WiCyS Evaluation

2017-2018

Year 5

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Project Evaluator

Background and History of WiCyS
WiCyS is a community of engagement, encouragement, and support for women in cybersecurity. The WiCyS initiative originated from Tennessee Tech University in 2013 with support from a National Science Foundation grant (Award #1303441, Lead PI: Dr. Ambareen Siraj, Professor of Computer Science and Director of the Cybersecurity Education, Research Outreach Center (CEROC) at Tennessee Tech University), as a collaborative project between Tennessee Tech, University of Memphis (Dr. Judith Simon) and Jackson State Community College (Dr. Tom Pigg and Ms. Lisa Matlock). Since then, with support from various industry, government and academic partners, WiCyS has become a continuing effort to address lack of gender diversity in the cybersecurity workforce. Each year, WiCyS has continued to grow and increase its support for women in cybersecurity.

**Transition From NSF Project Towards Non-Profit Organization**

During the past year, WiCyS began its transition toward a self-sustaining non-profit with 501(c)(3) status. WiCyS has created a Governing Board of Directors and developed its Bylaws. According to the Bylaws, “the specific purpose of the corporation shall be to support recruitment, retention and advancement of women in the professional field of cybersecurity, help increase the number of women security professionals and improve diversity in the cybersecurity workforce. WiCyS brings together women (students/faculty/researchers/professionals) in cybersecurity from academia, government and industry for sharing of knowledge, experience, networking and mentoring.” The organization has officially received 501 (c) (3) status. The first Board of Directors Meeting was held on March 21, 2018, during which the Bylaws were approved. In addition, Strategic Partners, Affiliates, Student Chapters, and Sponsoring Partners were established as entities of support for WiCyS.

WiCyS was originally developed as an Annual Conference, providing a unique event balancing the number of student attendees with academic, government and industry leaders who support intentional role modeling, networking, mentoring, and access to career information. In its new role as a non-profit organization, WiCyS is expanding on the Annual Conference to offer the following essential activities:

- A WiCyS membership community (so far 2,500 have joined to be WiCyS members)
- Maintenance of the public WiCyS online community (so far 2500 people are on the listserv)
- A WiCyS Job Board, where members can post and partners/sponsors can recruit for jobs.
- A WiCyS Speakers Bureau, where members can sign up to be invited speakers to be connected to various events/conferences.
- WiCyS Student Chapters, which are provided guidance and seed funding (so far close to 40 chapters have been established)
- Local or regional WiCyS Affiliates, where members come together in periodic meetings to support outreach, awareness and advancement of peers (so far, one affiliate has been established and two are underway)

WiCyS is unique. It is the only entity with national reach that aims to bring together students, educators and professionals in the discipline of cybersecurity under one community to share knowledge, experience, opportunities and resources. It is an exclusive
community dedicated for the recruitment, retention and advancement of women in this field at various levels of their careers and from various background.

The WiCyS Annual Conference is limited in size and is focused on bringing together students who aspire to have a career in cybersecurity with those who are already in the field. An equal balance of participation from academia, industry, and government provides significant opportunities to network, deliver hands-on workshop sessions, share cutting edge research, and support conversations to expose and resolve discrimination and unconscious bias toward women and minority groups in the cybersecurity profession.

Outside of conferences, WiCyS maintains an “online community portal” which consists of more than 2,100 women in cyber and growing every day. It facilitates sharing of resources, research, career and internship opportunities and regional/local events. Supporting ongoing conversations and interactions among students, educators and industry is the core platform and differentiating value delivered by WiCyS.

WiCyS Conference 2018

The WiCyS Conference, which moves across the U.S. each year to ensure diverse demographics of attendees across the nation, is designed to increase women’s participation in cybersecurity through research-supported practices that include intentional role modeling, networking, mentoring, and access to career information. The WiCyS Conference registration is controlled to ensure 50% of expected attendees are students from 2- and 4-year institutions at all levels of education, 25% of expected attendees are educators/researchers and the remainder are industry professionals and recruiters. Registration costs are subsidized at a very low rate for attendees (especially students and faculty). WiCyS provides two free nights shared lodging to all students, and to at least 30% of faculty. The no-cost lodging enables many students and faculty to attend the Conference. WiCyS also works to secure from WiCyS industry partners travel scholarships for students. The students and faculty receive such benefits by applying for and receiving WiCyS scholarships that are given in the supporting organizations’ name.

Workshops, networking and a Career Fair are integral parts of the Conference, along with dedicated sessions for academia, research and industry tracks. The event offers keynote speaker sessions, technical presentation sessions, panel and birds-of-feather sessions, lightning talks, student poster sessions, student and faculty workshops, and career and graduate school fair. It also builds and supports recruitment and retention outside the Conference through an online community for women in cybersecurity.

The Fifth Annual National Women in CyberSecurity Conference (WiCyS) took place in Chicago, Illinois on March 23-24, 2018. Approximately 1,200 people registered for the Conference, while approximately 1,000 attended – almost three times the number attending the first WiCyS Conference in 2014. This is despite the major snowstorm across the northeast that created travel complications for many of the attendees. The attendees were students, faculty, researchers, and industry professionals. There were 287 organizations represented at the Conference in 2017 and 365 organizations represented at the Conference in 2018. The Conference was evaluated by a general survey. In addition, the evaluator both observed the Conference and conducted informal interviews of attendees at the Conference. The WiCyS Conference has grown every year from 350 attendees in 2014, 475 in 2015, 750 in 2016, 785 in 2017 and approximately 1000 in 2018. While NSF originally funded 200 attendees, WiCyS has had approximately 3,360 attendees.
Diversity of Attendees
Data was taken from the registration forms about the demographics of the attendees. The data demonstrates that the attendees are from very diverse backgrounds: 2% were high school students, 19% were undergraduate students, 23% were graduate students, 11% were educators, 34% were security professionals, 7% were human resource personnel, and 4% were other.
Figure 3: Type of Attendee

Of the approximately 1,000 attendees, a total of 346 attendees completed the Conference survey for a response rate of 34.6%. This is a slightly increased response rate from the previous year. The following information is drawn from those surveys, with additional information included from interviews on-site and observations from the Conference.

Of those completing the survey, 96% were female, 3.64% were male, and .36% preferred not to answer. Similarly, the attendees reflected diversity in their race/ethnicity composition. Compared to the first year of the Conference, the diversity has increased. This year, 58% of the attendees were white, 14% black/African American, 22% Asian, 10% Latino/Hispanic, 1% American Indian and 2% Native Hawaiian/Other Pacific Islander.
Of the attendees, 2.6% had attended WiCyS 2014, 7.0% had attended WiCyS 2015, 12.2% had attended WiCyS 2016, 20.4% had attended WiCyS 2017, and 73.3% of the attendees were attending for the first time. This is an excellent composition, with approximately 27% of the attendees coming back for a second year and about 73% of the attendees being first timers.

**Coverage of Cost of Attendees**

WiCyS covered the cost of lodging for 53% of the respondents, 17% were covered by their institutions as sponsors, 24% by their institution, and 6% personally covered their lodging.
In response to coverage of travel, 57% of the responding attendees said their institution covered their travel. The second most frequent response was 29% of the attendees who said they personally covered their travel. Ten percent said that their travel was covered by WiCyS Strategic Partners (Facebook, Cisco, Fidelity Investments) and 3% were covered by the WiCyS Project.

Overall Impact of the Event
The response to WiCyS 2018 was overwhelmingly positive. The first indication of the success is how well the Conference was attended. Registration was capped at 1,200 and more than 1,000 attended the Conference. This was despite a major snow storm in the northeast that prevented some participants from attending.

Conference Observations and Conference Interviews
The next indication of the success of the Conference was from observations at the Conference. It was clear that there was a diverse group of attendees based on gender, race/ethnicity, education level, and type of attendee at the Conference. Despite the crowds at the Conference, all attendees seemed excited and engaged in Conference activities, and were very busy networking. Sessions were well attended. People were actively engaging in all interactive activities. Lots of questions were asked at all events, from individual sessions to keynotes. Networking was occurring at all possible opportunities from mealtimes to the hallways, in addition to the formal and informal networking events. The resume session was well attended and well organized. The career and graduate school fair was packed. The poster sessions were well attended and students were actively answering questions. Registration was very efficient. Even though more time was allowed for informal networking at meals, attendees requested more time to network at meals next year.

This year, a WiCyS Career Fair Handbook was produced that described each of the sponsors and opportunities that they offered to attendees. Several sponsors stated that they wanted to save internships specifically for WiCyS. However, other sponsors stated that it would be better if WiCyS was earlier in the year because they had already made their internship decisions by the time the WiCyS Conference was held. Some of the sponsors said that WiCyS was their favorite event because of the size of the event and the level of engagement with the attendees. Overall, most sessions were well attended and the audience was engaged.

All types of attendees (sponsors, faculty, and students) commented on the excellent networking opportunity that WiCyS provided. Many commented on how the size of the Conference allowed attendees to personally interact on a level that is not possible at larger conferences. Many students stated that they got to interact more personally with the better known companies than at larger conferences. Others stated that the Conference had better known companies than at smaller conferences. Faculty members across regions and with different types of under-represented students decided to collaborate across their projects because of attending WiCyS. This has the potential for increasing the impact of each of these respective projects. Students were able to get job interviews, internships, and feedback on their research. Faculty members were excited to have the opportunity to pitch their ideas to funding agencies.

**Surveys**

Another indication of the success of the Conference is the responses from the surveys completed by attendees. Of the attendees completing the survey, 96% rated the overall Conference as good to excellent, while only 3% rated it fair and two attendees (1%) rated it poor. The most common modal response was excellent, with 54% rating it excellent, 27% very good, 15% good, 3% fair and 1% poor (2 attendees).
The registration for the Conference was quick, friendly, and efficient. This was based on the evaluator’s personal observation and confirmed by the surveys. A total of 95% of the attendees felt that the registration process was excellent, very good, or good. This is similar to the previous year when 94% of the attendees felt the registration process was excellent, very good, or good. The most common response was that the registration process was excellent with 49% of the attendees reporting this response.

Overall, people were more pleased with the location, conference facilities, and lodging. This year 57% compared to 68% said the location was excellent. Many of the attendees expressed a desire for the event to be held in a warm climate. Overall, though, 97% felt that the location was excellent, very good, or good. Similarly, 54% expressed that the conference facilities were excellent. A total of 91% felt that they were excellent,
very good or good. Some of the issues related to the conference facility in open comments were that it was crowded; it had a confusing layout; and there was a need for more women’s restrooms near the events. Likewise, 66% said the lodging was excellent with a total of 96% rating it as excellent, very good or good. The aspect of WiCyS that attendees were least satisfied with were the meals and snacks, with 36% of them reporting meals and snacks as poor (15%) and fair (21%).

![Figure 10: Rating of Excellent, Good, or Very Good for Location, Conference, Facility and Lodging](image)

Overwhelmingly, the attendees felt this was a quality conference. This was reflected in both the surveys and interviews. Of the attendees, 96% found the content to be appropriate. Likewise, 97% felt that it was worthwhile.

![Figure 11: Percentage of Attendees who Found WiCyS Valuable](image)
WiCyS plays an important role in networking and mentoring. Evidence for this can be found from the surveys and observations at the Conference. From onsite interviews with attendees at the Conference and from surveys attendees completed, they indicated that they wanted even more time to network informally. In particular, attendees requested more time at meals to network.

Cybersecurity is a male dominated field, and women in the field can often feel isolated. WiCyS plays an important role in reducing this isolation with 96% of the female attendees responding that they felt less isolated as a woman in the field because of WiCyS. Similarly, 96% of the relevant attendees said that they felt a part of the women in the cybersecurity community as a result of attending WiCyS. These women found WiCyS to be an excellent networking opportunity, with 97% of attendees saying it helped them establish personal and professional contacts. Even more promising is that 97% of all responding attendees planned to keep in touch with people that they met at the Conference. Last year 95% responded that they planned to keep in touch with people that they met at the Conference. As part of the observations from the Conference, women seemed to be immediately connecting through LinkedIn more this year than at past conferences. This ensures that the Conference has more of a lasting impact. The women interviewed at the Conference appreciated both the opportunity to mentor others and to be the recipient of mentorship that WiCyS provides. Many indicated that they intended to be both a mentor and to find a mentor as a result of attending WiCyS.

![Figure 12: Networking and Community for Women Attendees](image)

Of the attendees responding, 99% found both of the keynote sessions valuable, and 98% found the distinguished speaker sessions valuable. Of those attending the student poster session, 98% found it valuable compared to 95% last year and 88% the previous year. This demonstrates that the student poster session has improved over time. Of those attending the technical presentations 100% found them valuable. This year the Birds of a Feather Sessions were rated lower than last year with 90% rating them valuable compared to 98% the previous year. The conference organizations might want to explore the difference between the Birds of a Feather Sessions.
Feather Sessions for the past two years. The panels were rated valuable by 96%, while 99% rated the Lightning Talks as valuable. The workshops were found valuable by 99% of the attendees. The Career/Graduate School Fair was rated valuable by 98%, the Mentoring Socials by 97%, and the Resume Clinic by 95% of those who attended these events; 98% of attendees found the informal networking opportunities valuable. Finally, 92% found the Meet Up for Educators with Funding Agencies valuable and 96% found the SFS Meet and Greet valuable.

Even though the attendees felt each of these components were valuable, they did provide feedback to help improve the event next year, both from interviews at the Conference and in the survey. One of the most common suggestions concerned the issue of the speakers being at the meals. A common recommendation for improvement was to use the meals (all or in part) as informal networking opportunities. This would make it both easier to hear the speakers and provide more time for informal networking. Similarly, attendees wanted more time between events to informally network. Attendees wanted more hands-on and interactive sessions overall. Additionally, there were numerous people who requested more technical sessions. Several attendees requested more diversity (race, ethnicity, and sexual orientation) of the speakers. Even though more technical presentations were added this year, attendees wanted even more. In addition, they wanted technical presentations to be a separate track rather than multiple technical sessions being held simultaneously, so that they could attend all of them rather than having to choose between them. The Males as Allies panel was the most controversial event at the Conference. There was disagreement among the attendees about the value of this session as expressed in numerous comments on the survey.

Figure 13: Percentage of Attendees Ratings of Each of the WiCyS Components as Valuable

Other indications of the success of the Conference are the percentage of attendees who would recommend the Conference to others, and the percentage of attendees who plan on attending next year. It is important to note that 83% would definitely recommend, another 10% would probably recommend the Conference, 4% would maybe recommend the Conference, while only 2% would probably not recommend the Conference, and less than 1% would definitely not recommend the Conference. Another promising finding was that
54% of the attendees definitely plan to attend in 2019, with 21% probably attending, and 18% saying they may be attending. Only 2% of the respondents said they probably would not and only 1% said they definitely would not attend. Many people provided comments in regard to this question. Many indicated that their attendance would be determined by funding, their job, or school status.

**Table B:**

<table>
<thead>
<tr>
<th>Representative Comments Regarding Attending Next Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myself or someone in place will definitely attend!</td>
</tr>
<tr>
<td>If I get lodging, I will attend</td>
</tr>
<tr>
<td>May not be in current position a year from now</td>
</tr>
<tr>
<td>Distance, traveling, cost</td>
</tr>
<tr>
<td>It depends if I can get lodging and meals paid for.</td>
</tr>
<tr>
<td>I will completing my last semester for my bachelor's degree.</td>
</tr>
<tr>
<td>I am in high school and I am not sure my mom will be able to go to Pittsburgh with me.</td>
</tr>
<tr>
<td>I've gone so many times, I want someone else in my organization to have the pleasure of attending!</td>
</tr>
<tr>
<td>I will leave the US, otherwise it is a Definitely.</td>
</tr>
<tr>
<td>I hope to see more technical presentations.</td>
</tr>
<tr>
<td>It's Pittsburgh in March. That's colder than Chicago.</td>
</tr>
<tr>
<td>I will be commissioning in May as an officer in the Navy.</td>
</tr>
</tbody>
</table>

![Figure 14: Percentage of Attendees Who Would Recommend the Conference](image)
While funding has had a major impact on attendance every year, the impact was slightly higher in every category this year than the previous year. Funding was crucial for attendance at the Conference, as evidenced by both the open ended responses that we received from participants about whether they would attend next year, and noting the answers to specific questions about funding and conference attendance. Of those responding, 99% said that the low cost of the subsidized registration enabled them to attend this Conference. Similarly, 98% of respondents said that the no cost housing enabled them to attend the Conference. Likewise, 96% said that no cost for meals enabled them to attend the Conference. Therefore, each of these components, which limited the cost of the Conference for attendees, was essential to the ultimate success of the Conference.

Consistently over the years, attendees have reported a powerful, pervasive impact of the Conference. This was true for all types of attendees: students, educators, and other
professionals. In addition to quantitative data, qualitative data was collected from the Conference attendees. Their open-ended comments demonstrated that the Conference was having a deep impact on individuals and organizations and was impacting them in various ways. Here are some responses when asked “Please share with us how this conference benefited you personally and why it is a worthwhile event/community for funding agencies/sponsors to support.” Note that a few were edited for typos, but none were edited for content.

Table C

<table>
<thead>
<tr>
<th>Representative Comments</th>
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<tbody>
<tr>
<td>This conference gave me the confidence to continue pursuing this career field and the possible careers I can have.</td>
</tr>
<tr>
<td>This conference is a great platform to bring up the bright talent from people hidden somewhere.</td>
</tr>
<tr>
<td>I was able to get hands on experience on the tools used in a real world setting to detect a threat actor in the workshops. The poster presentation helped me understand how security can be used and it's application when it comes to research.</td>
</tr>
<tr>
<td>It was a great way to bring awareness of our company's presence in the cyber industry and network with outstanding young women who could work for us in the near future.</td>
</tr>
<tr>
<td>I learned a lot new things both on personal and professional front.</td>
</tr>
<tr>
<td>I really enjoyed meeting other successful women who were good role models for me.</td>
</tr>
<tr>
<td>I feel that bringing women together to support each other, even when we are in another part of the country or continent, helps retain women in this field. It gives us an outlet that we might not have in our local environment.</td>
</tr>
<tr>
<td>Our campus is predominantly male, and it was such a thrill for me to bring our female students to a conference where THEY were in the majority and to network with other women who excel in their field. I've never been to a gender-specific conference, but I attended a women's college undergrad. It was the exact same energy at WiCyS: a sisterhood where everyone knew how amazing everyone else is, so we can get down to the important business of being vulnerable and learning from each other's experiences.</td>
</tr>
<tr>
<td>The workshops were fun to attend, the technical talks gave me more in-depth information on topics I knew little about, and the lightning talks were informative and entertaining.</td>
</tr>
<tr>
<td>Many of the sessions were very useful for those working in cybersecurity. I picked up several ideas and resources that I can directly use in the workplace so for that reason alone, it was worth attending.</td>
</tr>
<tr>
<td>This conference gave me the opportunity to start an NGO that empowers young girls by letting them know they can be a &quot;slay queen&quot; and a tech at the same time.</td>
</tr>
<tr>
<td>I had decided to put off my Bachelor’s degree. After the conference I decided to go ahead and do it. The speakers were inspiring and it was a wonderful group of people to be around.</td>
</tr>
<tr>
<td>I learned just how interdisciplinary cyber security is and how that diversity in background can have a positive effect (different minds discovering different problems). This conference is very unique in that it combines ethics, female promotion, and technical skills. In future years, I would like to see these three topics mirrored more in the selected speakers and workshops offered.</td>
</tr>
<tr>
<td>This conference provides inspiration as well as specific, practical support to increase participation and retention rates for women in cybersecurity. I personally benefitted from attending in that I made great connections.</td>
</tr>
<tr>
<td>I was thinking about the potential for cybersecurity-related jobs in academia as well as in industry. Meeting scholars from both academia and industry to explain about future of cybersecurity, especially for women simply boosted my confidence.</td>
</tr>
<tr>
<td>This conference benefited me personally by allowing me to explore what is possible for a professional in transition.</td>
</tr>
<tr>
<td>Found my job that I love in 2017</td>
</tr>
<tr>
<td>I made a lot of connections (friends!) in the field and learned skills regarding research, grant writing, and hacking (of course!). I greatly enjoyed the entire WiCyS experience and how well put together the event was.</td>
</tr>
</tbody>
</table>
This benefited me by energizing me in my career. Often mid-career you are trying to have it all, this gave me opportunity to meet other folks that were tied up in the midlevel career craziness and relate on how things were going (and how tired we are)

It is fun and informative and beneficial for young women and the career fair is beyond awesome.

The workshops were very informative and meeting someone at breakfast landed me an internship.

The conference evoked thought and inspired me to reach out to young ladies in my community that may be interested in the Cyber Security field.

It benefitted me because it allowed me to connect to many women who are in a position similar to mine.

To assist other educational organizations interested in proposing and initiating Cybersecurity programs at their respective schools.

Did not realize how fantastic everyone would be and networking with companies, students, and speakers was the best part.

It gave me a lot of confidence in continuing my education and looking for an internship. It is super worthwhile to support this event, because I believe it will help retain women in the field and encourage younger women to pursue something related to this field.

I went to the conference with no confidence of finding a job after graduation, but after I spoke with the different companies at the career fair I felt empowered and motivated.

It’s a great experience to get out and meet so many other women in a field where we're such a minority! The networking/career resources are great as well!

The conference allowed me to get out of my shell and network. I was able to approach people I didn’t know, which I used to find difficult to do.

As a student I got a chance to network with professionals. I felt really motivated and inspired by this conference.

It was very inspiring to see so many strong women come together that all work in the same field as myself. I felt personally motivated to do more for myself professionally, but to also get involved to help others in this field.

I was nervous about going, because security isn’t my focus and I don’t know much. But I was happy to find out that maybe I know a bit more than I thought. And it reminded me about the importance of security in all fields of technology.

The recruiting was excellent so that alone makes it worthwhile but also just seeing and encouraging all the young women in this field is critical. I only wish there was something like this when I was in school (a long time ago).

I really enjoyed connecting with women through their research and have gained a lot from connecting with them.

Lots information about the NSF grant proposal are useful. Also, some technical, networking sessions are helpful to my professional development.

It helped me gain contacts and meet new people. I was able to share knowledge and technical ideas, enrichening the person for her research and my own. It is a worthwhile event for agencies to support because there are so many brilliant people out there that do not have the knowledge of this conference or even of this field’s existence. Specifically this conference reaches out there to the group of people that have less opportunity to learn, and that is the women and especially those with less resources.

In multiple ways. Top 3 - Networking, got an opportunity to mentor, and feeling inspired to join the community.

I was able to hear exactly what employers kind of skills/certifications they wanted to see on my resume, which was particularly helpful.

It’s raising awareness by filling the gender gap in cyber security. According to statistics, on average a CISO is a white male with mean age (55). Conferences like WiCyS, will change the workforce dynamics in cyber security with time.

Gained exposure to great resources and job opportunities, being surrounded by like minds.

It was eye opening experience and wish I’d attended additional workshops which were overlapped and couldn’t attend.

I met many professional contacts which I have already and will continue to be in touch with during the year. I have new ideas for research ideas as the discussions were invigorating and I met many
students that I have referred to my organization for potential hires. So this experience was both beneficial for me and has a potential of high value for my organization.

Cybersecurity is a big field. I gained clarity on possible specialization tracts—operations, intelligence, development. WiCyS is instrumental in bringing together talent, comradery, and career development. It showcases the accomplishment of women and plays the vital role in helping to close the cyber workforce and gender gap.

Ultimately, events like WiCyC are a worthwhile investment. I feel like there are a lot of potential cyber security professionals out there that are willing to go get the training themselves if only they were encouraged. The WiCyS conference has emphasized my capability to achieve my goals in this field, and I believe for that reason WiCyS and programs like it will drive individuals to be passionate and dedicated employees.

It was good opportunity to do networking, finding job/internship, finding mentors. Besides, most of the talks were inspiring and I could make sure I am in the right direction of my research.

It helped me make more contacts of potential recruits and learn more about which schools support students in cyber security.

Motivated me to encourage females in cyber security with my own stories from my professional career.

I learnt a lot from the speakers and workshops - it really piqued my interest in cybersecurity. I saw that I should not feel lonely in this field because there are so many wonderful and courageous women already working in it. Organizations should support this wonderful initiative because we are entering an age where cybersecurity is becoming increasingly essential. It is in everyone's best interests to attract talent to this field - and this conference does so. Organizations will have direct access to this kind of talent in the conference so that they can recruit according to their purposes.

I was able to realize that I don't have to follow one specific path that is laid out for me. I have so many opportunities available for me, and I want to explore them all.

I really enjoyed the career fair. It was a nice opportunity to speak to employers without long lines, and the swag was great. The mentoring socials gave me a chance to connect with recruiters and employees in an informal settings. I met new people and learned some interesting things about the field.

It was great to see women that are in this field. Prior to this experience I only knew of like 3 other women in cyber security.

I was able to meet women who were genuinely passionate about what they do. It definitely gave me more direction about my future career as well.

Great opportunity to collaborate with educators, students and industry. Especially love bringing the students together with industry in a thriving environment.

I really enjoyed being able to learn about how other people got involved with this field and balanced personal life with work -- for example, I don't think I really hear male speakers talk a lot about how challenging having a child is on their career/education.

I expanded my professional network, by getting to know others from my school, through a workshop, and by speaking with employers at the career fair. I’ve connected with more of the women in security at my school by taking meals and discussing content with them. When I attended the escape room workshop, I was on a team with four others. Through working together to solve the problems, we got familiar with each other. After completing the challenge, we discussed common interests and exchanged information so that we could keep in touch. The career fair helped me learn about more opportunities at more companies that I would have otherwise found through individual research or my school's career fair, and speaking to representatives from so many large companies, in person, lead me to connect with companies I wouldn't have thought even had any opportunities for me. I also learned about different areas people are researching from fire talks and the keynotes. I enjoyed learning Dr. Landau's take on the second Crypto Wars, and I might use Mello-Stark, Hao, and VanValkenburg's escape room in a box materials. Finally, being around so many other women in cybersecurity, many of whom are doing novel work and presenting about it, inspires me to start doing more of my own studies in the area, and maybe to take up a side project in security making something new.

As the field of cyber security expands and more women come into the workforce, I think it definitely benefits the young women coming in the field to see the women who are already there and see those role models. Personally, from seeing these women I was more empowered to keep pursuing this field and knowing that there is no clear path, but that it can be done, it more motivation to keep going. I
I now feel that I can go and mentor young women to pursue a career in Cybersecurity and lead them to this conference.

I enjoyed meeting other women in the field, male allies, and the opportunity to meet and mentor others.

It helped me connect with other professionals that are trying to help diversify this field and encouraged me to give back to the community more.

The event was extremely valuable because it was attended by educators who use The Day of Cyber and also by company leaders who we work with as well. Powerful mix of audience.

It was so empowering to have so many in the room like me. That is not usually the case at a cyber or technical conference.

Personally, it's a great opportunity to learn from peers; because this particular community is a valuable workforce to strengthen cyber security, this community needs to be encouraged and supported.

I was so burnt out when I quit my job last year as a program manager for a Cybersecurity vendor. Once I recovered, I found I wasn't as thrilled to be doing communication consulting as I thought I would be - I missed Cybersecurity. This conference confirmed that I belong in this field.

As a company employee I got to meet many new faces from our company - expanding my network within the company. As an individual, I found more resources to support my own personal learning journey.

I've been teaching and attending conferences for many years, WiCys reaffirms that my work is not in vain.

It is an inspiration to be in the same room with so many smart and beautiful women trying to make a difference in our field. I truly have a deep respect for everyone there. I took so much away from this conference because I wasn't scared to talk to people as I was last year. WiCyS has helped build up my confidence over the past year I cannot thank you enough.

This conference reenergized by excitement and commitment to a career in this field. As a graduate student, it can be easy to get lost in the weeds of day to day school work, and forget the greater purpose that I’m working toward.

I struggle a lot with confidence in myself and in my skills. I am reminded that I’m where I’m supposed to be and that the only thing I could do wrong is to do nothing.

I get to know more directly related companies in this area and it's one of the best advertising for sponsors.

I was able to meet a potential employer, make more connections with other companies, made friends in the industry, saw some friends I have made along the way, gained inspiration and knowledge on how to survive and thrive as a woman in the field.

It brought together all the smart, passionate, ambitious women together figuring out their next career move in cybersecurity - a growing field - and sharing information on the topic with each other. An event like that inspires and motivates women like me to pursue our dreams, and get a better direction forwarding my career in cybersecurity. I got to meet and talk to so many other women and men working in different verticals of the field. I got so much more information about the field. I can reach out to these people and get advice on my next steps.

Just being exposed to and having the opportunities to hear other women in their field and how they got there is really encouraging and inspiring for me; I feel very motivated and inspired to continue studying and further my education in cybersecurity and I feel confident that I can succeed in the future. I didn't feel alone in my quest to pursue cybersecurity, and seeing successful women in the field makes me hopeful that I will find my own place in the field.

I went into this conference with a super shallow understanding of cybersecurity and left with confidence in myself as well as a huge desire to learn more. Those are two things my current degree plan might not have provided to me, and without that I probably wouldn't have given a second thought to cybersecurity.

I benefited because I was able to connect with other professional women for job prospects and speaking engagements.

Gaining the support of other women in facing the challenges that I am experiencing today. Getting the chance to network to self improve and getting exposure to new knowledge and networking opportunities. This is definitely more worthwhile than other conferences that I have attended before (SCaLE, CSUN Tech Fest, LayerOne) because it is entirely focused on Cyber Security which I find
that many other conferences are more general in Technology. I constantly feel treated like another
number in other conferences while WiCyS I am treated, looked at, and spoken to as an actual person
with potential.

I can't count the number of times I've almost quit my degree because its so damn lonely. This
conference reminds me that there are pockets of this community that are enjoyable to be around.
I learned much of valuable information, felt support and improved my confidence. Workshops,
talks were very robust, granular and engrossing!

We need to attract more women and minorities into the great cyber profession to address the
growing talent shortage and retain the ones we do have. This event specifically addresses both of
these issues and I was incredibly impressed with the diversity of the people in attendance.

Although I am a man, I still feel isolated in STEM sometimes because of my LGBT identity. This
conference allowed me to come in contact with many other LGBT people in cybersecurity, which
gave me a valuable sense of community. I got to know the people from my university better, and
made multiple new friends from other institutions.

Bringing together academia/industry/students like this to inspire each other really helps to connect
everything - solving from pipeline through end career needs to be a focus.

Inspired me to keep following my dreams when I was at the verge of giving up.

It helps me network with other HR professionals as well as potential job applicants.

I think that I was hesitant to continue my education is cybersecurity because of the lack of females,
but this conference has inspired me to continue and has given me the confidence to work even
harder.

I learned what it meant to be a part of a community. I learned to slowly be bold and find my voice.
Most importantly I did not know what questions to ask to create a connection or build a relationship
and I learned all of that during this conference. What I learned during this conference and how
proud I felt to be a woman in this community, I will be taking with me and sharing this as often as
I can.

This year I was able to establish many business connections and job opportunities, even a few that
I had not thought to peruse before. For companies it's a great way to get their name out there.

I didn’t get a chance to attend many sessions, as we were attending the career fair. I had wanted to
participate more, but the priority was to talk to other attendees and look for candidate for open
positions We identified several potential hires.

Educators and Professionals

Some of the questions on the survey were aimed specifically at the educators and
professionals. It is important to evaluate what these educators and professionals are taking
away from the Conference to help them succeed in the field. A total of 162 educators and
professionals answered the survey. Of the responding educators and professionals, 89%
reported that the Conference gave them ideas to improve their skill set. In addition, this
year 88% said that the Conference gave them ideas to share with their colleagues back
home. Similarly this year, 91% reported that the Conference helped them face work with
renewed enthusiasm. Likewise, 99% of responding attendees this year said that the
Conference helped them feel more connected to others in the field. In addition, 94%
reported that the Conference has had a positive impact on their professional development
this year. Overall, these educators and professors report a positive impact of this
Conference.
Since the impact on students was a crucial component of the Conference, a separate part of
the survey was answered only by students. A total of 184 students completed the survey. Some of the activities at the Conference were specifically aimed at a student audience, such as the student poster session, resume clinic, and the career/graduate school fair. Students were very pleased with these activities; 99% found the poster session valuable, 96% found the resume clinic to be valuable, 99% found the career/graduate school fair to be valuable, and 97% found the mentoring socials to be valuable.

This section of the survey deals with issues related to the Conference’s impact on
students’ commitment to a current degree and commitment to a career in computer security. Of the responding students, 98% said that the Conference increased their commitment to
complete their current degree program, and 97% reported the Conference increased their commitment to pursue a career related to information/computer/cybersecurity.

![Figure 19: Impact on Students](image)

The Conference also helped 96% of students learn about academic programs in information/computer/cybersecurity. Of the responding students, 94% of students reported that the Conference increased their intention to pursue a further undergraduate or graduate degree in a related field. This is up from 92% of the students responding accordingly the previous year.

The Conference provided opportunities for students to increase their knowledge of career opportunities, confidence in their abilities, and interest in pursuing a career in the field. An increased awareness of job opportunities in security was reported by 96% of the students. Many women leave the field because of their lack of confidence. The Conference worked to improve the confidence level of students and succeeded with 97% of students reporting an increase in confidence in their ability to succeed in a job in information/computer/cybersecurity. Importantly, 98% of the students reported an increased interest in information/computer/cybersecurity.

**Strengths of the Conference**

When attendees were asked to write a single word that best described their personal feelings after attending the Conference, their words were overwhelmingly positive. The four most frequent responses were “inspired,” “motivated,” “empowered,” and “excited.” Interestingly, the top four words this year were the same as last year’s top four words. The consistency of the top four words from year to year is remarkable. One of the most valuable parts of the Conference from the perspective of the interviewees was the inspirational and motivational spirit of the Conference. This is important, both for getting under-represented minorities into the cyberfield and then for keeping them in the field.

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMMITMENT CURRENT DEGREE</td>
<td>98</td>
<td>98</td>
</tr>
<tr>
<td>COMMITMENT CAREER</td>
<td>97</td>
<td>97</td>
</tr>
<tr>
<td>CONFIDENCE</td>
<td>97</td>
<td>97</td>
</tr>
<tr>
<td>PURSUE FURTHER DEGREE</td>
<td>94</td>
<td>96</td>
</tr>
<tr>
<td>INCREASED INTEREST</td>
<td>98</td>
<td>98</td>
</tr>
<tr>
<td>INSPIRED ME</td>
<td>98</td>
<td>98</td>
</tr>
<tr>
<td>LEARN CAREER OPPORTUNITIES</td>
<td>96</td>
<td>96</td>
</tr>
<tr>
<td>LEARN ACADEMIC PROGRAMS</td>
<td></td>
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Feedback from Last Year Incorporated Into WiCyS 2018

Each year WiCyS makes changes based upon feedback from the previous year. The iterative process of making changes at the recommendations of attendees has made a positive contribution to the Conference. The social networking opportunity with sponsors was one of the highlights of the Conference for many of the attendees, for example. This was implemented last year at the recommendation of attendees.

Useful Recommendations from Last Year Incorporated Into WiCyS 2018

Table E

<table>
<thead>
<tr>
<th>Recommendations from Last Year’s Conference Incorporated Into WiCyS 2018</th>
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<tbody>
<tr>
<td>Additional workshops were added to the program.</td>
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<tr>
<td>Waited until meals were closer to the end before speakers began to speak.</td>
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<tr>
<td>While in the large rooms, videos of the presenters were also on a screen to make it easier for those in the back of the room to see.</td>
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<tr>
<td>Moved mentoring from late Friday night to Thursday evening.</td>
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<tr>
<td>Improved ribbons for the badges so that they stuck better.</td>
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<tr>
<td>Information on the sponsors and the positions they are hiring for was provided to the attendees before the conference starts so that the candidates can be better prepared.</td>
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<tr>
<td>All emails were sent from a central location.</td>
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<tr>
<td>To prevent food waste and to save WiCyS funds attendees were surveyed whether or not they will stay for all of the meals.</td>
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<tr>
<td>More technical presentations.</td>
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<tr>
<td>With the move toward non-profit status, the organization is moving toward hiring a professional staff.</td>
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<tr>
<td>More diversity in speakers including an international panel on Diversity in Cybersecurity was added.</td>
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<tr>
<td>Expanded social media options.</td>
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<tr>
<td>At least one student was included on the planning committee.</td>
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</tbody>
</table>

Recommendations for WiCyS 2019

Table F

<table>
<thead>
<tr>
<th>Recommendation for WiCyS 2019</th>
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<tbody>
<tr>
<td>More diversity in speakers. In particular, include speakers that can address intersectionality (gender and race, ethnicity, etc.)</td>
</tr>
<tr>
<td>Add even more hands-on workshops to the program.</td>
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<tr>
<td>More informal networking time at meals and between sessions.</td>
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<tr>
<td>Include a &quot;Speed Dating&quot; session for the poster presenters, where they have 60 seconds or so to summarize their work. Also provide a printed copy of their abstracts and poster</td>
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</tbody>
</table>
numbers -- the audience can then write notes on which posters they want to visit. They did this at the Purdue CERIAS conference and it was fantastic!

Consider having the conference earlier in the year.

Even more technical presentations. Also, spread them throughout the conference rather than having them simultaneously.

The dinner panel discussion should have featured men and women from varying levels in their companies. This would have provided more women to share their experiences and how they have succeeded in this field while still sharing the male perspective and hearing how these allies are working with women at their companies.

For logistics: allow more time between sessions and meals, like a five or ten minute buffer. This was particularly needed when trying to get everyone from their talks to the room for lunch. Also, because there were not many women's restrooms near the part of the building where the conference was held, I missed the beginnings of a few sessions due to the long lines at the one nearby ladies' room.

Please share the workshop materials/slides.

More chairs/places to sit in the hallways.

Workshop rooms were too long - people in back could not see the screen. Need a different config or additional monitors.

While there was certainly a focus on women in a male-dominated workforce, I find that this is still an underestimation of the diversity in this field. I wish the conference-scheduled events also addressed privileges due to race or ethnicity, and offering a critical analysis of how that affects people in the field.

Genders other than male and female were nearly completely neglected in conference topics, and I feel that this could be extremely disheartening for those who do not see themselves represented in those binary categories.

Maybe have a student mixer or something, or have a dinner where you are assigned a seat at a table and you don't know anyone.

Not have the same type of workshop at the same time. I had to choose between EC-Council and an Escape Room which was torture.

More networking sessions.

Resume clinic before career fair

The technical workshop seems arranged later than needed; like some workshop requirement information -- download of software. I feel some connections or round-table discussions between the education and industry may be beneficial to the universities to update their curriculum.

Please include cards stating food allergy and/or dietary restrictions for the servers’ use. Many of the girls I ate with were either vegan, celiac, or had food allergies that not only the venue chefs seemed particularly under-prepared for, but the servers seemed unwilling to assist in accommodating/remembering. It is my understanding that these cards were available at previous conferences, and the other attendees I mentioned this to did not understand why they were not available this year.

Build in tour/off-site social activity to get more familiar with host city as well as forge informal networking opportunity. Build schedule to allow 5-15 minutes of transition/travel time between sessions.

I would like to see more efforts to help people connect before and after - as in WiCyS regional activities during the year to help build connections and momentum. We could have WiCyS branded webinars too.
I would like to have a longer poster session. With my other activities, I did not get to spend much time with the posters when the presenters were there. I appreciate the fact that the posters were available for several days but I would have liked more opportunities to speak with more of the poster presenters.

A lockpicking village would be cool.

Please be more specific upfront about the dates and times for the conference.

Have a session/talk on the CSEC 2017 (new undergrad cybersec curriculum guidelines). Diana Burley would be a GREAT keynote speaker

A session that focuses on the future of cyber from the lens of a VUCA world...

I want attendees to hear about the variety of roles that one could play in the cyber world - from anti-tamper to pen testing, from process to coding, etc.

Need to have much stronger Wi-Fi for the technical workshops.

A panel or similar activity for/about LGBT people, and how LGBT identity intersects with being a woman in cybersecurity, and/or a racial/ethnic minority.

Sessions that focus on students that are beginning in the field of cybersecurity, saying how to start learning in the field. I come from a school that does not have cybersecurity related classes but I want to know what I should do to further my study on my own.

United Airlines has a woman who is in charge of their security sector and I think she would make for a fantastic speaker for this conference

Make an after the conference social event with dance and music.

Either allow more workshops or provide more space in the workshops- they were all full very shortly after opening for sign-ups and I wasn't able to get into any of them.

I really appreciate that this conference has the focus of mentorship. This was something that we could all focus on and practice during the conference. I believe that if the conference had a focus that we could all foster during our three days together, everyone can leave with something valuable. *I would like to hear more about what kind of issues and adversities exist and how we can overcome this. I would love to see a panelist with different women at different levels in their cybersecurity career (intern, 1-5 years, 6+ years etc.). * Now that we have student chapters of WiCyS, I would love to have a session where student leaders can meet up and discuss ideas and challenges.

Please bring more people that can talk about the legal aspect of cyber.

Better communication/planning for workshops (distribute software before)

Bigger space for meals.

The most frequently requested changes were to add more diversity to the program, more technical sessions, more opportunities for informal networking, and more hands-on workshops. The other frequently requested change was to have technical sessions as a separate track that are spread out throughout the conference rather than being offered simultaneously.

**Opportunities from Sponsoring Partners**

Sponsoring Partners were surveyed prior to the WiCyS Conference about opportunities that they would be offering at the Conference. “Jobs” was the most frequent response, with 61% of the sponsoring partners offering job opportunities. This was followed by “internships,” with 53% of the partners offering internships. The most frequent response under “other” was related to educational opportunities.
Summary
Overall, this was an immensely successful conference by any standard. The Conference was evaluated by personal observations of the evaluator, interviews, and a survey of participants. All indications are that participants found the Conference well organized, meaningful, engaging, and a great networking opportunity. Participants’ individual needs were accommodated.

Intellectual Merit
The intellectual merit of this project is to increase awareness, as well as capabilities of a greater cybersecurity workforce, with special emphasis on women who are under-represented in computing fields and especially in cybersecurity. Full participation of a diverse workforce is crucial to integrate more creativity and multi-perspective problem solving to shape technology in cybersecurity. It is the only entity with national reach that aims to bring together students, educators and professionals in the discipline of cybersecurity under one community to share knowledge, experience, opportunities and resources. It is an exclusive community dedicated for the recruitment, retention and advancement of women in this field at various levels of their careers and from various background.

Cybersecurity is a growing field in which women are drastically under-represented. This Conference was the first national event for women in cybersecurity. The Conference provided an opportunity for students, educators, and professionals in this field to both network and to develop new skills.

Broader Impact
As a part of the broader impact, this project contributes to increase in the ability of the United States higher education enterprise to produce a diverse group of cybersecurity professionals. The WiCyS Annual Conference is limited in size and is focused on bringing together students who aspire to have a career in cybersecurity with those who are already in the field. An equal balance of participation from academia, industry, and government
provides significant opportunities to network, deliver hands-on workshop sessions, share cutting edge research, and support conversations to expose and resolve discrimination and unconscious bias toward women and minority groups in the cybersecurity profession.

The Conference meets several criteria of broader impact. The Conference provided learning and mentoring opportunities for high school students, college students, graduate students and postdoctoral students, as well as junior faculty. It stimulated the interest of students in research experiences and provided a professional development opportunity for computer science teachers. It broadened the participation of women and minorities in computer security through both recruiting new women and minorities into the field and helping to maintain those already in the pipeline through support and mentoring systems. The Conference helped to enhance the infrastructure for research and education by establishing collaborations among researchers in industry and academic institutions. The Conference also provided an opportunity for other NSF projects to broaden their dissemination to teachers and industry. Through strengthening the pipeline for computer security, the Conference also provides benefits to society by enhancing national security through strengthening cybersecurity.