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Building S-STEM scholars' knowledge and skills through technical and career-development seminars

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Abstract

This paper first presents an overview of the objectives and the accomplishments of the S-STEM ACCESS project and then focuses on a specific ACCESS program activity – the technical and career-development seminars and panels – which support ACCESS scholars' knowledge and skills development and contribute toward achieving several project objectives. The technical seminars exposed students to state-of-the-art topics and industry practices related to the rapidly evolving field of cybersecurity. The career-development seminars included topics on obtaining security clearances, understanding different cybersecurity workforce career paths, as well as on pursuing graduate degrees and research-centered careers. Since seminars and panels were open to all West Virginia University (WVU) students, they helped publicize the ACCESS program and the B.S. and Area of Emphasis (AoE) in Cybersecurity and therefore served as a recruitment mechanism. The results of the external evaluation showed that the seminars and panels were of exceptional value to students who unanimously gave them high positive scores. Qualitative responses to the survey and focus group input revealed that students appreciated the seminars for providing opportunities to connect with professionals and peers, to learn about potential career paths, to gain the knowledge and confidence needed to successfully secure an internship position, and other benefits.

1. Introduction

Cybersecurity is critical to our nation's economy, uninterrupted work of the critical infrastructure, public safety, and national security. According to *cyberseek.org*, there are currently over 597,700 open positions in the cybersecurity field across the U.S. Furthermore, the Bureau of Labor Statistics projects that the employment of information security analysts will grow 33% from 2020 to 2030, which is much faster than the average growth of 8% for all occupations during that same time period [1].

The NSF Division of Undergraduate Education (DUE) S-STEM funded project "Attracting and Cultivating Cybersecurity Experts and Scholars through Scholarships (ACCESS)" [2] aims to help address the huge unmet need for cybersecurity experts by achieving the following four objectives: (1) increase the annual enrollment of students in the Cybersecurity B.S. major and Area of Emphasis (AoE); (2) enhance curricular and co-curricular activities and student support services; (3) strengthen partnerships with computer and information technology employers from the public and private sector; and (4) investigate the impact of the curricular and co-curricular activities on students' success.

The project team carried out a wide range of recruitment activities to reach high school students and current WVU students at different academic stages and awarded scholarships to nineteen students in the first two years of the project. Overall, both the applicant pool and ACCESS scholarships recipients have greater proportions of female and minority group students than among the currently enrolled students in the B.S. and AoE in Cybersecurity at WVU. The S-STEM ACCESS program activities include organizing award ceremonies, offering technical and

career-development seminars, mentoring the ACCESS scholars, encouraging scholars' participation in student organizations centered around cybersecurity, providing scholars with research and internship opportunities, and engaging them in outreach activities.

This paper focuses on one of the ACCESS program activities – offering technical and career-development seminars and panels – which support ACCESS scholars' knowledge and skills development and help achieve ACCESS project objectives (1)-(3). While the COVID-19 pandemic presented challenges, the project team quickly adapted and organized online award ceremonies, meetings, and technical and career-development seminars. So far, the program offered seven seminars and panels, which were delivered by experts from industry and government. The technical seminars exposed students to state-of-the-art topics and industry practices related to the ever-changing area of cybersecurity. The career-development seminars included topics on obtaining security clearances (which are required for most cybersecurity positions) and understanding career options (including different cybersecurity workforce career paths, as well as pursuing graduate degrees and subsequently research-focused careers). In addition to learning from renowned cybersecurity experts, the program team designed these ACCESS seminars and panels to help students connect with cybersecurity professionals and learn about numerous internship opportunities. Furthermore, since seminars and panels are open to all WVU students and faculty, they contributed to publicizing the ACCESS program and the cybersecurity major and AoE, and therefore served as another recruitment mechanism.

Evaluation data collected in the spring 2021 showed that the majority of Cohort 1 students found all ACCESS program activities very or somewhat valuable except for the award ceremony, an event to introduce scholars to the program for which a plurality was neutral on the event's value. The technical and career-development seminars stood out as being valuable across the board, with 87.5% of scholars rating them as very valuable and 12.5% as somewhat valuable. Qualitative responses to the survey and focus group input revealed that students appreciated the seminars for providing an opportunity to connect with professionals and peers, to learn practical information about potential career paths moving forward (e.g., how to get security clearance, how professionals weighed working in industry v. government), to gain the knowledge and confidence to successfully navigate an internship application process, and other benefits.

The rest of the paper is organized as follows. Section 2 provides an overview of the objectives and accomplishments of the ACCESS project. Section 3 describes the seven seminars and panels offered so far, summarizes the goals achieved by them, and discusses the challenges that needed to be addressed. The evaluation of the seminars and panels based on data collected by a survey and focus groups is presented in Section 4, followed by the lessons learned and future plans described in Section 5 and the concluding remarks given in Section 6.

2. Objectives and accomplishments of the ACCESS project

The ACCESS project integrates the goal to increase the number of students with demonstrated financial need (including women and ethnic / racial minority groups) who complete STEM degrees with the tremendous unmet need of governmental organizations and industry for highly skilled cybersecurity experts. The ACCESS project, which started on January 1, 2020, for its duration of five years is planned to provide a total of 120 annual scholarships to approximately

40 unique students. In this section, we present the overview of the ACCESS project, with its activities and accomplishments grouped by the four project objectives.

2.1. Objective 1: Increase the annual enrollment of students in the B.S. and AoE in Cybersecurity

The B.S. major and undergraduate AoE in Cybersecurity at West Virginia University (WVU) are new; they started enrolling students in fall 2018. The ACCESS project seeks to recruit students and subsequently grow the number of graduates with specialization in Cybersecurity. Students are recruited from (i) high schools; (ii) the Fundamentals of Engineering Program (a common first-year experience in which students complete at least six core courses before moving to the major of their choice); and (iii) current students who would decide to pursue dual major with Cybersecurity or AoE in Cybersecurity.

The selection of the ACCESS scholarship recipients is done by a Selection Committee which consists of five NSF S-STEM team members. They evaluate and rank the applicants using a rubric that takes into account students' GPAs, awards and recognitions, extracurricular and community involvement, an essay on cybersecurity, and two recommendation letters. The final selection of the ACCESS scholars is based on the average of the ranks assigned by the Selection Committee members.

The project team successfully selected the Cohort 1 and Cohort 2 scholars consisting of 19 ACCESS scholarship recipients. Specifically, a total of 27 annual scholarships were awarded to these 19 students in the first two years of the project.

Overall, the ACCESS project successfully achieved its Objective 1 to increase the annual enrollment of students in the B.S. and AoE in Cybersecurity. At the time of proposal submission (based on spring 2019 data) there were only 19 students enrolled in the cybersecurity field of study: ten majored in Cybersecurity and nine students of other related majors pursued AoE in Cybersecurity. Out of these 19 students, 8% were from minority populations and 36% were females. In only one year (based on spring 2020 data), the enrollment has grown to 50 students (i.e., 2.6 times), of which 8% were minority students and 26% were female students. The increasing trend continued, with 69 students enrolled in the B.S. and AoE in Cybersecurity in the spring 2021, which is a 1.38 time increase over spring 2020 and 3.63 times increase compared to spring 2019. Of these 69 students, 14% were minority and 25% were female students. It is important to emphasize that both the ACCESS scholarship recipients and the applicant pool have greater diversity than students typically enrolled in the Cybersecurity major and AoE at WVU. Specifically, ACCESS scholarship recipients for Cohorts 1 and 2 together had 32% minority students and 37% female students. The two pools of eligible applicants, together consisting of 48 eligible applicants, had 19% minority students and 33% female students.

2.2. Objective 2: Enhance curricular and co-curricular student support services and activities for ACCESS scholars

To enhance ACCESS scholars' education experiences and build their professional and social skills, they are provided with curricular and co-curricular support services and activities, which

include participation in social events, mentoring, participation in the activities of CyberWVU (a student organization centered on cybersecurity), and engaging in undergraduate research.

The ACCESS scholarship award ceremonies were held online, for Cohort 1 on September 16, 2020 using Zoom and for Cohort 2 on October 6, 2021 using Microsoft Teams. Both award ceremonies included welcomes from the Statler College Dean and Associate Dean for Academics, and the LCSEE Department Chair; introduction to the ACCESS program by the PI, introductions of each of the ACCESS scholars; introductions of industry representatives; and discussion that included the ACCESS project co-PIs, other WVU faculty, and the external evaluator.

ACCESS scholars were connected with faculty to serve as their mentors and encouraged to become members of the CyberWVU, a student organization focused on cybersecurity which holds regular meetings, organizes cybersecurity training sessions, and participates in cybersecurity competitions. During Year 2, all eight Cohort 1 students and 6 out of 10 Cohort 2 students were members of the CyberWVU. ACCESS scholars were also made aware of research opportunities, such as the Summer Undergraduate Research Experience (SURE) at WVU and the NSF Graduate Research Fellowships Program (GRFP).

2.3. Objective 3: Strengthen the partnerships with computer and information technology employers

The ACCESS project has strengthened the partnerships with Cybersecurity employers by leveraging the existing connections and by developing new relationships, which have provided the ACCESS scholars with a multitude of opportunities to network, learn from and interact with potential employers.

One of the activities related to this objective is offering both technical and career-development seminars and panels, which were delivered by representatives of industry and government. The technical seminars exposed students to the state-of-the-art topics and industry practices related to the fast-developing area of cybersecurity. The career-development seminars included topics on obtaining security clearances (which are required for many cybersecurity positions), securing an internship position, and understanding different career options, such as joining the workforce or pursuing graduate degrees. These seminars were open to and benefited other WVU students.

Paid summer internships benefit undergraduate students in many ways, such as applying the knowledge learned in the classroom, developing new skills, meeting peers with similar professional interests, gaining valuable work experience and networking contacts, obtaining references for future job opportunities, and potentially being hired by the company upon graduation. Therefore, the ACCESS project team actively worked directly with different employers and through the Statler College biannual Career Fair to provide the ACCESS scholars with ample opportunities for internships. Eight out of nine Cohort 1 ACCESS scholars had paid internship positions in summer 2021.

2.4. Objective 4: Investigate the impact of the curricular and co-curricular activities on student success

The final, just as important, objective of the ACCESS project is to investigate the curriculum and co-curricular activities in relation to: their impact on increasing student interest and success in the cybersecurity field of study; providing the best possible experience for students; supporting informed program modifications; and generating knowledge that could be used in institutionalization of the ACCESS program and for implementation in other institutions.

To learn about the experiences of Cohort 1 ACCESS scholars during the 2020-2021 academic year, in spring 2021 we collected survey and focus group data. Detailed analysis of these data is currently underway and will be presented elsewhere. This paper is focused specifically on the description and evaluation of the impact that technical and career-development seminars and panels have on building ACCESS scholar's knowledge and skills in the cybersecurity area.

In general, during their first year in the ACCESS program, Cohort 1 students were very successful. Eight out of nine Cohort 1 students had paid internship positions in summer 2021 and one student had a paid research position during the whole 2021 calendar year. All Cohort 1 students maintained GPA higher than 3.00 and made progress towards their graduation. Eight out of nine students have their scholarship renewed for the 2021/22 school year. (The only student whose scholarship was not renewed, due to personal reasons, decided to graduate in December 2021 before being able to complete the AoE in Cybersecurity.)

3. Details on the ACCESS seminars and panels

Preparing for occupational success requires some preparation related to occupational socialization, "the learning of attitudes and behaviors necessary to recognized and sustainable competence within a context of employment" [3]. The seminars and panels presented by cybersecurity professionals offer cybersecurity students positive role models who can provide information related to the expectations, values, and work norms of the cybersecurity profession. The specific information gained about topics, such as obtaining security clearances, that are relatively unique to that and other national security-related fields, help students feel more prepared and confident as they approach their first work-place experience, whether it is an internship or a full-time job following graduation. Seminars offer a "different kind of intellectual setting" than the typical classroom learning environment [4] and one in which students are free to "learn purely for the sake of learning." [5]. These career-focused seminars presented by outstanding role models in the cybersecurity profession provide valuable career-development opportunities for the ACCESS and other WVU students.

In three semesters (fall 2020, spring 2021, and fall 2021), the ACCESS team organized seven seminars and panels given by renowned cybersecurity experts from industry, government, and research organizations. ACCESS seminars and panels exposed WVU students to state-of-the-art topics and current industry practices related to cybersecurity. They are part of the activities that aim to leverage the partnership between academia, government, and industry and provide ACCESS scholars with opportunities to learn from and network with experts and leaders in the cybersecurity field. Since seminars and panels are open for other WVU students, we believe that

events like these increase the interest of our current and future students to pursue careers in cybersecurity and contribute to defending the U.S. cyberspace from the ever increasing cyber threats and attacks.

In this section, we first describe the seminars and panels, then discuss the goals achieved by them, and the challenges we faced and how they were mitigated.

3.1. Description of ACCESS seminars and panels

ACCESS seminars and panels series started with the panel "How to get security clearance" which was held on October 21, 2020 using Zoom [6]. The panel moderator and five panelists are all WVU alumni with years of experience in different branches of the U.S. military, US intelligence community, National Guard, private industry, a nonprofit research institution, and a national research lab. The moderator and one of the panelists are women. Since many federal agencies and federal contractors require their employees to hold security clearances in order to do their job, this topic is very important for students who specialize in cybersecurity. The panelists shared with our students their experiences; recommendations and advice on how to navigate the process of getting a security clearance; examples of personal characteristics and behavior that may lead to a security clearance being denied; and the best practices to follow.

The technical seminar "Exploiting spacecraft" was given on November 18, 2020 using Microsoft Teams [7]. The speaker currently works as a Senior Cybersecurity Project Manager at the Aerospace Corporation and is a former civil servant at NASA. This seminar described the cyber threat landscape for space systems and was focused on three specific examples: Command Replay Attack, Command Link Intrusion, and Denial of Service using GPS jamming. The speaker discussed how these three attacks were performed using high fidelity ground-to-space simulators and the recommendations on how to protect against the attacks. He also provided references that would allow students to build their own simulations and begin their own research in the area.

Another seminar "Mitigating adaptive cyber threats" was held on March 23, 2021 using Microsoft Teams [8]. The speaker has over 20 years of experience as cyber defense leader of several commercial and U.S. government programs and is currently a Chief Technology and Strategy Officer at the private sector. This talk addressed the evolution, motives, and capabilities of cyber threat actors; the approaches and components of cybersecurity programs; cybersecurity roles within an organization; and the emerging technologies that can be used to combat these cyber threats. The speaker also described his career path in cybersecurity, and provided career advice and recommendations to students for their professional journey.

The panel "The importance of the cyber domain in national security and how to position your future career" was held on April 13, 2021 using Microsoft Teams [9]. The moderator currently holds a position of Chief Technology and Strategy Officer in private industry and the two panelists had eminent careers in the public sector: one is a retired U.S. Army Major General and former Chief of Staff of the U.S. Cyber Command and the other is a retired Chief Technology Officer of the Defense Information Systems Agency (DISA). This panel session was a combination of technical and career-development topics. The panelists first discussed the

complexities of cyber threats and the access to cyber weapons, and their implications to national security. Then, they shared with the students their professional experiences and career paths in military, government, and private industry.

The seminar "The vast world within the cybersecurity domain", held on April 26, 2021 using Zoom [10], was presented by a female speaker who has a PhD in Organization and Management and many years of working experience both in the private and public sector, including 20 years of active duty in the U.S. Air Force. This seminar provided details about many different career pathways in the cybersecurity domain, ranging from the technical side of the discipline to policy-setting and management. The goal of the seminar was to help students identify their specific interest and focus their studies on preparing themselves for an exciting and rewarding career.

The next seminar "Becoming a cybersecurity research scientist", held on October 27, 2021 via Microsoft Teams [11], addressed both technical and career-building topics. Unlike the other seminars and panels, this seminar exposed the ACCESS students to a career path focused on doing cybersecurity research. The speaker is a female of Hispanic ethnicity. She has a Ph.D. in Computer Science with a main research focus on cybersecurity and currently holds a Technical Staff Member position at the MIT Lincoln Lab. The talk first addressed how pursuing graduate education and different research opportunities led to the speaker's career in doing research. The technical part of the talk was focused on malware detection using several machine learning approaches, including a novel multimodal learning approach based on deep neural networks.

The last seminar of 2021 "Using digital twins for cybersecurity testing" was offered on November 17, 2021 via Microsoft Teams [12] by a speaker who is currently a Senior Cybersecurity Project Manager in an independent, nonprofit corporation and a former civil servant at NASA where he led numerous information assurance and cybersecurity activities conducting independent technical assessments of NASA space and ground missions. This technical talk was focused on testing for cybersecurity by using the novel "digital twins" technology. A digital twin is a virtual representation that serves as a real-time digital counterpart of a physical object (in this case a spacecraft) that allows for affordable and scalable testing of complex systems that require high level of security.

3.2. Goals achieved by the offered seminars and panels

Next, we summarize the goals that were achieved by the seminars and panels described in the previous subsection.

- **Building knowledge and skills on technical aspects of cybersecurity,** which broadened students' knowledge and skills acquired through their regular coursework by covering cutting-edge technologies applied on real-life complex problems, including: cybersecurity exploits of spacecrafts [7]; cyberthreat landscape and emerging technologies to combat these cyberthreats [8] and their implications on national security [9]; using artificial intelligence/ machine learning for malware detection [11]; and using digital twins technology for cybersecurity testing [12].

- **Building knowledge and skills relevant to students' educational and professional career development** focused on: the process and best practices for getting security clearance [6], specifics of cybersecurity career paths in military, government, and private industry [7, 8, 9, 10]; different cybersecurity career specializations (from technical to policy and management) [10]; and pursuing graduate degrees (M.S. and Ph.D.) and subsequently career focused on research [6,11].

- **Networking with cybersecurity experts and leaders, both from the public and private sector.** In addition to learning technical and career-development knowledge and skills, seminars and panels provided ample opportunities for students to connect and network with renowned experts and leaders in the cybersecurity field. These interactions enabled students to explore internship and employment opportunities and build professional relationships.

- **Having role models, who motivate students to uncover their true potential and inspire them to succeed in their education and professional careers,** is an important aspect of the interaction with the accomplished speakers of the ACCESS seminars and panels. All twelve speakers are prominent cybersecurity experts and leaders. Four (out of twelve) are women, three of which have Ph.D. degrees and two have military experience. Having female role models is especially important because the cybersecurity profession is male dominated.

3.3. Challenges and their mitigation

The ACCESS project started in January 2020, and the Cohort 1 students were awarded their first-year scholarships for the 2020/21 school year. Due to the COVID-19 pandemic, at that time no in-person activities were held at the university. The ACCESS team adapted quickly to the challenges imposed by the pandemic and held the award ceremony, meetings with ACCESS scholars, and the seminars and panels online, using either Zoom or Microsoft Teams. While the online format allows for assembling seminars and panels with geographically distributed participants, it also restricts the social interactions.

To address the challenges imposed by the limited in-person interactions due to the COVID-19 pandemic and better support the ACCESS scholars, the Principal Investigator of the ACCESS project created a private online group in Microsoft Teams "ACCESS Team", which includes all ACCESS scholars and allows for more efficient exchange of information, communication, and interaction. While the "ACCESS Team" online group will continue to be utilized, we plan to resume in-person activities, including seminars and panels, when it is safe and possible to do so in order to support students' full participation and community building.

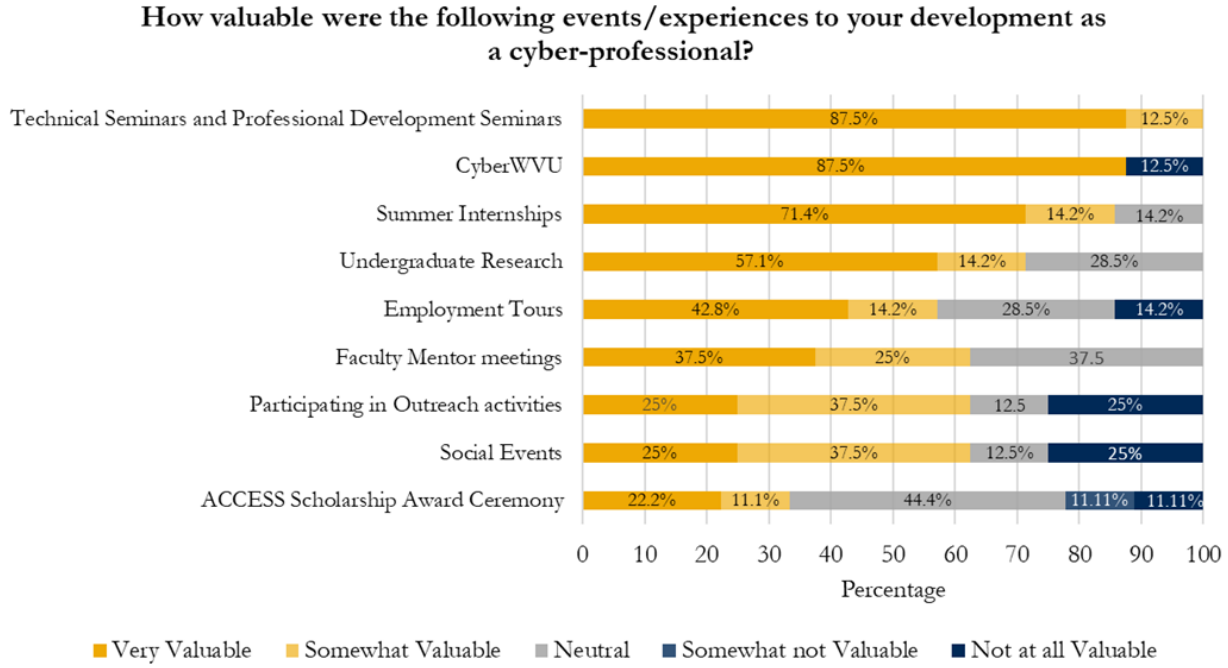
Students' busy schedules impose another challenge to their active participation in the program activities. The ACCESS team attempted to mitigate this challenge by scheduling the seminars and panels during the time slots when most classes were over and during the times of the semesters when there were no exams scheduled. The announcements for the events were made widely as soon as the arrangements with the speakers were finalized.

4. Evaluation results that speak to the value of the seminars

The results we discuss in this section derive from survey and focus group data, which we collected in spring 2021 to learn about scholars' experiences during the 2020-2021 academic year. All nine members of the first cohort completed the survey. Further, six scholars provided more in-depth feedback about the ACCESS program by participating in one of two focus groups; a seventh student responded to focus group questions in writing.

The seminars stood out as being reportedly useful for ACCESS scholars. Figure 1 demonstrates that all survey respondents reported finding the seminars somewhat or very helpful to their development as a cyber-professional. Given that the activity received unanimous positive regard and the highest scores, seminars appear exceptional within the program.

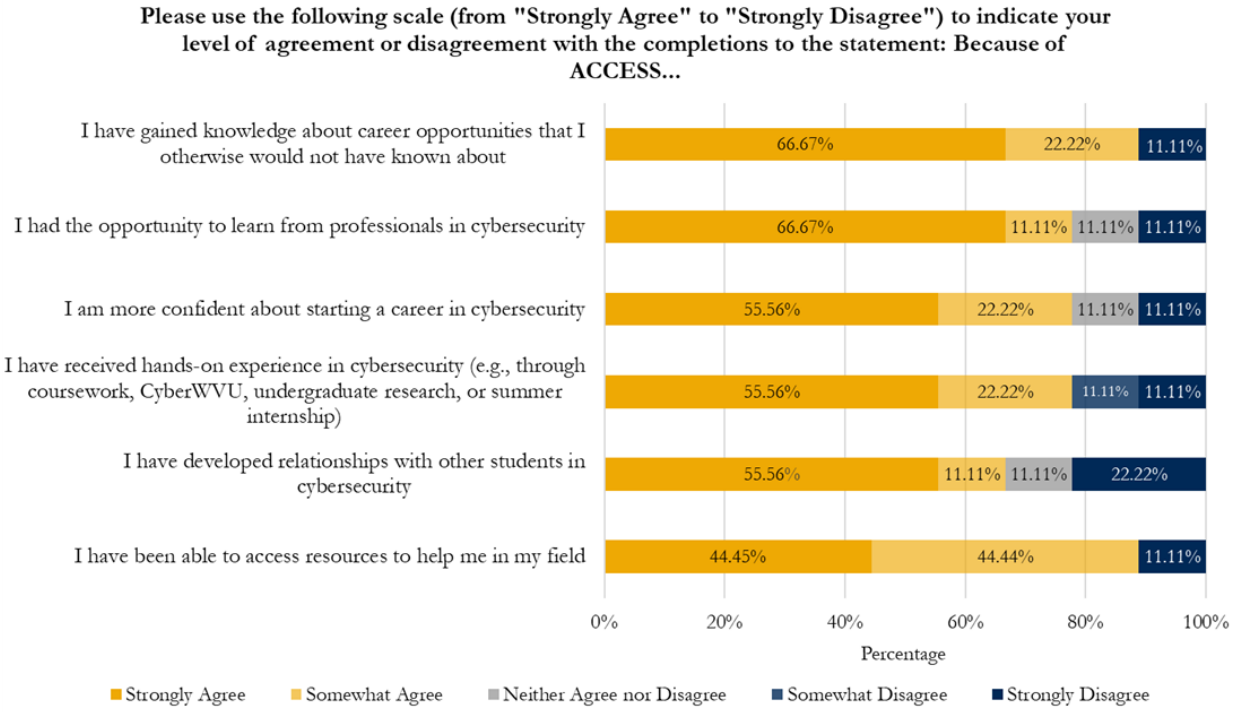
Figure 1.



Students reported gaining several specific benefits from the program (Figure 2). Large majorities indicated they somewhat or strongly agreed that they have learned about career opportunities, learned from cybersecurity professionals, are more confident starting a cybersecurity career, have developed hands-on experience, have developed relationships with other students, and have accessed resources that will help them in their field.

While we cannot link these benefits exclusively to the seminars, qualitative responses to the survey and in focus groups corroborate that the seminars were helpful for each of the above items. Specifically, students reported appreciating the seminars for providing an opportunity to connect with professionals and peers, to learn practical information about potential career paths moving forward (e.g., how to get security clearance, how professionals weighed working in industry v. government), to gain the knowledge and confidence to successfully navigate an internship application process, and other benefits.

Figure 2.



In the survey, one scholar suggested that the seminars were helpful for learning about career opportunities: "The seminars taught me a lot about jobs that I wouldn't have known of without ACCESS." In a focus group, a scholar elaborated on this point:

> "[The seminars] definitely helped me try and narrow down what I actually want to do as a career once I graduate, because you know there's the whole private sector and public sector. And there's just so many different fields within cybersecurity and just hearing people talk about … Maybe they were in both of those sectors. So, you could ask them, "Hey, why did you switch, why did you leave the private sector and go to the public sector?" and just hear first-hand experience – what are the pros and cons of both. And so you know I could try and figure it out on my own what I'd want to do."

Also in a focus group, one scholar linked their getting an internship, which hopefully led to hands-on experience, to the practical knowledge and confidence they gained by participating in a seminar: "After doing the seminar, I applied for a job with the security that required a security clearance and I felt confident I'm going into it, I understood what was needed to me and what the company was going to give me for it, and now I have an internship with a base level security clearance."

Also in a focus group, one scholar suggested the seminars are helpful for connecting with other students: "I think personally [...] not only has [the program] alerted me to other people that are in my major that are hard workers, it's also helped me build connections through [... the seminars.] Not only do you get to meet professionals but also other students that are in the same major."

While student feedback about the seminars was overwhelmingly positive, students proposed some possible ways to make them more engaging moving forward. For example, one student shared in a focus group that the pandemic-necessitated online format of the events was not ideal. While noting that online seminars facilitate greater participation among people who are geographically spread out and busy, it is challenging to connect with others since many people have their cameras off. Two students also suggested they often have to multitask during events, with one person indicating it is because the event is too long at 90 minutes and another suggesting more advance notice of the events would allow the students to better plan around the seminar. In an in-person event, one student remarked, their focus would remain on the seminar.

5. Lessons learned and future plans

In subsection 3.3 we discussed the challenges we faced and the actions taken by the ACCESS team to address some of these challenges. The results of the external evaluation suggested additional ways the seminars could be improved moving forward. In this section, we summarize the lessons learned and our future plans.

Given the logistical benefits of virtually hosting seminar speakers from distant locations, the project team will weigh the tradeoffs of holding some or all future seminars fully or partly in person. For any seminars that include an online component, the project team will strive to make them more engaging for students. For example, student engagement may benefit from emphasizing the importance of keeping cameras on during seminars, for those students who are able to do so. Given that some ACCESS students reported that they would find this more engaging and beneficial to community building (while not wanting to be the only student with their camera on), some encouragement may go a long way. Further, students may appreciate that having their camera on can allow them to connect to seminar speakers more directly, which can in turn streamline follow-up communication. To protect students' privacy, however, it could be appropriate to ensure students are able to adjust their video-conferencing settings to disguise their environment (e.g., by blurring the background or adding a fake backdrop) and offering to troubleshoot with students whose hardware / software configurations do not support this.

The external evaluation also indicated that students may be better able to dedicate their full attention to the seminar if it were shorter (e.g., an hour) and if they consistently received early enough notice to clear their calendars. Early notice can also be possible if a date has not been nailed down. In that case, the project team plans to provide one or more tentative dates for an event.

6. Conclusion

The S-STEM ACCESS project has completed two out of its five years. During this time period, the project team created and successfully implemented multiple activities that led to achieving the project's objectives. This paper is specifically focused on the technical and career-development seminars and panels that were designed to build ACCESS scholars' knowledge and skills, and to contribute towards achieving several project objectives.

The seminars and panels stood out for their reported usefulness for all ACCESS scholars. Students shared that the seminars helped them connect with professionals and peers, learn practical information about potential career paths moving forward, and gain knowledge and confidence to successfully navigate an internship application process. This suggests these activities are powerful for preparing students for the workforce and may therefore be valuable additions to similar programs.

Hosting seminars online, which the COVID-19 pandemic required, offered benefits (particularly that it was easier for more speakers to participate regardless of location) as well as presented challenges (especially related to students' engagement). There may be ways to mitigate the challenges (e.g., facilitating more participants to have their cameras on, limiting the length of the meetings, exploring hybrid online/ in-person options) while continuing to enjoy the benefits.

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