates back to translation (or whatever)." It helps make everything come together. So I think it gives you a bigger view than the narrow scope you have in class. – Student Member

One student held a different perspective, noting that the research experience actually lowered his/her confidence to do STEM work:

- Confidence, okay, that's the key word right there. Lowered it, I'll say lowered it. Like the class work was very easy, I felt. And I felt that the class work, the computer science classroom, I should say, I did not feel like that was something that was going to help me in the future ... because all the stuff we did my first semester, I had done in my trade school. And then, the research on the other was like the other end of the spectrum, where it was like, "This is so hard, like I have no idea how to do this type of thing." And so it felt like the class work wasn't what I wanted or wasn't helping me, and the research was so like out of my league that I was very lost and confused as a first-year freshman.

How, if at all, did participating in those research experiences influence your sense of yourself as a future scientist or mathematician?

Most students provided feedback for this prompt, and nearly all of them perceived that their research experiences had positively influenced their sense of themselves as a future scientist or mathematician:

- I think so, especially since some of my research I've done included presentations at conferences, and that really helps because you're getting that feedback from professionals in the field.
- I think it makes it easier for me to be like, "Oh, I am a chemist because I'm doing experimentation as a chemist."
- Yes, First2, being a part of that in combination with my general coursework and research, First2 gives a little bit of a sociology aspect of research, which I think is really important for me since essentially all of my classes are more straight technological science. So First2 gives me the human balance of the work with PDSAs and the research that involves humans and surveys and things like that.
- I definitely feel like it has. I've been able to do research. I've seen the aggravation of not getting something to work, and then also the joy of, "Hey, we finally got the results we were looking for." But also, I've learned how to design research projects and find scholarly sources in order to back up my research and find things like that.

Describe how sure or unsure you are about knowing what you want for a career and how to move forward toward that career. All 11 students responded to this prompt, and the general consensus is that while they know the field they want to be in, they have not settled on a definitive position. Illustrative quotes follow:

It's just a validating thing. I think that's all that it is, because in classes, I think you can get beat down by a bad grade or something like that, but with research, if you have a bad result, that's science. And so you just keep doing it and eventually, you might get something good, but even if you get something bad, you still went through the process. And so it helps boost your self-esteem because classes can tear you down pretty fast. – Student Member

I definitely knew what I had in mind coming to college, and I definitely knew my set goal, but getting there, I had kind of an idea, but not exactly what I needed to do. And I feel like the network and just the opportunities it's given me gave me more of a pathway to what I can do. And it definitely helps students, like "You need to take this class, you need to do this, you need to do research, you need to do internships." It gives them a broad idea of how to get there and what they need to accomplish, complete, and do before they get to their end goal. – Student Member

- Mine is pretty straightforward, especially since I'm in my second to last semester, so I definitely kind of know where I'm going and I'm working on finding graduate schools to apply to.
- So I'm pre-med, and I'm set. I shadowed and I know that's what I want to do. I love talking to people, and so I'm ready. With the next steps, it's like, I'm taking a year off, too, because I graduated in 3 years, so I need that year. And so I don't really know about the application process and stuff like that.... I know about the next steps, but I guess I'll just have to figure it out.
- I've known that I wanted to do medicine since I was a little kid, so I know I want to work in a hospital. But in regard to a specialty, I have absolutely no clue because everything is super interesting to me as of right now.
- I'm not entirely decided on a specific career, but my general intentions at this point are to go to graduate school, at least a master's, possibly a Ph.D., and working in some form in conservation biology, but I'm not quite sure what form that would be in.
- I was not very set on what I wanted to do really up until maybe 3 months ago, if that. And even still, it's like there's general things that I enjoy and I want to do, and that's my issue—I enjoy doing way too much stuff.... Your career can always change, but choosing what I want to do first, I guess, is scary to me, because it's probably going to require more schooling.... But, in general, I feel like the network has opened my eyes to different things that I can do with my degree.
- How sure am I? I'm very, very sure. I'm so sure that I have some diagrams that I've drawn for my life in the path that I could take. I'd say that there's some indecision in them, but I do have paths that I'm very interested in.

Describe your level of interaction with STEM individuals from outside your school. Several students provided feedback about interactions with STEM individuals, both inside and outside of their schools:

I definitely feel like my internships have allowed me to widen my network, and so I know some different professors at [institution], and I know a couple of people at [institution], and we've had some guest speakers [that have STEM jobs or different things like that] come in and speak to some of my classes. So I've been able to talk to them and build a network with them. – Student Member

- Since I started my research, I've done an international conference every year [anthropology, paleopathology, forensic science]. So, yeah, it's definitely seeing the broader community at one of those conferences. And then, when you get closer to home, there's local conferences for ... nearby professors and then, of course, at your own institute.
- I would say that I've mainly interacted with those on my campus, but I will be going to a few conferences. Like today, I'm going to go to the American Chemical Society Conference in New Orleans.
- Through my lab, I had an opportunity to join things like [the] West Virginia Entomological Society. I presented at places like the Undergraduate Research Day at the capitol, which gave me the opportunity to meet one of my senators and other people from around the State.

Others reflected on their interactions specifically with STEM students:

- *I do know I am friends with a few of the students just from meeting them from the all students meeting across the State.... We definitely still talk about the First2 and the requirements and all that, too. So it definitely had given me a sense of how STEM is taught and how other courses are taught across the State and at other campuses.*
- *I think a lot of my interactions with other STEM majors outside of my school comes from our all-students meetings, or conferences, or our leadership training conferences that we have. But most of the time, it's through First2, so not a lot outside of First2.*
- *I would say much more detailed conversations [with STEM individuals outside of] my college. At my college, there's only like five or six people in the computer science department in my year. And so I don't communicate with them a lot but I have a lot of buddies at Virginia Tech that I talk to.*

Several students noted that their involvement was limited to First2 conferences and reflected that the virtual conferences they had attended made it "harder to connect to people just because you can't step aside and have a conversation." Furthermore, one student noted that the new NRMN program that was introduced at the fall 2023 First2 virtual conference was "a little late" and hard for students to get used to with their course loads and being close to graduation, and another commented, "I don't know that it's [NRMN] as helpful as they wanted it to be."

To what extent do you feel like you're part of a scientific or STEM community? Most of the students responding to this prompt felt like they were part of a scientific or STEM community:

I guess I felt more like a member the first time I had a research poster printed, and I saw my name on it, and I was like, "Okay, this is the real deal. I've done research. I see what I've done." And especially presenting at a conference and people asking me, "Well, tell me a little bit about your research." And so I get to tell them about my own experiences and different things like that. So I definitely feel like a member. I'm also a National Science Foundation Scholar, so I've been invited to their conferences. And so ... if the National Science Foundation sees me as a member of the science community, is inviting me to their thing, I feel like, "Okay, I can see past my own little bit of imposter syndrome" and say, "Okay, yeah, I guess I am a member of the scientific world." – Student Member

- *I feel like, if anything, First2 has made me have a stronger connection than if I were to not be in First2, but I feel like I still could be further along. But this is also only my first year in First2.*
- *With my scholarship group, First2 helped me be more receptive to my professors. So I'm not afraid to talk to any of them, and they're probably sick of me. So I think that connection is there, so I feel more connected in that sphere, but then less connected when it comes to the institutional team.*
- *I think I'm very involved and also being in First2 does help a lot because it connects me to advisors and faculty that are in our College of Science, which has been really helpful.*

Do you have any insights about why some students do not remain involved with First2? Most students provided insights about why some students do not continue their involvement with First2. Common themes included learning that they were not interested in research, heavy STEM course loads, changing to a non-STEM major, and time/schedule conflicts. Illustrative quotes follow:

- *When I went through the immersion, I knew a few students who didn't join the First2 Network afterward, and some of them went through the experience and discovered that they didn't want to be a STEM person because they saw research wasn't for them and the heavy class load that was expected, they didn't think they'd be able to go through it. And then there were other people who just didn't think they would have the time to be a part of the network or they just didn't click with the faculty that they met.*
- *I know a couple of students that have not stayed with the network. Some of them have been directors or whatever before, and then they step back, and I think most of it's a time commitment. Occasionally, they don't agree with somebody on a certain view or whatever, but you're always going to get that in life. So most of it, I think, is just a time commitment, especially being in a STEM major. STEM is hard.*
- *I know some students chose not to, they chose to change their major.... A couple of our students chose to change from STEM to pre-med or nursing and that doesn't qualify under First2. I know other students have said it was just a lot of work to find a research mentor and be in research.*
- *I believe that some people don't want to do the research and don't think that they can do anything else but the research inside of First2. So they just don't like it and feel like it's a bunch of work along with their STEM degree.*
- *We did a bridge program instead of a full immersive last year at my campus and we have not kept any of those students with First2. We've kept a couple in STEM, but I think the general perspective, from what I could tell, was that it was too much just social[izing] and lecture about study skills, stuff like, that they may have already had experience with, and not enough actual hands-on or even STEM-related things in general.*
- *I would say a big reason is the club environment is going down a lot. Like people get spread very thin here. It's very [apparent] with the faculty. A lot of people are leaving and people are taking on more roles and stuff, and so the previous [club] president ..., she was gung ho about First2, it was the only thing she did outside of classes and so they were able to make a very good environment. We did a lot of events and stuff. So that brought in a lot of students.... I had big shoes to fill; I did not fill them.*

There actually was a couple of people who did the summer program with me who did not wind up staying in First2. And most of those people, they changed because they realized that they wanted to change their major to something else. Since we were all pre-college, I think pretty much all of us were not super set on what we wanted to do. And having the opportunity to participate in STEM and see a little bit more about it, gave some people like me added confidence, but some people thought, "Maybe I would like to do something else." – Student Member

Wrap-Up

How can the First2 Network provide you with better support as you continue in your STEM program? Students identified a number of suggestions for better support from the First2 Network. Four themes emerged: expansion of focus on more STEM fields, provision of more graduate school or career support, increased respect for students, and more STEM-focused support as opposed to social support. Illustrative quotes follow:

- *I do know that they mainly focus on the natural sciences and not the tech and engineering side of it. So we have talks with other people who've been in chemistry or biology or some other natural sciences, but none from [the] engineering or tech side.*
- *With computer science, just putting more computer science people in the network there. It's a lot of just, you know, maybe like the typical STEMs or the typical sciences of biology, chemistry, things like that. Not a lot of computer-related people.*
- *It's just maybe the transition of being a college student to actually going into a career or an industry. I feel like bridging that gap a little bit more.... Maybe doing a workshop on graduate school, applications or interviews, or something like that to help students.... I know our goal is the first 2 years of college, but to also help see these students off onto their next step, so that way they're also successful and they don't just get the degree and then stop.*
- *I feel like the network focuses a lot on being a student, undergrad student, but there's not really a lot of talk about graduate students, and what you can do after. I feel like being an undergrad student in First2, you still kind of represent First2 at grad school or med school or wherever you continue. So I feel like ... bridging the gap, helping others continue on and not just totally forgetting about school and just getting the degree while they're here and never continuing on or knowing what they're going to do.*
- *I would just say keeping expectations equal. So what they expect from me, I expect from them. If they expect a timely response from me, I expect a timely response from [them]. So I think just keeping standards equal is the biggest thing.*
- *Equal respect in some instances, I feel blown off, but all of us are adults and so I feel like it needs to be held to that same standard.*
- *I think if you're going to apply, I think it needs to be more STEM focus[ed] because I think we get a lot of the social or administrative work, and the last couple of years, it feels like it's been less and less STEM focused and the things that are STEM focused are for very, very specific niche groups, like chemistry majors, looking for a job nearby sort of thing. So just remembering that it's for STEM students and not for social science.*
- *I've only been in First2 since it's been more like social science based with all the PDSAs and the political stuff that we focus on.*

The remaining suggestions were idiosyncratic in nature. A few illustrative quotes follow:

- *I think that it would also benefit if we could tailor it more to the year of college you're in, because for the different years, you have to focus on different things. You might be having to take certain entrance exams, maybe they can gather material for how to study for this or just where to go to get help for that kind of stuff.*

Our industry board advisors, industry people that come to talk to us, have mainly only been chemistry, it would be nice to hear about other majors and other interests. – Student Member

- Just really setting processes, everything needs to be made clear. I feel like a lot of the First2 Network is a jumbled mess and with somebody that's like, "I really need organization in my life or I can't focus," it kind of is a stressor. Management, as well as the PDSAs, the definition of an institutional team—that should be made similar across the board.
- Overall, like leadership opportunities. Things where I could practice being able to lead a group. A lot of our communication is remotely/remote-based but I don't believe that we have any training on remote facilitation. Like we do get put in the positions through these meetings that we have to, that we take the ideas forward and we host and stuff, but we never have formal training for it.

What is one thing that the First2 Network is doing especially well for students?

Respondents identified several things they perceived that First2 was doing especially well for students. The most common focused on financial support provided by the First2 Network, followed by research opportunities and several idiosyncratic comments. Several illustrative quotes follow:

- I think just the aspect of me having this ability to work for First2 really has saved me because I don't think I would be able to have the course load that I have right now and have an outside job. And so having this position ... I want to do research more, not only because I can get paid for it, but because I am able to do that without having to worry.... I can focus on my education.... I feel like that's really what has helped me stay in STEM.
- With our timesheets, you can put almost anything on there that pertains to science, and that's everything I do all day long is just do a bunch of different [science] activities.... And so, with First2, having everything online and having just wide options, it's made everything so much better because I don't have to worry about anything. I'm just doing what I need to do.
- I think just getting us involved in research. I am not very involved in the network as a whole, I'm mostly focused on the campus part. But I know that our faculty that's at our campus really makes sure that everyone who wants a research opportunity gets it.
- I would say support-wise for research, like connecting students with research opportunities and taking some students to a lot of conferences and stuff like that.
- It's definitely on the institutional team level that it's being done really well. I mean, at my institution, I would say that we have a 3:1 faculty-to-student ratio at these meetings, and we have some faculty attend even all of our campus club meetings. We have the dean coming to our meetings ... and it's a really good direct communication.
- I feel like just connecting them and making a relationship with professors and other students and just other people involved in their community or outside the State or in the State, just relationships and connections. They could always be useful in the future.

Any final comments to make anonymously via a survey link? One student provided feedback through the optional survey link shared at the end of each session:

My biggest thing about it is that I'm getting paid to do things that better me and then that doesn't take away from my studies and the reason I'm at college. And I don't feel stressed, too. Yeah, I'm very blessed that I don't have to feel that financial concern in a lot of ways. And so this, I mean, for me, the premise of it, its core, is the best part about it. – Student Member

- *The overall network is becoming too focused on social sciences and recruiting rather than STEM and network persistence in my opinion. Although some community building is nice, the heavily structured format in the all-students meeting does not actually help all that much and feels like a waste of time sometimes. In addition, the high school outreach is something I feel should not be a requirement, as the lack of transportation/reliable technology, connection to teachers in the area, makes it very difficult for some students.*

Student Focus Group Summary

In sum, respondents most often joined the First2 Network for the opportunity to have a paid position, get involved with research, and become better connected with STEM faculty and students. They suggested more outreach to high schools and more clarity about the First2 Network (definitions and eligibility criteria).

Participants were able to clearly identify the various roles that students could hold within the First2 Network and had filled many of those roles collectively. In terms of student voice within the network, about half of the respondents held positive views related to the network, their institutional team, and their personal voice. Others held more mixed perceptions, putting forth both perceptions of a strong voice at times, yet little to no voice in other circumstances.

There was a range of student involvement in First2 PDSA activities across the institutions represented. Most students reported involvement with the Hometown Ambassadors PDSA activities. Furthermore, there was a range of involvement of students with the institutional teams at each campus. For some sites, only directors and co-chairs were directly involved, while students at other institutions noted that all First2 students were invited to institutional team meetings. Students were offered a variety of leadership opportunities available either specifically within the institutional team setting or more broadly within the First2 Network, including serving in campus club leadership positions or as mentors for immersive experiences, attending and presenting at conferences, and leadership training.

While there was a general consensus among students that they knew the field they wanted to be in, many had not yet focused on the specific position they wanted to pursue. Several students reported interactions with STEM professionals, both within and outside their institutions, while others focused more specifically on their interactions with other STEM students. Overall, most students did feel like they were part of a scientific or STEM community and suggested that students who leave the First2 Network may do so due to a lack of interest in research, switching to a non-STEM major, heavy STEM course loads, and general time or scheduling conflicts.

Suggestions for the First2 Network to provide better support to students included an expanded focus on a broader range of STEM fields, more graduate school or career support, increased respect for students, and more STEM-specific support as opposed to more social support. However, they recognized that the First2 Network is doing well by providing financial support and research opportunities for students.

3.4.4 Student Outcomes

First2 Network Student Persistence and Graduation Rates

During the First2 Network's fourth year, network leadership members conceptualized and established a data-sharing system whereby students participating in some aspect of network activity provided informed consent for the network to use their Social Security numbers to obtain verified HEPC data about STEM persistence and graduation. HEPC set up a secure site through which network leaders uploaded Social Security numbers and agreed to merge those identifiers with their State dataset to compile individual-level persistence results. During Years 5 and 6, HEPC then aggregated STEM persistence information into a summary report that was shared with the evaluation team for inclusion in the annual evaluation reports.

The overall STEM fall-to-fall persistence rate among First2 Network, first-time freshmen who provided consent for tracking is 61 percent (60 of 99 students) from the fall 2018, 2019, 2020, 2021, 2022, and 2023 cohorts. Excluding those cohorts that should have graduated at or before spring 2024 (2018, 2019, and 2020), the STEM fall-to-fall persistence rate increases to 70 percent (50 of 71). The overall STEM fall-to-fall persistence rate among First2 Network sophomores and higher who consented to tracking is similar, at 62 percent (105 of 170 students) for all six cohorts and 70 percent (105 of 149 students) when excluding the first three cohorts.

STEM persistence and graduation rates varied for each cohort of first-time First2 Network freshmen who had provided consent for tracking. As shown in table 25, by spring 2024, persistence rates ranged from 0 percent for the fall 2018 cohort⁹ to 80 percent for the fall 2023 cohort. By the end of spring 2024, graduation rates ranged from 43 percent for the fall 2020 cohort to 83 percent for the fall 2019 cohort (excluding later cohorts as they would not have reached the 4-year graduation point yet). The remaining percentages of these students either switched to a non-STEM major, transferred to another institution, or dropped out of college.

Table 25. STEM Persistence and Graduation Rates by Cohort for First2 Network Freshmen With Tracking Consent

Cohort	Persistence Rate (as of Spring 2024)	Graduation Rate (at end of Spring 2024)
Fall 2018 Cohort of First-Time Freshmen	0% (0 of 2)	50% (1 of 2)
Fall 2019 Cohort of First-Time Freshmen	8% (1 of 12)	83% (10 of 12)
Fall 2020 Cohort of First-Time Freshmen	64% (9 of 14)	43% (6 of 14)
Fall 2021 Cohort of First-Time Freshmen	64% (18 of 28)	11% (3 of 28)
Fall 2022 Cohort of First-Time Freshmen	73% (24 of 33)	6% (2 of 33)
Fall 2023 Cohort of First-Time Freshmen	80% (8 of 10)	N/A

STEM persistence and graduation rates also varied for each cohort of First2 Network sophomores and higher who consented to tracking. As shown in table 26, by spring 2024,

⁹ The small number of students from the fall 2018 cohort who provided consent means that this estimate cannot reliably describe the experience of other fall 2018 cohort students in the First2 Network.

persistence rates ranged from 0 percent for the fall 2018, 2019, and 2020 cohorts to 91 percent for the fall 2023 cohort. By the end of spring 2024, graduation rates ranged from 100 percent for the fall 2018 cohort to 21 percent for the fall 2023 cohort. The remaining percentages of these students either switched to a non-STEM major, transferred to another institution, or dropped out of college.

Table 26. STEM Persistence and Graduation Rates by Cohort for First2 Network Sophomores and Higher With Tracking Consent

Cohort	Persistence Rate (as of Spring 2024)	Graduation Rate (at end of Spring 2024)
Fall 2018 Cohort of Sophomores or Higher	0% (0 of 3)	100% (3 of 3)
Fall 2019 Cohort of Sophomores or Higher	0% (0 of 5)	80% (4 of 5)
Fall 2020 Cohort of Sophomores or Higher	0% (0 of 13)	92% (12 of 13)
Fall 2021 Cohort of Sophomores or Higher	41% (12 of 29)	69% (20 of 29)
Fall 2022 Cohort of Sophomores or Higher	60% (31 of 52)	44% (23 of 52)
Fall 2023 Cohort of Sophomores or Higher	91% (62 of 68)	21% (14 of 68)

Statewide STEM Readiness, Persistence, and Completion Rates

One metric that the First2 Network tracks is the percentage of STEM students across West Virginia persisting in their programs of study, regardless of their participation in network activities. Because the network also seeks to influence the readiness for STEM students for college and program completion, this report also includes STEM readiness and STEM completion rates.

These State-level data are provided by HEPC DSR and disaggregated by variables of interest to the First2 Network for which data are available. Data are organized by College Readiness (STEM readiness rate), STEM Persistence (retention rate), and STEM Completion (graduation rate). Appendix C provides more complete details by College Readiness (tables 1a–1g for STEM readiness for 2016–2022 freshmen), College Participation (table 2 for Fall-to-Fall and Fall-to-3rd Fall retention rates for 2016–2022 freshmen), and College Completion (table 3 for graduation rates for 2012–2018 freshmen). These data provide point-in-time information as part of the examination of trends throughout the First2 Network. In general, several consistent trends are apparent in these data:

- Pell recipients have significantly lower rates of readiness, persistence, and completion than their non-Pell counterparts.
- STEM students have consistently higher readiness and persistence rates than non-STEM students, but most often have lower completion rates.
- In general, the results by rurality indicate slightly lower readiness, persistence, and completion rates for rural youth when compared with non-rural youth.

To highlight areas of interest within readiness, persistence, and completion, figures 25–30 are presented on the next several pages. Note that all of these depictions focus on students based on whether they were a STEM major or a non-STEM major during their first year.

For College Readiness (figures 25–26), figure 25 shows that STEM students have higher rates of STEM readiness than non-STEM students, regardless of rurality, for all seven freshmen cohorts. Rural STEM and non-rural STEM scores increased from the 2016 cohort to 2017, then show a generally decreasing pattern through the 2021 cohort; 2022 cohort rates are equal to the 2021 rates. The non-STEM groups (rural and non-rural) both show an increase in STEM readiness rates for each successive cohort from 2016 to 2018, then rates drop or stay the same for the 2019 cohort (rural and non-rural, respectively), before both decrease for the 2020 and 2021 cohorts and then decrease slightly (rural non-STEM) or remain unchanged (non-rural non-STEM). The largest increase is the 17 percentage point jump from 2016 to 2017 for non-rural STEM youth; the largest decrease is the 14 percentage point drop from 2020 to 2021 for non-rural non-STEM students.

Figure 25. STEM Readiness Rate (Percentage) by Freshmen Cohorts: Rurality by Major

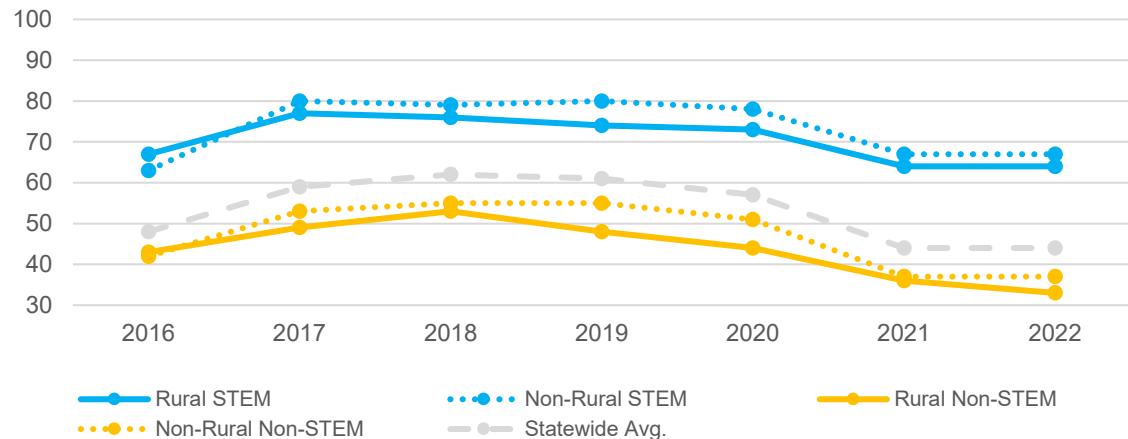
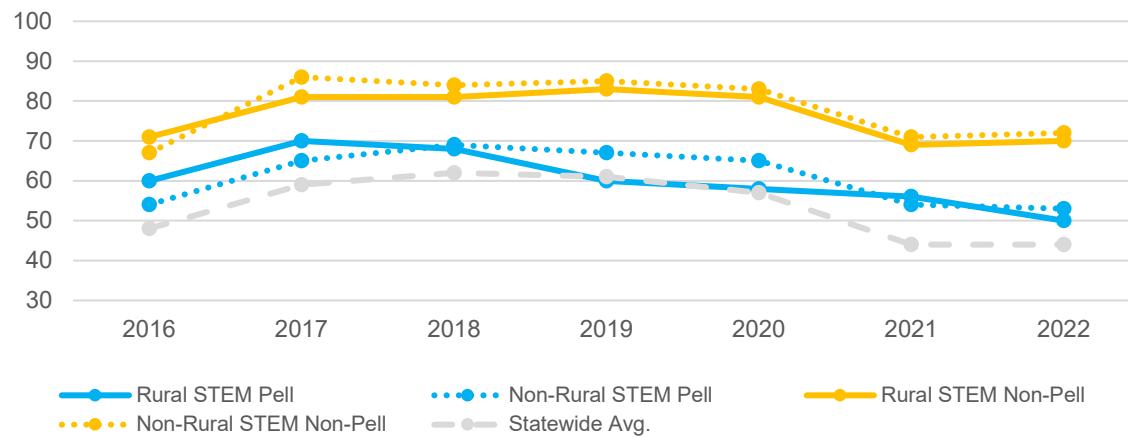


Figure 26 shows that for STEM students, Pell recipients have lower STEM readiness rates than their non-Pell counterparts, regardless of rurality, for all seven cohorts. All four groups show varying patterns of increases, decreases, or nonchanging rates across the seven cohorts, but all four groups show a decline for the 2020 and 2021 cohorts. The largest increase is the 19 percentage point jump from 2016 to 2017 for non-rural STEM non-Pell youth; the largest decrease is the 12 percentage point drops from 2020 to 2021 for the rural STEM non-Pell and non-rural STEM non-Pell students.

Figure 26. STEM Readiness Rate (Percentage) by Freshmen Cohorts: Rurality by STEM Major by Pell



For College Participation (figures 27–28), figure 27 shows that STEM students have slightly higher retention rates than non-STEM students, regardless of rurality, for all seven cohorts. All four groups show a decrease in retention rates from the 2016 to 2017 cohorts, then increases from 2017 to 2018 and 2018 to 2019, before reflecting decreases from 2019 to 2020. From 2020 to 2021, the retention rates increased for rural STEM students, decreased for non-rural STEM students and non-rural non-STEM students, and remained the same for rural non-STEM students. All four groups showed increases from 2021 to 2022. All changes were less than 10 percentage points.

Figure 27. Fall-to-Fall Retention Rate (Percentage) by Freshmen Cohorts: Rurality by Major

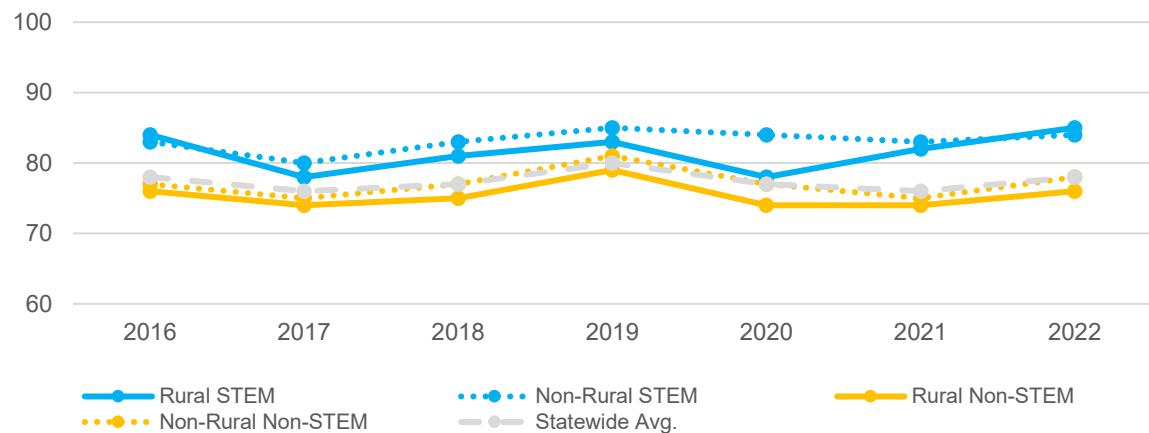
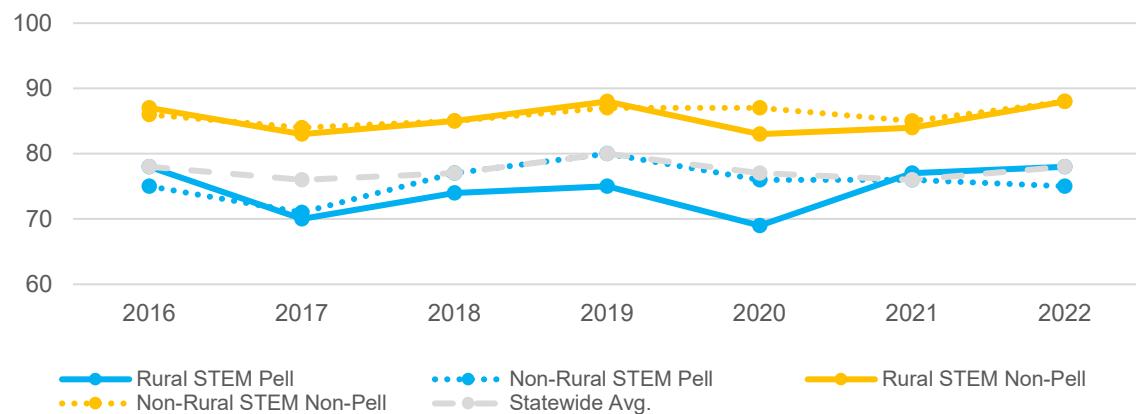


Figure 28 shows that for STEM students, Pell youth have lower retention rates than their non-Pell counterparts, regardless of rurality, for all seven cohorts. All four groups show a decrease in retention rates from the 2016 to 2017 cohorts, then increases from 2017 to 2018 and 2018 to 2019, before showing a decline for the 2020 cohort (except for the unchanging non-Rural STEM non-Pell group). From 2020 to 2021, the retention rates increased for two groups (rural STEM Pell and rural STEM non-Pell), decreased for one group (non-rural STEM non-Pell), and stayed the same for one group (non-rural STEM Pell). Three groups showed increases from 2021 to 2022; the non-rural STEM Pell students showed a slight decrease. All changes were less than 10 percentage points.

Figure 28. Fall-to-Fall Retention Rate (Percentage) by Freshmen Cohorts: Rurality by STEM Major by Pell



For College Completion (figures 29–30), figure 29 shows that STEM students have lower graduation rates than non-STEM students, regardless of rurality, for six of the seven cohorts (2013–2018); the 2012 freshmen cohort had slightly higher graduation rates for STEM youth compared with non-STEM. All four groups show varying patterns of increases, decreases, or nonchanging rates across the seven freshmen cohorts. All changes were less than 10 percentage points.

Figure 29. Four-Year Graduation Rate (Percentage) by Freshmen Cohorts: Rurality by Major

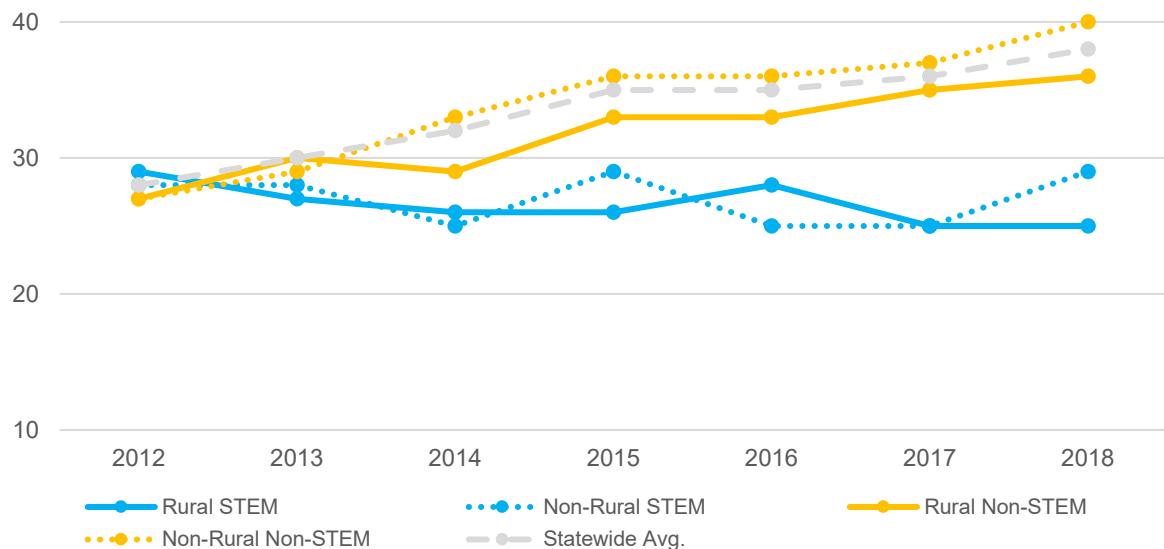
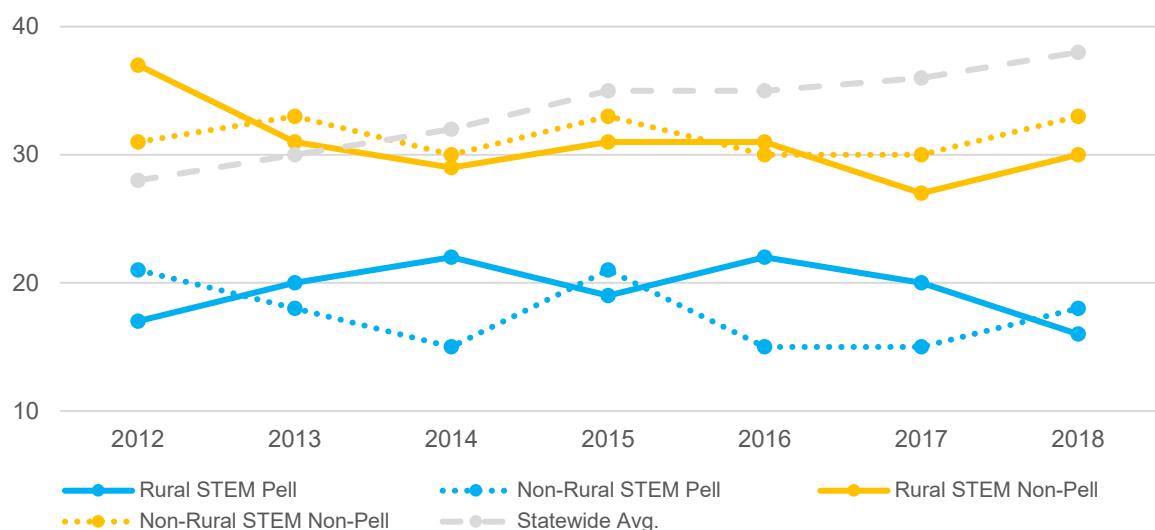


Figure 30 shows that for STEM students, Pell recipients have lower graduation rates than their non-Pell counterparts, regardless of rurality, for all seven freshmen cohorts. All four groups show a variety of increases, decreases, or nonchanging rates across the seven freshmen cohorts. All changes were less than 10 percentage points.

Figure 30. Four-Year Graduation Rate (Percentage) by Freshmen Cohorts: Rurality by STEM Major by Pell



Student Outcomes Summary

The overall STEM fall-to-fall persistence rate among First2 Network, first-time freshmen who provided consent for tracking is 70 percent (50 of 71 students) for the 2021, 2022, and 2023 cohorts. This rate is lower than the overall statewide persistence rates for rural STEM and non-rural STEM youth for the 2021 and 2022 cohorts, which range from 82 percent to 85 percent.

The overall STEM graduation rate among First2 Network freshmen who provided consent for tracking is 61 percent (17 of 28 students) for the 2018, 2019, and 2020 cohorts. This rate is higher than the overall statewide graduation rates for rural STEM and non-rural STEM youth for the 2018 cohort (latest data available), which range from 25 percent to 29 percent.

Analyses of all West Virginia students enrolled in public institutions indicate that Pell-eligible and rural youth had lower rates of STEM readiness, persistence, and completion than their non-Pell-eligible and non-rural counterparts. STEM students had higher STEM readiness and persistence rates than non-STEM students, but lower completion rates.

4 Conclusions and Recommendations

4.1 Conclusions

4.1.1 First2 Network Structures and Processes

The First2 Network has grown substantially since its beginning, from 144 members in Year 1 to 1,156 by Year 6, which is an increase of more than 700 percent. Membership increased steadily through the period, increasing by 33 percent during the past 2 years. Of particular importance, the number of participating students rose steadily through Year 5, when 324 participated in activities. Year 6 officially showed 131 student participants, although most members that year (65 percent) had an unknown status.

Similarly, the PDSA process showed impressive evolution and growth across the 6 years. In Years 1–4, the network launched 141 PDAs when such activities were led by specific working groups. An audit and quality review then identified strategies for improvement, including a shift to institutional team-led efforts in Year 5 with an increased focus on shared measures, metrics, goals, and key strategies. In this new context, 24 of 34 PDAs (71 percent) carried out in SY 2022–2023 were completed, as were 25 of 47 PDAs (53 percent) in SY 2023–2024. Looking ahead, network members are planning for 54 PDAs in SY 2024–2025.

Another prominent area for growth was in partnerships. From an initial set of 12 partners, this number grew to 76 by Year 6. The Year 6 total included 20 higher education partners and 56 other partners, including STEM entities, industry, and educational organizations.

Increases also were evident in pathway capacity and pathway connections. To build capacity, the network retained two new backbone positions in Year 6: a new First2 program coordinator to lead communications and develop relationships among stakeholders and serve as a mentor to emerging backbone leaders, and a communications coordinator to work with a communications team to grow the network. Network members also conducted onboarding sessions for more than 125 institutional team members to familiarize them with the organizational structure and network practices.

To facilitate connections, members developed publications and made presentations to regional and national groups. Members presented at meetings of the American Chemical Society and the West Virginia Academy of Science, among other conferences. The network held its own conferences—up to four a year—relying on a mix of in-person and virtual events. Members had articles accepted for publication in a variety of journals, giving network activities added visibility nationally.

The results from Steering Committee Surveys showed progress over the life of the project. For eight items common across the surveys for Years 1–6, seven exhibited growth over the 6-year period. Data showed increases in the share of respondents who believed that the Steering Committee engaged in constructive communication, that members trusted each other, and that the committee had a clear understanding among members. For two survey items added for Years 5–6, responses were generally positive as members said that they had a clear vision for the network and meetings were designed to complete key tasks.

In Steering Committee interviews, participants said that the structure of the Steering Committee has remained relatively unchanged since the shift from working groups to institutional teams. They believed that the structure of two meetings per month leads to more productive and strategic use of time, and members receive information well in advance in order to help avoid immediate deadlines. Participants cited several accomplishments, including onboarding new members and new institutions in the network. Overall, they agreed that they are making progress on Steering Committee and First2 Network goals, including improvements that have strengthened institutional team efforts. Participants also praised the collaborative nature of the First2 Network.

Institutional team survey results showed positive perceptions of the network in Years 5–6, both regarding the support of students and the effectiveness of their teams. They had similarly strong perceptions about their institutional teams regarding the ability to collaborate, support students, and provide leadership opportunities to students. Respondents had positive perceptions for the Plan, Do, Study, Act cycles of PDSA. Such findings represented some improvement over Years 1–4; in Year 4, for example, some respondents had concerns that scheduling challenges allowed insufficient time for activities, and three-fourths of the respondents wanted additional resources to better support their engagement in PDSA efforts.

In interviews with members of institutional teams, participants said that their teams had evolved or grown from Year 5 to Year 6. The cross-cutting goal of supporting first-generation students was clear across sites, with students having access to numerous leadership opportunities. The most common facilitating factors for PDAs were coaching and the PDSA template provided by the First2 Network, while the most common challenges were implementation delays for coaching and failing to have enough involvement to complete all of the tasks in a timely manner. Key outcomes included improvements in institutional team operations, PDAs underway or completed, and better communication and sharing about the network. Systems-level changes were evident at both the network and campus levels, and all sites had clear sustainability strategies planned or underway.

Throughout the project, participants have rated conferences highly, with most agreement on most items rated at a 4.0 or above on a 5-point scale. Conferences presented a challenge during the COVID-19 pandemic as they were moved from in-person to virtual sessions. In Years 5–6, the network held one virtual and one in-person conference. In many surveys, the lowest rated item was the amount of time allowed for networking with other network members. In Year 6, the highest rated items were the ability to apply items learned at the conference (November 2023) and meaningful sessions and conference structure (May 2024).

4.1.2 Systems Targeted by the First2 Network

The Network Value Survey administered in Years 1–5 showed varied results by year but overall strengths when comparing initial and final surveys. Network members valued the various benefits of First2 participation similarly in Years 1–2, and they particularly valued the networking, community building, and knowledge acquisition associated with network engagement. Year 3 saw moderate to large gains, especially for students, some of whom said the network provided them with a better understanding of their own studies and purpose and cited high levels of involvement with First2 student clubs and internships. Average ratings then declined somewhat in Year 4, although students continued to indicate appreciation for the connections, colleagues, and collaboration available through the network. The ongoing pandemic may have influenced some of these views.

While no survey was administered in the final year, Year 5 First2 student respondents reported strong perceptions of the systems-level impacts from their network membership. They reported small gains across value life cycles and areas such as networking, community building, and applying learning and practices. All five subscale scores showed slight increases for student members and members overall saw evidence of improvement, such as improved STEM program persistence rates. Student members say that they have stayed consistently engaged and valued their participation in the network.

4.1.3 Impact of the First2 Network

SNA survey data reveals that the First2 Network has become increasingly more collaborative across the years, with an increase in the number of unique network members identified as collaborators and increased levels of collaborative engagement among members across the years. These survey results mirror and corroborate the network's increases in membership annually. Furthermore, the increased number of student respondents in later years also mirrors the parallel increase in student membership and engagement in the network.

In following up with students who had participated in one of the network's summer immersion research experiences, survey data revealed four statistically significant increases in respondents' scores related to research knowledge from their initial pretest at the start of the immersion experience to the recent follow-up, indicating that students have continued increasing their knowledge about research. Furthermore, respondents still held positive perceptions of those immersion research experiences, with most agreeing that it helped increase their scientific knowledge, improve their research skills, learn how STEM research is conducted, and increase their knowledge of research within a STEM field.

Students most often join the First2 Network for the following reasons: to get involved with research, become better connected with STEM faculty and students, and secure a paid position. Perceptions related to the degree of student voice within the network were varied; however, most respondents in the student focus groups reported positive views of overall student voice in the network and within their institutional teams, as well as positive perceptions of the strength of their own personal voice in the network. Overall, most participants perceived that they were part of a scientific or STEM community, with some noting interactions with STEM professionals both within and outside of their institutions, as well as with other STEM students.

While the number of students who provided consent for tracking their persistence and graduation is low, preliminary results suggest that the overall STEM fall-to-fall persistence rate among First2 Network, first-time freshmen from the 2021, 2022, and 2023 cohorts is lower at 70 percent compared with the overall statewide persistence rates for rural STEM and non-rural STEM youth from the 2021 and 2022 cohorts, which range from 82 percent to 85 percent. However, the overall STEM graduation rate among First2 Network freshmen (again, who consented for tracking) from the 2018, 2019, and 2020 cohorts is 61 percent, which is higher than the overall statewide graduation rates from rural STEM and non-rural STEM students from the 2018 cohort (latest State data available), ranging from 25 percent to 29 percent.

Across the years for West Virginia students enrolled in public higher education institutions, analyses in which Pell eligibility is used as a proxy for first-generation status indicate that Pell-eligible STEM students had lower STEM readiness scores and lower STEM persistence and graduation rates than non-Pell-eligible students. Similarly, rural students, in general, earned lower STEM readiness scores and had lower persistence and graduation rates than their non-rural counterparts. Furthermore, STEM students had higher STEM readiness and persistence rates than non-STEM students but lower completion rates. And, looking at statewide graduation trends, the percentage of West Virginia students graduating at 4 years has increased from 28 percent for the 2012 cohort to 38 percent for the 2018 cohort (latest data available), indicating that the needle is moving in a positive direction for this statewide metric.

4.2 Recommendations

For current network sustainability efforts, and for undertaking similar efforts in the future, the evaluation team offers several broad recommendations for consideration.

- Continue to strengthen coaching/onboarding support. The First2 Network has made improvement science activity a core strategy of its work to improve early persistence of rural, first-generation STEM students in their majors. In the most recent years, this effort is being conducted through institutional teams with coaching support by network leaders/principal investigators. While still in its infancy, members may want to elect a chair/co-chair to serve in this role as the network moves into its status as a nonprofit organization, ensuring that it is sustainable and accurately reflects new understanding and the needs of the problem from different perspectives.
- Build in backbone support. Early on in the grant, the program had an outside partner provide backbone support to coordinate and design a blueprint for increasing organizational capacity. Different from previous working group structure, institutional teams allowed for greater centralized activity for institutional utilization with access to targeted First2 improvement science support, ensuring contextual understanding. Moving forward, without consistent backbone support, this approach may lead to institutional silos with differentiated strengths that do not get leveraged throughout the membership.
- Build in data support for identifying, collecting, and combining common metrics across sites (“data wrangler”). Despite the continued effort by institutions and First2 Network leadership to support data collection, the project did experience challenges in the form of member data tracking, particularly student data. Steering committee members may want to continue to strengthen capacity at the First2 Network level to coordinate longitudinal data collection, specifically appointing someone who is responsible for student tracking and securely capturing the shared measures across sites.
- Build in explicit junctures for student engagement/involvement while streamlining and offering flexibility for their responsibilities/obligations. This grant cycle has prioritized the involvement of student leaders across the network, and students acknowledge their growth and value within the network. Such a strong structure, including explicit guidelines and proper support, will continue to lead to long-standing student engagement beyond the grant. The network may consider expanding these efforts to allow for greater flexibility in participation and responsibilities. Student members reported needing more clarity around obligations and flexibility in their involvement. Network leaders may want to explore different ways of soliciting student engagement in the work and providing professional learning opportunities for faculty and staff who engage with them, ensuring standardized expectations and guidance.
- Celebrate the level of buy-in/involvement of network members at large, network leadership, and students, and their blood, sweat, and tears that went into launching, growing, and sustaining this network! Although the official project period is concluding, it is important to reflect on the lessons learned to sustain progress made through the

program and celebrate the impact of resources after the conclusion of the grant. Staff, team members, committee members, and the community partners it serves have been loyal constituents throughout the contract. First2 Network may want to consider incorporating a concluding discussion panel or social hour, focusing on what might benefit program participants as far as sharing successes, challenges, and lessons learned.

- With the addition of two new backbone staff in Year 6, each with the responsibility of enhancing communications, the network may find value in increasing its outreach to other educational programs that serve high-need students. One example is the West Virginia Gaining Early Awareness and Readiness for Undergraduate Programs (GEAR UP), also operated by WV HEPC, which promotes a “college is possible” message to secondary school students in the State. Network leaders could present at GEAR UP leadership conferences and brief GEAR UP program staff, who then may promote the network to their high school students who are interested in STEM.

5 Notes

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