Building an Inter-Institutional Collaboration for STEM Achievement Among Small Universities in Appalachia:

A Planning Grant for an NSF S-STEM Track 3 Proposal

NSF Award # 2424568

Needs Assessment Report

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FIRST2 NETWORK

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Executive Summary

This needs assessment was conducted through an NSF S-STEM planning grant Award # 2424568 to inform a multi-institutional Track 3 proposal aimed at improving recruitment, retention, and success of low-income, academically talented STEM students in West Virginia's rural-serving higher education context. The study integrates evidence from WVU Institute of Technology and Glenville State University (GSU) (with Fairmont State University initially engaged but later withdrawing from data sharing) and is grounded in the statewide First2 Network culture of student voice, early research experiences, and continuous improvement. Data sources included institutional enrollment and retention metrics, financial aid indicators, student and faculty/staff surveys, focus groups, and regional workforce/economic development information aligned with West Virginia's Vision 2025 science and technology priorities.

A key outcome of the planning work was the selection of consortium STEM majors aligned to state workforce platforms (Life Sciences, Computer/Data Science, Advanced Manufacturing, Advanced Energy) and to institutional strengths. Across participating majors, the needs assessment revealed high unmet financial need among Pell-eligible STEM students (averaging roughly $7,500–$8,000 across institutions/majors) and variable academic performance and first-year retention. Importantly, the eligible pool is limited: only ~42–47% of enrolled STEM students at the participating institutions were Pell-eligible in 2024–2025, underscoring the recruitment challenge for S-STEM reach and equity goals. The consortium therefore adopted a holistic scholar selection model (minimum HS GPA 2.75 plus a short application survey, faculty interview, and recommendation letter) to identify students with strong potential and commitment, not solely prior advantage.

Across institutions, existing support (e.g. first-year seminar structures, tutoring centers, TRIO services, career services, First2 programming, outreach, and research opportunities) provide a strong foundation for S-STEM implementation. However, student input and institutional evidence show these supports are often underutilized due to lack of awareness and stigma, despite being perceived as effective by students who use them. Students strongly prioritized relationship-based support (especially connecting with faculty and guidance navigating academic challenges/resources), practical resource support (e.g., free textbooks/materials, software/tools), and hands-on lab/research opportunities, alongside career readiness supports (internship placement and resume development) and personal development (stress and time management).

The cross-institutional analysis identified five shared challenges that shape the Track 3 concept and coordinated solutions:

Recruitment constraints driven by enrollment declines/flat trends, limited targeted outreach, and historically lower-than-expected S-STEM applicant pools statewide which prompted a consortium-wide recruitment plan with unified messaging, admissions integration, K–12 outreach, and faculty/student ambassador engagement.

Retention and graduation barriers stemming from academic readiness gaps (especially math), financial stress, competing family/work responsibilities, mental health/testing anxiety, rigid institutional processes, hidden program costs, and rural constraints (internet access, childcare, reluctance/limitations around relocation).

Mentoring capacity gaps, where advising exists but consistent, holistic mentoring/coaching is limited, leading to planned academic coaching training and wraparound, multi-layer mentoring models.

Data infrastructure and evaluation limitations (particularly at WVU Tech and GSU), necessitating a coordinated evaluation structure with shared metrics, improved data pathways, and external evaluation support.

Variable institutional readiness, with GSU newer to S-STEM-scale implementation, requiring a tiered capacity-building approach (e.g., dedicated coordinator support, cross-institutional implementation coaching, quarterly check-ins, and training in grant management and student tracking).

Student voice was intentionally centered through First2 student leader involvement in survey testing, distribution strategy, and interpretation. Survey data (n≈98 across 17 STEM majors) and focus group feedback reinforced a consistent theme: students thrive when support is personal, responsive, and embedded in authentic relationships, while traditional support structures are less effective when they are hard to access (hours), poorly advertised, or carry stigma. Cultural survey findings further highlighted Appalachian family dynamics (high personal agency paired with strong family loyalty and debt aversion) supporting the need for culturally responsive, family-inclusive mentoring and barrier reduction strategies.

Collectively, these findings directly inform the proposed Track 3 priorities: coordinated recruitment; cohort-based community building and networking; wraparound mentoring (peer, faculty, family); cross-campus CURE-based research experiences and technical skills development; career exploration and professional development tied to regional workforce pathways; policy/practice improvements to reduce hidden costs and expand access (e.g., virtual tutoring networks); and a rigorous research/evaluation plan using shared metrics and PDSA continuous improvement. Next steps focus on integrating S-STEM visibility into admissions pipelines, designing summer bridge and culturally responsive mentoring/coaching training, expanding CURE modules, strengthening shared data/evaluation processes, continuing student co-design via First2, and finalizing proposal components, partnerships, and budget structures for a competitive NSF Track 3 submission.

Introduction

This needs assessment was conducted as part of a National Science Foundation (NSF) S-STEM planning grant to support the development of a multi-institutional Track 3 proposal focused on increasing the recruitment, retention, and success of low-income, academically talented students pursuing STEM degrees. The assessment brings together data and insights from three West Virginia institutions (West Virginia University Institute of Technology (WVU Tech), Glenville State University (GSU), and Fairmont State University (FSU)) to identify shared challenges, institutional strengths, and student needs. All three institutions are active members of the First2 Network, a statewide NSF INCLUDES initiative focused on improving STEM persistence among rural, first-generation, and low-income students through student voice, early research experiences, and systemic change. The First2 Network has fostered a culture of collaboration and continuous improvement that provides a strong backbone for this planning effort. This assessment draws on institutional data, student and faculty surveys, focus groups, and data from regional economic development reports to inform the design of evidence-based interventions that are scalable and responsive to the conditions of West Virginia's rural-serving institutions.

West Virginia University Institute of Technology (WVU Tech) is a regional campus of West Virginia University with a strong focus on engineering and technology. Located in Beckley, WV, WVU Tech's mission is to provide accessible, high-quality education that prepares students for careers in STEM, business, and health sciences. The institution serves a student population of approximately 1,600, many of whom are first-generation college students and residents of rural communities. WVU Tech's STEM offerings include ABET-accredited engineering programs (such as chemical, mechanical, and electrical engineering), computer science, biology, and health sciences.

Glenville State University (GSU) is a small, public, liberal arts institution in central West Virginia that supports rural and underserved students. GSU serves roughly 1,300 students, with a significant portion coming from economically disadvantaged backgrounds. Its mission emphasizes student-centered education, public service, and regional development. The STEM programs at GSU include biology, chemistry, natural resource management, and a newly expanding mathematics program.

Fairmont State University (FSU), located in north-central West Virginia, serves about 3,600 students and has a mission grounded in providing transformative educational experiences through comprehensive academic offerings, community engagement, and personalized support. FSU's student body includes a high proportion of Pell-eligible and first-generation students. Its STEM programs encompass areas such as biology, chemistry, mathematics, computer science, engineering technology, and cybersecurity. These regional institutions play a key role in workforce development and access to STEM careers for students across Appalachian communities in the north, central, and southern parts of the state.

The First2 Network is a NSF INCLUDES-funded initiative focused on improving the persistence of rural, first-generation, and low-income STEM students in WV and beyond, particularly during the critical first two years of college. As a regional learning network, First2 brings together higher education institutions, K–12 partners, students, employers, and community organizations to co-create solutions that address systemic barriers to STEM success. All three institutions participating in this S-STEM planning grant are active members of the First2 Network. Their involvement has fostered a culture of student voice, continuous improvement, and cross-campus collaboration that directly informs this planning effort. Lessons learned through First2, including the importance of early research experiences, strong faculty-student relationships, and data-driven change, provide a foundation for identifying focused, evidence-based strategies to support low-income, academically talented STEM students through the S-STEM program.

Methodology

A wide range of data sources were used to inform this assessment of needs and guide the development of an evidence-based, multi-institutional S-STEM proposal. Institutional data was gathered from the offices of Institutional Research and Financial Aid at each of the three participating campuses. These data included metrics on student enrollment, retention, graduation rates, cumulative GPAs, financial aid eligibility (particularly Pell Grant status), and first-generation status. Data was disaggregated by STEM major when possible, to identify patterns and disparities affecting low-income, academically talented students.

From our initial conversations and modeling after the work done at each institution with the First2 Network, we had intentions of prioritizing student input. To center the student experience, surveys were developed and distributed to a sample of current STEM students across the three institutions. These surveys asked students about academic and financial challenges, campus support, and perceived barriers to success. A complementary set of questions focusing on faculty and staff gathered perspectives on institutional strengths and challenges in recruiting and retaining STEM students from low-income backgrounds. In addition to the surveys, focus groups and interviews were conducted with students, faculty, and staff to deepen the qualitative understanding of key themes such as academic advising, mentoring, and the impact of financial stressors on academic performance.

External data sources were consulted to provide regional context for workforce demands and opportunities for STEM graduates in West Virginia. Data from regional economic development agencies provided insight into emerging sectors and the need for a well-prepared, local STEM workforce.

To ensure consistency and allow for meaningful comparisons across institutions, a common data framework was developed. Each institution submitted data in response to shared prompts and metrics, and analyses were conducted collaboratively by the planning team. Quantitative data was summarized using descriptive statistics and visualizations to identify cross-institutional patterns and areas of divergence. Qualitative data from open-ended survey responses, interviews, and focus groups were coded thematically. Together, this data provided a rich, multi-dimensional understanding of the current landscape and informed the identification of priority areas for intervention through the future S-STEM Track 3 proposal.

Selecting STEM majors for the multi-institutional S-STEM program

The STEM majors selected at each institution were strategically chosen based on institutional strengths (e.g. program vitality, potential, enrollment trends), regional workforce needs, and the growing demand for STEM professionals in West Virginia. Regarding workforce needs, our selection aligns closely with the Vision 2025 Science and Technology Plan, which identifies four high-priority science and technology platforms for growth: Life Sciences, Computer and Data Science, Advanced Manufacturing, and Advanced Energy. WVU Tech's majors (Biology, Forensic Investigations, Chemical Engineering, and Chemical Forensics) align with the Life Sciences platform through connections to health sciences and forensic biology, and with Advanced Manufacturing through Chemical Engineering and Chemical Forensics, which support the state's focus on chemicals and materials. At GSU, majors such as Biology, Chemistry, and Environmental Science support growth areas within both the Life Sciences and Advanced Energy platforms, including Environmental Science, Natural Resources, and Decarbonization. Forest Technology, Wildlife Management, and Land Surveying also reinforce the state's emphasis on natural resource management, contributing to applied research in ecology, conservation, and sustainable land use. FSU's majors (Biology, Chemistry, Computer Science, Mathematics, and Engineering) cover key areas across all four platforms. These programs support pathways into high-demand fields such as biotechnology, materials science, and renewable energy. Mathematics, present at two institutions, also serves as a critical foundation for modeling, data analysis, and interdisciplinary innovation. Together, these carefully selected majors position students for success in the state's emerging science and technology economy while supporting long-term regional development.

Enrollment numbers and retention/success metrics

After identifying the majors to be included in the scholarship program, the next step was to gather institutional data to assess the success metrics, unmet needs, and Pell eligibility rates within each selected major. This process proved particularly challenging at the two institutions reported below, as institutional research staff were managing high workloads and had to develop custom reports from the ground up to meet these data requests. As a consortium, we came up with a common definition of low-income that would work across all institutions (Pell eligibility) which then allowed us to determine and identify the pool of potential S-STEM scholars and estimate appropriate scholarship amounts. Table 1 summarizes key findings that informed our projections and planning for each institution.

Although initially challenging, the process of building these reports for the project significantly enhanced our understanding of the requirements, data sources, and institutional processes needed to access key success metrics. As a result, at WVU Tech

and GSU we have strengthened institutional capacity by streamlining data acquisition pathways and clarifying internal procedures. Importantly, we have also established a clear point of contact within the institutional research office, which will make future data requests more efficient and sustainable as the project moves forward.
In addition to Pell Grant eligibility and a minimum high school GPA of 2.75 the consortium decided that applicants will also be evaluated based on three supplemental components: 1) a short application survey, 2) a faculty interview, and 3) a letter of recommendation that highlights the student's potential for growth and success. These elements allow the consortium to assess applicants' experiences, interests, and engagement with STEM beyond the classroom. This holistic approach is designed to identify students who are not only interested in STEM but also show promises for long-term commitment to the field.

Table 1. Average unmet need, number, and average GPA for domestic low-income students with unmet need for 2023-2024 across 10 unique majors included in this request. Full time first-year retention (FTFR, %) for the major is also shown. An itemized table with values per institution, per year can be found in the Supplemental Documentation.

Institution*	Majors	Unmet need	Eligible Students	Average GPA	FTFR (%) for major
WVU Tech	Biology	$7,870	38	3.00	45%
	Forensic Investigations	$10,052	21	2.84	68%
	Chemical Engineering	$6,049	4	2.89	86%
	Chemical Forensics	New major Fall 2024			
	Average amount & # awards	**$8,000**	**16**	**2.91**	**57%**
GSU	Biology	$11,184	7	2.87	46%
	Chemistry	$4,230	3	3.23	36%
	Environmental Science	$9,786	4	2.65	92%
	Forest Technology	$8,758	9	1.05	60%
	Land Surveying	$1,353	9	3.18	65%
	Wildlife Management	$10,505	5	2.55	87%
	Mathematics	New major Fall 2025			
	Average amount & # awards	**$7,500**	**10**	**2.60**	**64%**

*At the time this table was prepared, Fairmont State University had withdrawn from the project. Therefore, their data are not included due to their decision to withhold this information until they are prepared to submit their own proposals.

Existing student support and co-curricular programming

To assess the academic, student support, and infrastructure foundations on which the current project builds, we gathered information from each institution's academic support and student services offices. Table 2 highlights the institutional student support resources available at WVU Tech, Glenville State University, and Fairmont State University that will be leveraged to support S-STEM scholars. The table highlights the robust academic and support infrastructure already in place at each institution, demonstrating a strong foundation to promote the success of S-STEM scholars.

Table 2. Existing resources for STEM students that will support S-STEM scholars.

Resource Type	WVU Tech	GSU	FSU
First-Year Seminar Course	WVU 191 grouped by major: emphasizes active learning and community engagement	GSU 100 grouped by major: supports transition to college	SOAR: covers academic and personal success skills
Tutoring & Academic Support	Student Success Center: free tutoring, advising, and workshops	Pioneer Support Center: free tutoring in math/science and skill-building workshops	LEAD Center: free tutoring/mentoring, embedded tutors in chemistry and math, and peer tutoring for First2 students
TRIO Student Support Services	TRIO SSS – for first-generation, low-income, and disabled students: tutoring, advising, and aid support		
Career Services /Counseling	Career Services Center: resume help, counseling, mock interviews, and job fairs	Career counseling available through PSC	Career Services Center, Industry speaker series, internship connections via NASA and local tech firms, and career-related grants
Faculty/Peer Learning Communities	WVU 191 learning communities by major	GSU 100 cohorts by major	Embedded tutoring in key courses, peer tutoring for First2 and proposed S-STEM model
First2 Network Participation	Active involvement: peer tutoring, early research, and student feedback model to be adapted for S-STEM		
STEM Outreach Engagement	Outreach opportunities with several community-based organizations (e.g. PCWA, STEM days, Student led K-12 engagement)	STEM events for regional K–12 schools	WV SPOT STEM outreach, NASA Education Resource Center, and student-led K-12 engagement

Research Opportunities / Grants	Curriculum embedded research (First2 Network sponsored)		NASA WV Space Grant research mini-grants and STEM education partnerships
Industry Partnerships	Alliance, Inc., TC Energy & Dow, and Toyota USA Foundation Mostly SE. Need to extend to AS.		Active NASA and industry partnerships, advisory boards, and internship pipelines

Since all institutions offer first-year courses grouped by major and tailored to student success, collaborative development of shared modules related to belongingness and STEM identity-building can be implemented across campuses, ensuring consistency and scalability of the S-STEM scholar experience. Also, the existing peer tutoring and mentoring structures can be linked to create a broader, cross-campus learning community for S-STEM scholars. This would foster a sense of belonging beyond individual institutions and allow for shared best practices, virtual peer mentoring, and collective problem-solving. For this reason, it was evident to the members of this group that some of our proposed innovative co-curricular interventions as a consortium will be about enhancing and elevating these common resources with ideas such as a multi-institutional mentoring and virtual tutoring program, and wrap-around mentoring systems that enhance faculty-student-family engagement. Finally, because similar academic support services are already in place, it becomes easier to assess the impact of interventions using comparable metrics. This enables the team to co-develop assessment tools, streamline data collection, and report program outcomes more effectively.

Some of the observed variation such as differences in industry partnerships and research opportunities, creates a valuable opportunity for these institutions to leverage each other’s strengths, expanding community engagement and broadening experiential learning and career pathways for students across all campuses. To that end as part of our curricular and co-curricular interventions we have designed an integrated multi-institutional course-based undergraduate research experience. The course-based research experience is designed to leverage the diverse faculty expertise and institutional resources across the consortium, integrating meaningful, interdisciplinary research into the curriculum. By drawing on the unique strengths of each institution, the program creates authentic research opportunities that span multiple STEM disciplines and enrich the educational experience for all participating students.

Cross-Institutional Needs Analysis: Shared challenges and proposed coordinated solutions

Building on these complementary strengths, a cross-institutional needs analysis revealed a set of shared challenges among consortium members, highlighting common barriers to the recruitment, support, and retention of low-income, high-achieving STEM students, which prompted the development of targeted, collaborative solutions tailored to each institution's context.

Challenge 1: Recruitment of low-income, high-achieving students into STEM major

Based on enrollment data (Figure 1) there is a chronic issue with recruitment at all 3 institutions, showing a flat or negative trend over multiple years.

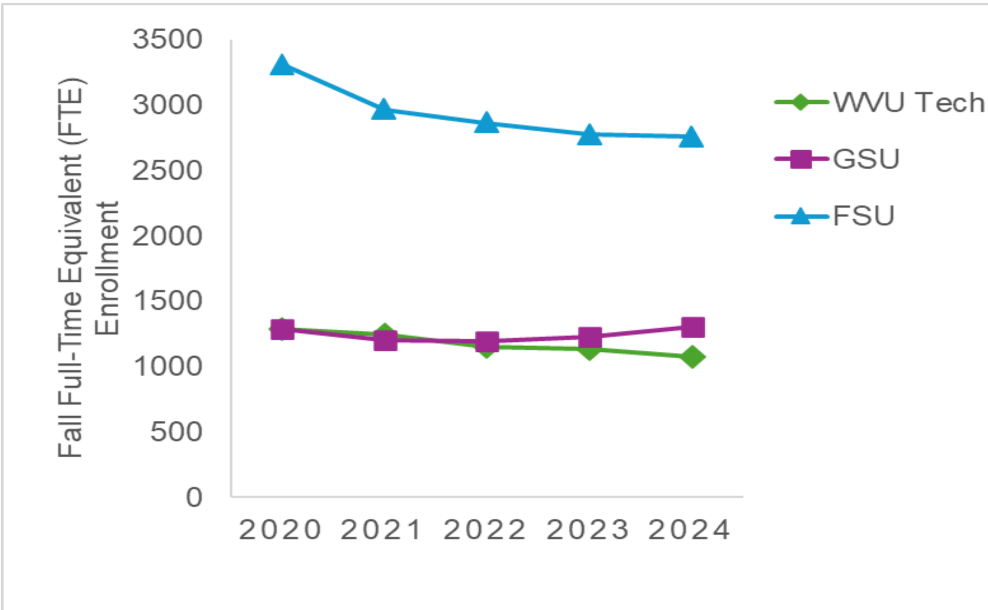

Figure 1. Fall enrollment data for all 3 institutions over the last 5 academic years.
Source:https://www.wvhepc.edu/wp-content/uploads/2024/12/HEPC_EnrollmentReport_2024_FINAL.pdf

WVU Tech and FSU are experiencing sustained enrollment declines, signaling a need for targeted interventions, particularly in recruitment and student retention for STEM majors. GSU's slight rebound is a promising sign and could offer best practices for the other institutions to consider. These trends reinforce the critical role of the S-STEM project in stabilizing and expanding enrollment in STEM fields, which is essential to supporting the STEM workforce and broader economic development in the state. Notably, the pool of eligible S-STEM students last year was under 50% (Table 3), presenting a significant challenge to recruitment, scholarship reach, and progress toward the program's equity goals. This underscores the urgent need to build stronger recruitment pipelines, enhance outreach to low-income and first-generation students, and establish institutional supports that attract and retain S-STEM-eligible scholars.

Table 3. Enrolled STEM students vs Pell Eligible for 2024-2025 AY

Academic Year	WVU Tech	GSU	FSU
Total count	150	78	N/A

Eligible for S-STEM	63 (42%)	37 (47%)	22%

Given these recruitment realities, each institutional team reviewed historical and current admissions practices, demographic trends, and student support infrastructures to identify barriers to recruiting and enrolling low-income, academically talented STEM students. At WVU Tech the analysis revealed not only gaps in outreach to potential scholars (e.g. admission events are not major specific) but also inconsistencies in how scholarship opportunities were marketed and how students navigated the application process (e.g. information was mostly available on the school's website, thus reaching students in the S-STEM target audience who were not already planning to apply for college was limited). Importantly, during consultations with other West Virginia colleges and universities that have managed S-STEM Track 1 projects, a consistent challenge emerged: recruiting eligible students was more difficult than anticipated. For example, at both FSU and UC the recruitment strategies included emails that included program details, a brochure, and an invitation to meet, followed by follow-up phone calls. School visits featured a mix of scientists, faculty, students, and alumni who presented the program and shared career experiences. At UC, informational videos were later created and shared with teachers and counselors, replacing in-person visits with digital flyers and links. A live Q&A panel with scientists hosted by the Admissions office which included faculty and S-STEM scholars was recorded and made available to all students on the potential applicant list. Even after all these efforts, institutions reported lower-than-expected applicant numbers, highlighting the need for more innovative, targeted, and sustained recruitment strategies to build a robust pool of eligible S-STEM candidates.

These findings guided our decision to develop a coordinated, consortium-wide recruitment and application process. By drawing on local data and lessons learned from peer institutions, we recommend a multi-faceted recruitment strategy that integrates campus admissions efforts, regional K-12 STEM outreach, personalized faculty engagement, and targeted communication through statewide education networks summarized in Table 4.

This evidence-based approach will ensure that our recruitment activities are grounded in real institutional contexts and are responsive to the specific challenges identified in our data analysis.

Table 4. Recommended Consortium-Wide S-STEM Recruitment Strategies

Strategy Type	Description	Collaborators / Tools

Utilization of a unified recruitment and application process	Develop shared flyers, posters, and videos; implement a common application process across institutions	All consortium institutions; NSF-ETAP Core Application Tool
Integration with Admissions Offices	Embed S-STEM recruitment within existing admissions workflows; assign admissions staff to liaise with S-STEM team-use of prospective student lists and communication channels	Admissions and recruitment offices at each institution
Cross-promotion and marketing among institutions	Share recruitment strategies and materials among consortium members	Consortium-wide collaboration
K–12 STEM Outreach Collaboration	Distribute unified marketing at regional K–12 outreach events through ARC-funded STEM project	ARC project team at each institution ("Building Connections to Grow Capacity")
Undergraduate STEM Ambassadors	Encourage undergraduate ambassadors at institutions to promote S-STEM opportunities at schools, camps, and state STEM events	First2 Network College Readiness Ambassadors; WV Science Public Outreach Team
Faculty Personal Engagement	Faculty send hand-written postcards and meet with prospective students during campus visits	STEM faculty at each institution along with Admissions offices
Digital & Statewide Promotion	Promote scholarships via institutional websites, emails, and social media, plus statewide networks	Institutional communication teams; WVHEPC; state math and science teacher associations
Recruitment of Enrolled Freshmen	Identify eligible STEM students during their first semester and invite them to apply	Institutional IR/advising offices; faculty mentors

Challenge 2: STEM retention and graduation barriers (e.g., financial, academic, cultural)

From the individual institutional needs assessments, it is clear that STEM students at these institutions face a wide range of academic, financial, personal, and institutional barriers that interfere with their success. Also Appalachian cultural values play a part in STEM student success across all institutions. As part of this effort, we incorporated a cultural survey originally developed at Marshall University and used at Fairmont State University (FSU) that explores how Appalachian cultural values and identity shape the experiences, decisions, and educational pathways of college students. By applying this culturally grounded lens, we aim to better understand the strengths and pressures associated with Appalachian identity and how they intersect with institutional structures and student support systems. This enables us to design interventions that are not only evidence-based but also culturally responsive and grounded in the lived realities of our students. Below is a bulleted list of the key takeaways from both the institutional assessment processes and the cultural survey:

- Many enter college with poor academic readiness, especially in math, and lack fundamental skills such as note-taking and studying.
- Academic gaps are compounded by external pressures identified in our current students such as juggling jobs, family responsibilities, and caregiving roles while coping with mental health challenges, testing anxiety, and time management difficulties.
- Institutional systems can be rigid and unsupportive; students encounter issues with course availability, registration processes, and faculty who may be inflexible or unaware of student needs.
- Financial stress, including navigating the FAFSA and dealing with housing insecurity, further adds to the burden.
- Across campuses, a lack of awareness of available support services prevents students from accessing help that could ease their path.
- Challenges are deeply shaped by its rural context, with unreliable internet access outside of campus, a lack of childcare, and strong family ties that discourage relocation for education. Students are often first-generation (~25%) and low-income (22%), with some (unknown %) serving as primary earners for their families.
- Other barriers are more structural. For example, students face scheduling conflicts from required non-credit-bearing labs, inflexible course structures, and early grading systems that may demoralize rather than guide.

Because we have observed that students at these institutions face a complex mix of academic, financial, personal, and institutional barriers that interfere with their persistence and success, our Track 3 project will include a deep, systematic study to uncover, quantify and understand the specific challenges our students encounter. This inquiry will be guided by a carefully developed set of research questions (Table 5) integrated into our overall research plan, allowing us to quantify how these barriers vary across institutional and cultural contexts.

Table 5: Research questions for Track 3 proposal research plan	
Research	How can hidden costs in STEM programs be removed to improve

Question 1	student progression?
Research Question 2	How do changes to student mentoring, e.g., family-inclusive mentoring, impact student persistence in STEM?
Research Question 3	Do consortium wide community-building and leadership activities improve student sense of belonging?

Challenge 3: Faculty engagement and mentoring capacity

At all three institutions, faculty members serve as academic advisors for students within their majors, providing guidance on course selection, degree requirements, and academic progress. However, few faculty engage in academic coaching in the deeper, more holistic sense; going beyond basic advising to offer personalized support that may include goal setting, career exploration, and skill development in an effort to fosters a sense of belonging and confidence in their STEM identity.

While the advising infrastructure is in place at these institutions, this project aims to support faculty in expanding their roles to include more intentional and impactful mentoring. To do so we will pursue training in academic coaching, which is a personalized support service that helps students build skills and strategies for academic success. Like a personal trainer for school, an academic coach helps students improve their time management, study habits, motivation, and confidence while developing action plans to overcome challenges. Interested parties (e.g. faculty, students, and staff) at each institution will participate in professional development in academic coaching. The workshop has been designed and planned for September 2025 at the Glenville State University campus.

Challenge 4: Data infrastructure or program evaluation limitations

GSU and WVU Tech currently face significant limitations in their data infrastructure and capacity for program evaluation. While both institutions collect student data for internal use and compliance reporting, these systems are often fragmented, inconsistently applied, and lack the functionality for real-time monitoring of student progress and outcomes. Evaluation efforts are similarly decentralized, with few dedicated staff focused on assessment, making it challenging to measure the impact of interventions or track student success over time, particularly in a way that supports cross-institutional comparison. These gaps underscore the urgent need for improved coordination, centralized data management, and the creation of shared evaluation tools to enable evidence-based decision-making and continuous improvement throughout any future S-STEM initiative.

To address these challenges, as a consortium, we will establish a coordinated evaluation structure led by a cross-institutional team of PIs from each institution and a contracted professional evaluator shown on Table 6.

Table 6. Management Team for each Institution and the Consortium			
Institution/Organization	Consortium Leadership Team	Institutional Teams	STEM Administrators
WVU Institute of Technology	Aida Jimenez	John Hird* Kimberlyn Gray Jay Raymond	Tamara Smith**
Glenville State University	Sara Sawyer**	Rico Gazal Jeremy Keene	Mari Clements
First2 Network	Sue Heatherly	Samantha Mitchell Margaret Falletta	
* Identified as Co-PI for customized mentoring ** Institutional Data Researcher			

Each campus will form its own internal S-STEM project team, including faculty from STEM majors, student support personnel, a STEM administrator, and representatives from the Financial Aid and Admissions Offices. Each team will also include a designated institutional data researcher responsible for aligning data collection and analysis with project goals. This structure will not only enhance project implementation but will also foster sustainable, institution-level systems that will persist beyond the grant period. Regular progress reports will support iterative improvement and ensure all activities remain aligned with the overarching goals of the S-STEM Track 3 project.

Challenge 5: Institutional Readiness & Capacity

Of the three institutions that participated in this planning grant, Glenville State University has never had an S-STEM program. Without prior experience managing an S-STEM grant, GSU relies heavily on single individuals in each area (one faculty, one grants specialist person, one institutional researcher) to coordinate efforts, resulting in limited capacity and slower response times. While there is clear faculty commitment and a willingness to grow, the infrastructure for program management, data tracking, and cross-campus coordination is still in development. In contrast, WVU Tech has some S-STEM infrastructure in place through its engineering programs but will need to expand support to other STEM areas. Fairmont State University (FSU) is the most prepared, with robust administrative systems, faculty engagement, and existing grant experience that provide a strong foundation for scaling up. Each institution brings valuable assets to the consortium, but varying levels of capacity will require differentiated support to ensure consistent and effective implementation.

To address the varying levels of institutional readiness, we propose a tiered, collaborative support model that leverages the strengths of the more prepared institutions while building long-term capacity at GSU. Specifically, we will establish a cross-institutional implementation support team, anchored by experienced personnel at the other institutions, to mentor and provide hands-on guidance to GSU during the initial phases of the S-STEM project.

The planning proposal process enabled Glenville State University to thoroughly assess its institutional needs, and as a result, it is now better positioned and more prepared to implement a large-scale S-STEM program. Nevertheless, we will allocate part of the project budget to support a dedicated S-STEM coordinator (distinct from other main responsibilities) tasked with coordinating with institutional research and financial aid and also to help with the interdepartmental coordination needed. In parallel, we will have cross-institutional teams focused on key project components such as recruitment, data management, student support services, and evaluation. These collaborative groups will provide templates, protocols, and "coaching" to help GSU implement systems that align with the broader consortium goals.

Additionally, we will schedule quarterly implementation check-ins and capacity-building workshops, with focused training on grant management, student tracking systems, cross-office coordination, and institutional research. This supportive and scaffolded approach ensures that GSU can grow its internal systems and leadership capacity while still contributing meaningfully to the consortium from the start. Over time, this model is designed to reduce disparities in readiness, promote shared accountability, and build a sustainable S-STEM ecosystem across all three campuses.

Centering student voice in our needs assessment

Centering student voice in the needs assessment for our Track 3 S-STEM proposal was essential to ensure that the proposed program reflects the real experiences, challenges, and aspirations of the students it is designed to serve. Too often, institutional decisions are made without directly engaging those most affected (students) especially those from rural, first-generation, and low-income backgrounds whose perspectives are frequently underrepresented.

Collaborating with First2 Network student leaders to collect data

We held a series of structured workshops throughout the academic year in order to determine the best ways to survey students at each institution. At WVU Tech and GSU, the First2 Student Coordinator met with the First2 Student Directors and Assistant Student Directors for an evening session. During these meetings, students and interested Institutional Team members completed surveys developed by the planning grant team. Their task was to test the surveys for clarity from a student perspective and to familiarize themselves with the content to confidently administer them to other students. Following this, the group brainstormed strategies to maximize the number of survey responses they could receive from other STEM students. Ideas included asking STEM professors to distribute the survey at the beginning of class, presenting the survey at STEM club meetings, and working with campus Student Success offices to administer the survey to STEM students. Responsibilities were divided among the students, ensuring a coordinated effort to increase response rates. At Fairmont State University, the PI took a different approach, administering the surveys only to First2 Campus Club members and current S-STEM participants, opting not to pursue broader distribution.

In all cases, First2 students provided feedback on which survey questions were clear, which were problematic, and their overall comfort level with the surveys. At GSU and WVU Tech, the First2 Student Coordinator scheduled follow-up meetings several weeks later to review survey results and conduct preliminary data analysis. Inclement weather in West Virginia and the many days of campus closings during that time led to low initial survey response rates. In response, we revised our distribution strategy by assigning different students to lead outreach efforts. They collaborated to draft personalized group emails as an opening message to increase engagement and encourage participation. The First2 Student Coordinator returned to GSU and WVU Tech before the end of the performance period to analyze survey results with students and help them refine their takeaways. The finalized survey was deployed in Spring 2025 with the goal of capturing student perceptions and identifying potential misalignments between student needs and the academic and support services currently offered across institutions.

A total of 98 students were anonymously surveyed in 17 STEM majors across all 3 institutions. The information gathered will directly inform the development of curricular and co-curricular support across our multi-institutional S-STEM program, ensuring that interventions are relevant, responsive, and grounded in the everyday realities of STEM students across our campuses. Below is a summary of the findings.

Student survey findings

Students were asked how valuable they would find peer support and community-building activities as well as advising/mentoring activities commonly deployed in most S-STEM projects we consulted during our first in person workshop event. Across the board students thought that all of these are either very or somewhat important, but “connecting with faculty” and “guidance on navigating academic challenges and resources” received the most “very important” scores.

This feedback highlights students’ strong desire for meaningful academic relationships and structured support as they navigate their college experience. While all support strategies were viewed as beneficial, the emphasis on faculty connection and academic guidance suggests that students are seeking trusted mentors and clearer pathways through the challenges of higher education. Prioritizing these elements in S-STEM programming could have a significant impact on student engagement and persistence.

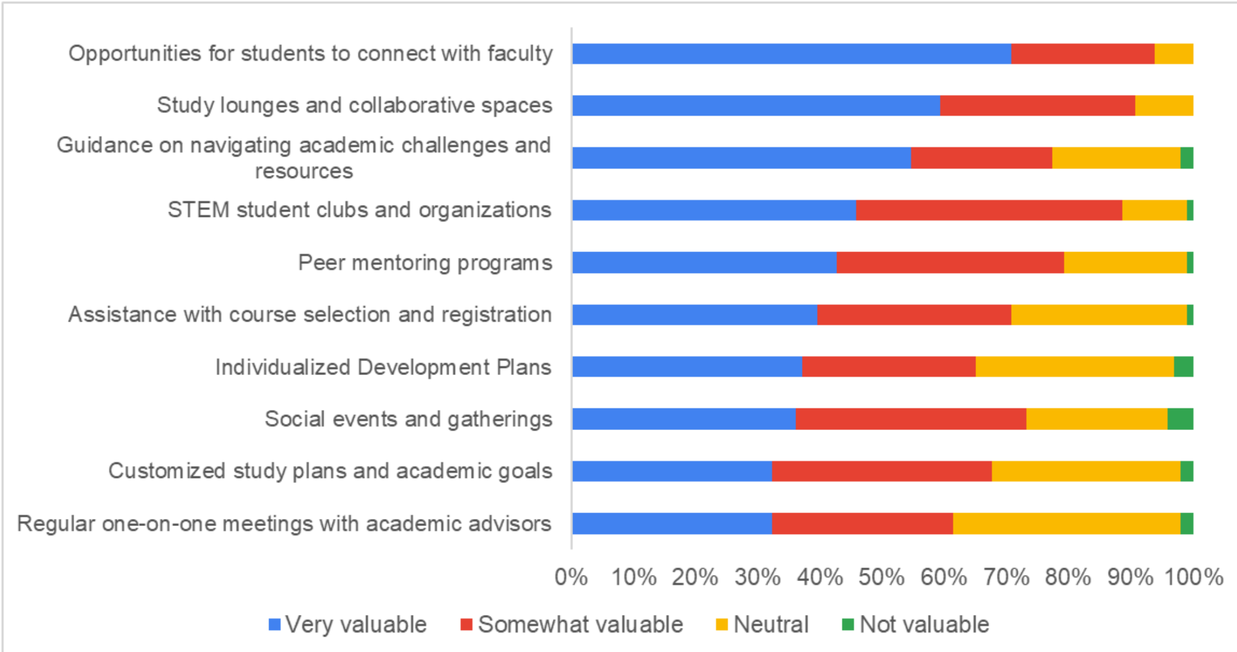

Figure 2. Student perceptions of key support structures in some current WV S-STEM Programs.

To better understand how academic support services are functioning across our campuses and how they can be improved to meet the needs of S-STEM scholars, we asked students a series of questions focused on the availability, accessibility, usage, and perceived effectiveness of these services. Academic support services focus on helping students succeed in their coursework through resources like tutoring, writing centers, study skills workshops, and academic advising.

We began by asking students to identify which academic support services are offered at their institutions to establish a baseline of awareness and institutional offerings. We then asked about the main challenges students face in accessing these services, recognizing that the mere existence of support does not guarantee its usability. To gauge student engagement, we asked how frequently they utilize these resources, and finally, we sought their feedback on the effectiveness of the services they have used. Together, these questions are designed to uncover both systemic gaps and promising practices, providing crucial insight for shaping student-informed improvements to academic support within the S-STEM program.

Survey data shows that students are more aware of tutoring centers (91%) and less aware of all others (~58%). The majority of students (72%) claimed lack of awareness as the top challenge followed by stigma (61%). Surveys revealed what all staff already knew, which is that resources available are underutilized with 50% of respondents selecting that they use these resources “not often or rarely” and 18% listed “never”. However, the majority of respondents (82%) think these resources are either “effective” or “very effective”. Students identified several key areas for improvement to enhance academic support services listed in Table 7 below:

Table 7. Student recommendations to improve academic support services		
Theme	**Issue**	**Student Suggestions**
1. More Hours & Flexibility	Tutoring ends by 5 PM-conflicts with classes and extracurriculars	- Offer evening hours - Provide weekend availability - Support students who study later in the day
2. Increased Staffing	Not enough tutors for upper-level & STEM courses	- Hire and train more tutors - Ensure all STEM subjects have coverage - Assign multiple tutors to difficult courses - Address science tutor gaps
3. Better Awareness of Services	Many students unaware of what is available	- Promote via TikTok, digital signage, large banners - Use more engaging outreach beyond email- Provide service lists & study tips to first-years
4. Peer Mentorship & Study Groups	Limited peer-led support options	- Expand peer mentorship programs - Organize dorm-based study groups - Emphasize approachability and reduce stigma
5. Improved Accessibility	Services are hard to find or use online	- Clearer signage and interactive orientation - Simplify booking/access platforms - Offer quiet, distraction-free environments - Combine academic & mental health support
6. More Faculty Involvement	Disconnect between faculty and support services	- Encourage faculty presence in tutoring spaces. -Integrate support into class culture - Offer extra credit for service use - Require study/tutoring hours

We asked the same four questions regarding availability, barriers to access, frequency of use, and perceived effectiveness of student support services. Student support services address broader aspects of student well-being and success, including mental health counseling, career services, financial aid, housing assistance, and programs that support student belonging and engagement.

Surveys show that 80% of respondents selected lack of awareness also followed by Stigma associated with seeking help (62%). Student responses to the questions regarding frequency of use and effectiveness of support services closely mirrored those of academic supports. Student feedback reveals several recurring themes for improvement of Student support services shown on Table 8 below.

Table 8. Student Feedback on Campus Support Services

Theme	**Summary of Student Feedback**
1. Awareness and Advertising	A major theme was the need to improve awareness of services across campus. Students suggested better advertising strategies, including placing information on the main website, increasing visibility through emails or campus-wide promotions, and more opportunities to meet service staff.
2. Hours and Availability	A common concern was limited-service hours. Students requested extended or later hours, especially for those with busy or non-traditional schedules. Some also suggested having more available staff or time slots for events and seminars.
3. Staff Interactions and Attitude	Some comments pointed to issues with the approachability or demeanor of staff, with students asking staff to be more mindful about mental health. Others called for more staff trained in mental health support or with better communication skills. One student noted: *“I know that many do not seek them out because the people that work there are condescending. Not in a mean way, but they are all very business-minded and that is extremely different from the way many STEM professionals operate.”*
4. Accessibility	Students raised concerns about physical accessibility, particularly in housing and maintenance.
5. Service-specific Suggestions	Some comments focused on specific services, such as the health clinic, financial aid, housing, and tutoring. Students wanted more thorough medical testing, improved maintenance responsiveness, more tutors in difficult subjects, and expanded tutoring for more classes.
6. No Suggestions or Unfamiliarity	A significant number of students either did not feel informed enough to offer feedback or felt satisfied with services.

When give the chance to tell us which academic resources the new S-STEM program should prioritize, the top 3 answers were: free textbooks and study materials, laboratory and research opportunities, and free software and tools. The top 2 answers for which career development activities to prioritize were internship placement assistance and resume building workshops. The top 2 answers for which professional development opportunities to prioritize were certification programs and workshops on emerging STEM fields and technologies. The top 2 answers for which personal development opportunities to prioritize were stress management and time management.

We can conclude that students prioritize access to practical academic resources that reduce financial barriers and enhance hands-on learning. The strong preference for free textbooks and study materials, laboratory and research opportunities, and free software/tools suggests that students value supports that make STEM education more accessible, engaging, and applicable to real-world scenarios.

The survey also revealed that career readiness is a major concern, with students seeking structured pathways into the workforce. High interest in internship placement assistance and résumé building workshops indicated a strong desire for guided, institution-supported transitions from college to career.

Some of the open ended questions in the survey showed that students recognize the need for both technical and personal development to succeed in STEM. Requests for certification programs and exposure to emerging technologies point to a desire to stay competitive in evolving fields, while interest in stress and time management reflects a need for supports that sustain well-being and prevent burnout in demanding academic environments.

Student responses to the open-ended questions also highlighted several recurring themes around how to better support STEM students. Many emphasized the need for greater awareness and communication about existing resources and opportunities, suggesting that simply making students more aware of what is available and figuring out the barriers to using these services and addressing them could improve engagement. Others advocated for practical skill-building workshops, such as time management, study strategies, stress management, public speaking, and habit formation, as key supports for navigating the rigors of STEM majors. There was strong interest in career development, with multiple students calling for more internship placement support, certification opportunities (e.g., W3Schools), and field trips to workplaces to connect academic work with future careers. Social connection and community-building were also mentioned, with students recommending more frequent informal gatherings, mentorship opportunities, and encouragement to join major-specific clubs that offer networking, competition, or conference experiences. These responses reinforce the need for a well-rounded approach that integrates academic, professional, and social support.

Cultural Survey Insights

We chose to survey how Appalachian family structure influences student perceptions of college because cultural values and family dynamics play a critical role in shaping students’ educational decisions, motivations, and support systems, particularly for first-generation students from rural communities. In many Appalachian families, strong interdependence, close-knit relationships, and obligations to home and community can create both encouragement and tension around attending college or pursuing STEM careers, especially if those paths require relocation or long-term time commitments. Understanding these influences allows us to design supports that are culturally responsive, helping students navigate potential conflicts between academic goals and family expectations while also leveraging the strengths of Appalachian identity to promote persistence and success in higher education.

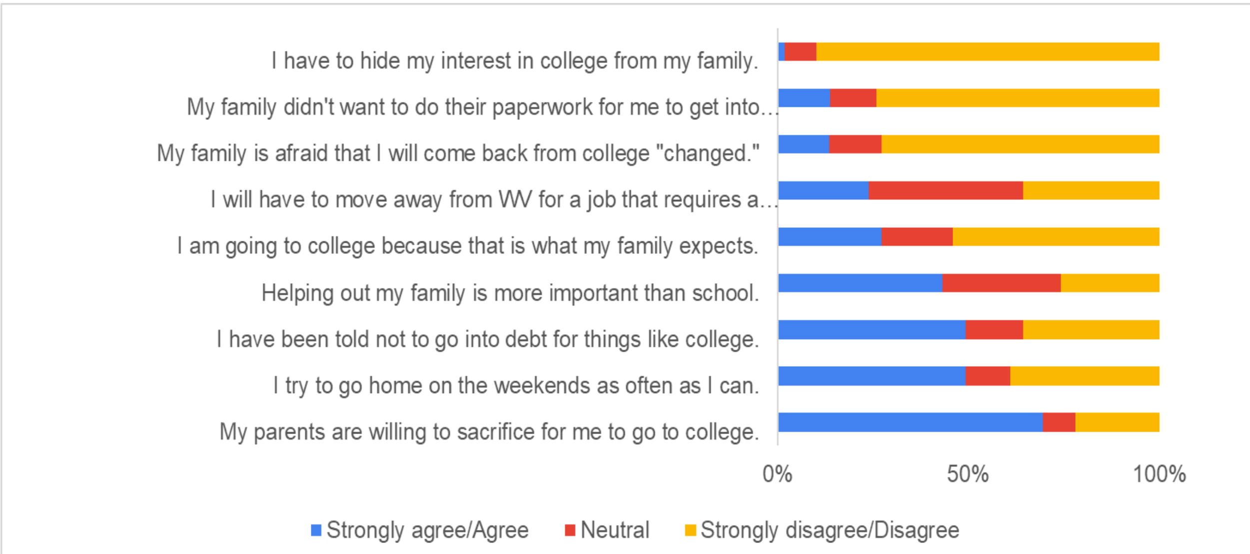

Figure 3. WVU TEch and GSU STEM student perception of college-going and family dynamics (n=61).

The pattern of responses shown in Figure 3 suggests a complex and deeply rooted set of values characteristic of many students from Appalachian or similarly rural, working-class backgrounds. The strong disagreement with the statement *“I am going to college because that is what my family expects”* indicates that students largely see their college attendance as a personal choice rather than a family-imposed expectation which highlights a sense of individual agency. At the same time, the strong agreement with *“my parents are willing to sacrifice for me to go to college”* reflects the presence of strong familial support, even if families may not have explicitly pushed students toward higher education. The large number of students in agreement with *“helping my family is more important than school”* and *“I try to go home on the weekends as often as I can”* underscores a deep sense of familial responsibility and loyalty, suggesting that students often juggle emotional or practical obligations to their families alongside academic commitments. Finally, the strong agreement with *“I have been told not to go into debt for things like college”* reveals a pervasive concern about financial risk, likely shaped by family experiences or cultural norms around economic self-sufficiency and debt aversion.

Together, these responses illustrate a nuanced student identity which is self-directed and motivated yet also shaped by powerful cultural and familial ties. These students are committed to education, but their decisions and behaviors are heavily influenced by family loyalty, financial caution, and the desire to maintain strong connections to home. This underscores the importance of designing supports that honor these values while helping students succeed academically and professionally.

Focus groups during the First2 Network Spring 2025 conference

We took the opportunity to convene a diverse focus group composed of first gen STEM students, faculty and student services staff during the First2 Network Spring Co-Conference, leveraging the event's central location, strong representation of STEM faculty, students, and institutional leaders from across West Virginia, and its shared commitment to improving outcomes for rural and first-generation STEM students.

During the S-STEM focus group session (Concurrent Session H), participants were welcomed with a brief introduction and a review of ground rules to set the tone for open, respectful discussion. This was followed by a "Gallery Walk" activity, where attendees reviewed key results from the needs assessment survey and contributed a "notice" and a "wonder" (brief reflections on the data that sparked insights or raised questions).

Attendees were then divided into three focus groups, each assigned a topic aligned with research interests: Topic 1: Academic Challenges, Topic 2: Barriers to Resources, Topic 3: Academic and Career Support.

The focus groups included 1 or 2 students each and 2-3 faculty and staff from institutions affiliated with the First2 Network. All students were STEM majors and Pell eligible. Each group engaged in discussion and exploration of their assigned theme, sharing perspectives and experiences that informed the broader S-STEM planning process. The session closed with a brief discussion to wrap up and highlight emerging insights from the focus group responses. Below is a breakdown of the key points raised across each focus group discussion topic.

Topic 1: Academic Challenges

Time management and self-regulation: Students described the transition from high school to college as difficult, particularly in terms of time management. In high school, regular reminders and structured schedules supported productivity. In college, the sudden need to self-manage time and fight distractions, which is a major challenge. Many students struggle to balance sleep, school, and personal life, referencing the "3-8s rule" (8 hours each for sleep, school, and fun) as an ideal that's hard to maintain.

Academic isolation in STEM & Online Learning: Some STEM and IT programs' move toward increased online learning has reduced opportunities for hands-on lab experiences and social connection, both of which are seen as critical to academic success. Students noted that isolation from peers and instructors can diminish motivation and the sense of academic community.

Equity and belonging in the classroom: Gender imbalances in some majors were mentioned as contributing to feelings of discomfort or exclusion. These social dynamics may make it more difficult for students to fully engage in courses or group learning experiences.

Faculty relationships matter: Multiple students emphasized that one-on-one support from professors, particularly through office hours, made a significant impact on their understanding and confidence. One student shared that meeting with faculty helped them grasp course expectations more clearly: *"What helps me the most as a student-me personally-is professors having office hours and getting one-on-one help. I can see what they are wanting."*

Mentoring as a transformative experience: Personal mentorship, especially when individualized and empathetic, was described as a powerful support. One student shared that a mentor's observation of their thinking style led to a life-changing conversation about being neurodivergent: "*She noticed that I have lilypads of thoughts rather than a train of thought and was interested in knowing that so that she could help me the way that I needed."* This example highlights how mentorship can go beyond academic instruction to shape identity, confidence, and persistence.

Support resources vs. real usage: Students acknowledged the availability of various support services but admitted to rarely using them. This underutilization may reflect a combination of stigma, lack of perceived relevance, or a preference for support that feels personal and integrated, such as faculty relationships, over traditional, institutionalized services.

Faculty accessibility and class size: Some participants shared that they felt disconnected from faculty in larger departments, which made it harder to seek help or form relationships. Smaller programs made it easier to build those connections, which in turn influenced their academic direction.

Topic 2: Barriers to Resources

Mismatch between services and student schedules: Most services operate during traditional business hours (8 to 5), which does not match the habits of students who study late at night.

Stigma and misperceptions: Despite the availability of many resources, usage remains low possibly due to stigma or poor communication. Students often perceive support centers as spaces for those who are "struggling," rather than tools for all learners.

Topic 3: Academic and Career Support.

Effective mentors provided both accountability and support. One student reflected that a college advisor challenged their academic complacency, pushing them beyond what they believed they were capable of, even when they thought their work was already strong.

Participants define mentoring as **more than just academic guidance**. Mentors were credited with noticing learning differences (e.g., suggesting neurodivergence) and adapting their support accordingly. This underscores the value of personalized, one-on-one relationships over generalized support services.

Good mentoring is linked to communication. Students valued mentors who responded promptly, made them feel seen, and asked questions to ease their discomfort in unfamiliar environments, especially when students felt "small" or "out of place."

Female students raised concerns about gendered experiences in STEM mentoring. Some described not receiving meaningful mentoring until they had a woman faculty mentor who understood the societal challenges women face in STEM. They emphasized that mentoring female students often involves helping them unlearn internalized beliefs about not taking up space or being assertive.

Mentoring gaps still exist. One student asked, "*Do I even have a mentor*?", indicating that many may not recognize or receive formal mentoring. Others relied more on high school advisors than college support networks, further pointing to inconsistent access.

Career advising is inconsistently accessed or known. There was strong interest in practical tools such as job banks or systems like the "career connector," but students noted that such resources were either under-promoted or unknown to them.

The focus groups findings, along with the surveys utilized, reveal a consistent theme: students thrive when support is personal, responsive, and embedded in authentic relationships. While structural barriers like time management challenges, online learning isolation, and mismatched service hours persist, students emphasize the transformative impact of individualized faculty engagement and mentoring. Traditional support services remain underutilized, suggesting a need to rethink how institutions connect with students, especially those with diverse learning needs. These insights affirm that for our future S-STEM proposal to be effective, we must center relationship-based, flexible, and inclusive support structures that align with how students actually seek and experience help.

How these findings support our future S-STEM proposal

Informed by the institutional needs assessments and insights gathered through faculty, staff and more importantly student voice, we have identified the following priorities we aim to pursue in our Track 3 proposal. These proposed activities are designed to directly address the challenges and opportunities revealed through our planning process.

Recruitment

Recruitment efforts will focus on building a strong, multi-institutional strategy to attract and select promising scholars. This includes developing shared marketing materials and an annual recruitment plan in collaboration with campus admissions offices, as well as engaging regional networks to spread the word. The recruitment plan will be implemented and refined annually based on assessment data to optimize outcomes and ensure an inclusive and effective scholar selection process.

Community Building & Networking

To foster a sense of belonging and support, students will participate in a variety of community-building events. A summer bridge program will lay the foundation for cohort bonding and academic preparation, followed by ongoing leadership training provided by the First2 Network, statewide gatherings at WVAS meetings, and regular STEM faculty-student socials. Monthly virtual professional development meetings will also connect students across campuses, strengthening a shared network of scholars.

Wraparound Mentoring

Students will receive holistic mentoring that includes peer, faculty and family support. Peer mentors are trained in effective co-mentoring and regularly check in with scholars, especially in their first year. Faculty mentors guide students in creating academic and career-focused Individual Development Plans (IDPs), and inclusive workshops engage families as active partners in student success. These layers of mentorship ensure students are supported academically, socially, and emotionally.

Content research experiences and Technical skills development

Hands-on research opportunities are delivered through coordinated CUREs (Course-based Undergraduate Research Experiences) across institutions centered around a particular topic all institutions will contribute to based on interest and expertise. Faculty receive training to design and deliver impactful CURE modules that develop students' technical and research skills. Outcomes are systematically assessed to improve the experience, ensuring that these embedded research opportunities align with workforce and graduate school preparation.

Career exploration and development

Career exploration is embedded throughout the program with a mix of in-person and virtual opportunities. Collaborations with initiatives like ARC POWER and events with alumni and industry professionals expose students to diverse STEM career paths. Students work with faculty mentors to develop and monitor career plans using tools like LinkedIn. A wide range of professional development offerings, including leadership and workforce skills sessions at WVAS meetings and summer institutes, builds power skills and career readiness.

Campus Policies and Practices

Institutional practices are examined and improved to better support scholar success. Efforts include establishing a virtual tutoring network and identifying "hidden costs" of college that create barriers for students. Through pilot projects and iterative testing, effective solutions are scaled and adopted into campus policy, making support systems more equitable and accessible.

Research and Evaluation

A coordinated research and evaluation strategy underpins the initiative, with data sharing agreements and IRB approvals enabling rigorous study of outcomes. Shared metrics and regular reporting cycles guide continuous improvement. Consortium members are trained in PDSA (Plan-Do-Study-Act) protocols, and results inform scholarly outputs such as white papers and WVAS journal articles. These efforts ensure transparency, accountability, and evidence-based evolution of the program.

Planning grant process evaluation

Participants and Collaborative Experience

A total of eight participants completed the collaboration feedback survey, representing a 62% response rate from the planning group (excluding Marshall University). Respondents represented a diverse cross-section of the consortium, with 38% from WVU Institute of Technology, 25% from Fairmont State University, 13% from Glenville State University, and 25% affiliated with the First2 Network. The majority of respondents were faculty (n = 6), with the remaining participants serving in staff roles (n = 2). Experience with collaborative grant work was evenly split, with half of respondents reporting no prior experience and half indicating previous involvement, underscoring the importance of clear communication and shared expectations within the planning process.

Participants reported multiple preferred communication channels, with email and in-person meetings each identified by 75% of respondents, followed by Zoom meetings (50%). Overall ratings of communication during the planning process were positive, particularly in terms of respectfulness (mean = 8.43/10) and inclusiveness (8.13/10). Ratings for professionalism (7.86/10) and transparency (7.14/10), while still favorable, reflected greater variability in participant experiences.

Qualitative feedback revealed some challenges related to communication clarity and consistency. While respondents generally noted that the Principal Investigator maintained professionalism, several participants reported concerns regarding the behavior of one team member perceived as repeatedly unprofessional or disrespectful. In addition, some respondents described a lack of transparency and documentation as the project progressed, particularly when informal side conversations increased. This contributed to confusion around roles, expectations, and how individual tasks aligned with broader project goals, highlighting the need for clearer documentation and communication structures in future collaborative efforts.

Engagement in Planning Activities

Most participants agreed that the PI and Co-PIs effectively communicated the overall goals of the collaborative effort. Engagement levels were strongest during needs assessment discussions, where the majority of respondents either strongly agreed or agreed that they were meaningfully involved. Similar levels of engagement were reported for curricular planning discussions, reflecting broad participation in shaping the academic and programmatic components of the proposal.

Perceptions of role clarity and task support, however, were more mixed. While several participants felt their roles were clearly defined and supported, others expressed neutrality or disagreement, reinforcing feedback that clearer role delineation earlier in the process could have improved efficiency and alignment across the consortium.

The November 23rd in-person meeting was widely viewed as a critical and effective component of the planning process. Nearly two-thirds of respondents rated the meeting as very effective, with an additional 13% rating it as moderately effective. Participants noted that the meeting successfully facilitated collaborative decision-making, with 75% indicating it did so to a great extent. Integration of diverse perspectives was also rated positively, with half of respondents describing it as very effective.

Participants particularly valued the structured facilitation, strong attendance, and extended work time during this meeting. Several respondents suggested that future collaborations would benefit from longer, more focused work sessions, whether in person or virtual, rather than frequent shorter meetings. Some also noted that a more unified articulation of project goals at the outset could further strengthen shared understanding and alignment.

Across the planning process, participants felt that diverse institutional and disciplinary perspectives were meaningfully incorporated, particularly during the development of consortium goals, shared metrics, and proposal writing. The inclusion of undergraduate students as contributors was viewed as a significant strength, consistent with the First2 Network's emphasis on student voice. Participants also valued collaboration among institutions of varying sizes and missions, as well as the involvement of external partners such as First2.

Despite these strengths, some respondents suggested that clearer role definitions at the beginning of the project would have helped ensure that all perspectives were not only included but optimally leveraged.

Overall, participants expressed strong confidence in the long-term impact of the collaboration, with 71% reporting they were very confident in its outcomes. A smaller number expressed neutrality or some doubt, often linked to concerns about communication clarity or role alignment rather than the project's underlying goals. Taken together, these findings suggest that while the planning process was largely effective and well-received, future multi-institutional efforts would benefit from more explicit role definitions, improved documentation practices, and structured communication protocols to support sustained collaboration and shared accountability.

Next Steps and Recommendations

Based on the comprehensive needs assessment, student voice analysis, and institutional readiness findings outlined here, these are the recommendations and next steps to inform and prepare for the submission of a competitive S-STEM Track 3 proposal:

1. During the Spring-Fall 2025 period each institutional team will generate a plan to integrate S-STEM visibility into current institutional admissions pipelines by embedding scholarship messaging into open house events, campus tours, and admissions communications. Teams will also develop faculty-led and student ambassador recruitment efforts, including hand-written outreach and presence at high school STEM events.

2. During the same time period we will begin to plan to address key barriers to STEM retention. We will design a summer bridge program at each institution to build early confidence, academic readiness, and peer connection with students currently enrolled in STEM majors listed in Table 1. We will provide training for faculty and student mentors in academic coaching strategies that are intentionally enriched with an understanding of Appalachian cultural values, ensuring mentorship is both effective and culturally responsive. In Fall 2025 we will begin to expand CURE (Course-based Undergraduate Research Experiences) modules across disciplines and campuses. These activities will help us create ongoing faculty communities of practice around mentoring and student-centered pedagogy. We will also take advantage of the current data dashboards with common metrics developed by the First2 Network and train all PIs and data leads in PDSA evaluation frameworks.

3. We will continue to leverage student voice via the First2 Network in all three campuses to co-design activities and evaluate support.

4. Finalize Proposal Components
To prepare for submission of the NSF S-STEM Track 3 proposal, we will consolidate all planning work into the required proposal sections, including Institutional Context and Needs Assessment, Recruitment and Retention Plan, Curricular and Co-Curricular Interventions, and others outlined in the solicitation. Letters of support will be secured from the ARC POWER Initiative and other key collaborators. Budget planning will allocate funds for a dedicated S-STEM coordinator at each institution, summer bridge programs and leadership events, CURE module development, and the creation of evaluation tools and shared dashboards. The full proposal will be drafted in alignment with NSF Track 3 guidelines, reviewed by internal deadlines, and submitted via Research.gov by the designated NSF deadline.