

CRA-WP Grad Cohort Workshop for Inclusion, Diversity, Equity, Accessibility, and Leadership Skills (IDEALS):

2024 Immediate Impact Evaluation Report

ENIOLA IDOWU
CENTER FOR EVALUATING THE RESEARCH PIPELINE (CERP)
COMPUTING RESEARCH ASSOCIATION





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Center for Evaluating the Research Pipeline Computing Research Association 1828 L St NW, Suite 800 Washington, DC 20036 e. cerp@cra.org





## **ABOUT CERP AND ACKNOWLEDGEMENTS**

The Computing Research Association's (CRA) Center for Evaluating the Research Pipeline (CERP) is a research and evaluation center whose mission is to promote diversity in computing. CERP serves as a resource for the computing community by supporting efforts to recruit and retain individuals considered underrepresented in computing or historically marginalized (i.e., women; people who are Black/African American, Hispanic/Latinx, Indigenous and First Nations, Native Americans, Alaska Natives, Native Hawaiians, and Pacific Islanders; persons with disabilities; persons from low-income backgrounds; first generation college students; LGBTQIA+ individuals; and veterans). More generally, CERP strives to inform the computing community about patterns of entry, subjective experiences, persistence, and success among individuals involved in academic programs and careers related to computing.

CERP was created by the Committee on the Status of Women in Computing Research (CRA-W)/Coalition to Diversify Computing (CDC) Alliance through a National Science Foundation grant to the Computing Research Association (CNS-1246649). The current research was supported by NSF grant CNS-1840724. Any opinions, findings, conclusions, and recommendations are the authors' and do not necessarily reflect the views of the National Science Foundation.

For more information about CERP, visit <a href="http://cra.org/cerp/">http://cra.org/cerp/</a>.



# **TABLE OF CONTENT**

ABOUT CERP AND ACKNOWLEDGEMENTS	2
TABLE OF CONTENT	3
INTRODUCTION	4
METHODS	
Procedure	5
Analysis	5
PARTICIPANT PROFILE	7
<b>EVALUATION FINDINGS: ALL PARTICIPANTS</b>	9
Identification with Computing, Confidence, & Imposter Syndrome	9
Social Support	12
Career Interest	
Chapter Summary	
INTERSECTIONAL EVALUATION FINDINGS	16
Overall Findings	17
DISCUSSION & SUMMARY	20
REFERENCES	21

## INTRODUCTION

The CRA-WP Grad Cohort Workshop for Inclusion, Diversity, Equity, Accessibility, and Leadership Skills (IDEALS) is a two-day workshop for students who are underrepresented in computing graduate degree programs, with the goal of increasing students' sense of belonging and persistence in the field. To reach this goal, Grad Cohort IDEALS gives participants the opportunity to connect with a supportive community and create professional networks of peers and senior researchers in the field. Through seminars and discussions, the workshop engages participants in

"This workshop was the highlight of my year. I'm a 3rd year Ph.D. candidate in computer science. I was eagerly looking for ways to improve my dissertation and push it to the next level. I found the ways to publish better research, overcome publication failures, seek mentors and so much more at the workshop. I'm so fortunate I was given the opportunity to attend the conference. I wish the workshop did not get over so soon".

several topics related to career pathways and tips for success in computing graduate degree programs. IDEALS Grad Cohort also provides one-on-one mentoring and professional development opportunities to promote students' successful progression into computing research careers.

The inaugural IDEALS workshop was titled Grad Cohort for URMD. In 2020, following community-wide conversations among CRA-WP leadership, staff, program organizers, and other stakeholders, the workshop was officially renamed to its current name. Research and evaluation results indicate that the workshop has a positive immediate impact on participants (Wright, 2018a; Wright & Yarzebinski, 2019; Yarzebinski & Wright, 2020) as well as long-term benefits (Stout, Tamer, Wright, Clarke, Dwarkadas, & Howard, 2017). For the 2024 workshop, it was co-located with CRA-WP Grad Cohort for Women in Minneapolis, Minneapolis and brought 106 attendees to build networking with GCW attendees.

Using a pretest/posttest methodology, the CRA Center for Evaluating the Research Pipeline (CERP) evaluated the 2024 workshop using an online survey distributed to participants before and immediately after the workshop. The post-workshop survey also included open-ended feedback questions for participants to provide feedback about the workshop (results are found in the **2024 Participant Feedback Report**). This report discusses CERP's evaluation efforts and results of their analysis assessing any immediate impact on participants' outcomes (e.g., sense of belonging) as they relate to the goals of the workshop.

## **METHODS**

### **Procedure**

CERP evaluated the Grad Cohort IDEALS workshop using a pretest/posttest framework, wherein participants were recruited at two time points to complete an online survey: once approximately two weeks prior to the workshop (Time I) and again immediately after the workshop (Time 2). The online survey distributed at both time points gauged participants' perceptions of the computing field and experiences in their degree programs, self-assessments of social support, and future career visions. The survey administered after the workshop also contained questions capturing participants' feedback and evaluation of the workshop.

#### Measures

CERP used the following outcome measures in analyses: identification with computing, confidence to achieve, confidence to communicate, perceived mentorship support, perceived professional network, feelings of imposter syndrome, and career interests, These measures were selected because they align with the goals of the program, which were outlined in the Introduction.

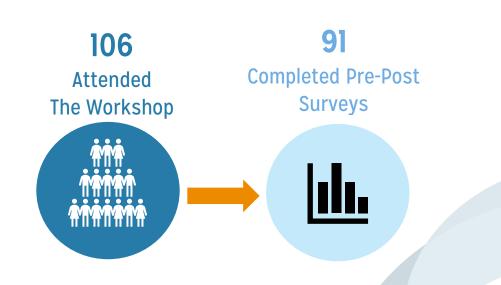
Reliability was determined for multi-item outcome measures (e.g., identification with computing) using Cronbach's alpha. Alpha levels  $\geq$  .70 are considered acceptable. Items that were found reliable were averaged together to form composite mean scores, which were used in analyses to test for changes from Time 1 to Time 2

### **Analysis**

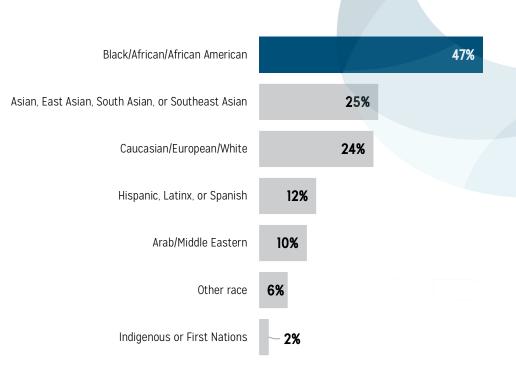
Pre/post comparisons of all participants were analyzed using a paired samples t-test on each Likert-scale outcome measure (e.g., measures rated on a scale from 1 to 5 to create a mean score), regardless of intersectional identities. Results assessing intersectional differences over time were generated using a repeated measures ANOVA, wherein Time was treated as a within-subjects variable and Group (i.e., underrepresented women vs. non-underrepresented women; has a disability vs not) was treated as a between-subjects variable. For each statistical test, we indicate whether differences in means or proportions from Time 1 to Time 2 are statistically significant using the conventional,  $p \le .001$ ,  $p \le .01$ , and  $p \le .05$  thresholds for inferential statistics. Post-hoc tests were conducted to further explore significant finding more closely across the intersectional groups.

It is important to note that positive changes between Time 1 and Time 2 responses suggest, but do not prove, the positive impact of the workshop. Due to limitations inherent in pretest/posttest self-reported data, changes between Time 1 and Time 2 could be due to response bias, demand characteristics, or may be fleeting and not sustained over time.

## WHO ATTTENDED 2024 CRA-WP GRAD COHORT FOR IDEALS WORKSHOP?











90%

Doctoral Students

**50%**Non-U.S.
Citizens

60% Women

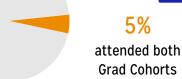


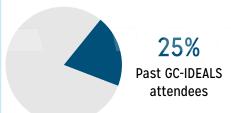


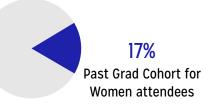


**40%**One or more disability

PAST GRAD COHORT ATTENDEES







## PARTICIPANT PROFILE

Of the 106 attendees, 91 participants completed both the pretest and posttest survey. Data from these 91 participants were analyzed for the demographic information and pretest/posttest evaluation findings. Demographic and other characteristics of those attending the IDEALS workshop conference are displayed in the infographic above. Most workshop attendees identified as African, African- American or Black, and 50% were non-U.S. citizens. Additionally, most of the participants identified as women (60%).

Among the 2024 participants, about 42% had previously attended either a Grad Cohort for Women workshop or a GC-IDEALS workshop. Of the 38 who had attended one or both workshops, 17% (n = 15) had attended GCW in a prior year, and 25% (n = 22) had attended GC-IDEALS previously (in 2021 or a prior year). Only one GC-IDEALS participant had attended <u>both</u> a previous GCW workshop and a GC-IDEALS workshop.

Table 1a. Participant demographic characteristics by gender, racial/ethnic identity, and citizenship.

	Women (n = 53)	Men (n =29)	Gender- queer/non- conforming (n = 6)	All (n = 88)
Racial/Ethnic Identity				
African American / African / Black	42%	66%	0%	48%
Caucasian / European / White	28%	14%	40%	24%
Hispanic, Latinx, or Spanish origin	12%	16%	-	13%
South Asian (e.g., Indian, Pakistani, Nepalese, Sri Lankan)		7%	40%	13%
Indigenous or First Nation		7%	-	2%
Something else	9%	12%	-	10%
Arab / Middle Eastern		3%	20%	10%
East Asian (e.g., Chinese, Japanese, Korean)	8%	7%	20%	8%
Southeast Asian (e.g., Cambodian, Vietnamese, Hmong, Filipino)	4%	1	-	2%
Other Asian		1	20%	2%
Citizenship Status				
U.S. citizen or permanent resident (includes dual citizenship)	52%	45%	75%	51%
Non-U.S. citizen with temporary visa	44%	55%	25%	47%
Other non-U.S. citizen	4%	-	-	2%

Notes: Values for racial/ethnic identity represent the percentage of respondents who selected each item; respondents could select more than one item.

Table 1b. Participant demographic characteristics by gender, degree enrollment, and generation status.

	Women (n = 53)	Men (n =29)	Gender- queer/non- conforming (n = 6)	All (n = 88)
Degree Enrollment				
Terminal master's (will graduate and finish with a Master's degree)	13%	3%	20%	10%
Doctoral (include those earning a master's degree as part of their doctoral program)		97%	80%	90%
Generation Status				
First-generation status	37%	39%	60%	39%
Continuing generation status	64%	61%	40%	61%

Table 1c. Participant demographic characteristics by gender and disability status.

	Women (n = 53)	Men (n =29)	Gender- queer/non- conforming (n = 6)	All (n = 88)
Disability Status				
One or more disability	38%	45%	80%	59%
No disability	62%	55%	50%	55%

### **EVALUATION FINDINGS: ALL PARTICIPANTS**

Results presented in this section discuss <u>ALL</u> participants' responses before the workshop (Time 1) compared to their outcomes after GC-IDEALS (Time 2).

### Identification with Computing, Confidence, & Imposter Syndrome

Participants showed significant improvement in their computing identity and confidence to succeed in computing.

Utilizing composite measures where individual items are averaged, we present the results reflecting participants' average levels of identification with computing, confidence to succeed and persist in the field of computing, confidence in their professional communication skills, and their experience of imposter syndrome at both Time 1 and Time 2.

• Results indicate that there were statistically significant mean differences from Time 1 to Time 2 in the attendees' identification in computing and their confidence to succeed in their degree programs.

Figure 1. Attendees showed significant improvement in their computing iidentity and confidence in their achievements between Time 1 and Time 2.



Notes: Values represent mean responses for each composite item. Responses were given on a five-point scale with higher numbers indicating greater agreement with each item. Statistical significance was determined using paired-samples t-tests. N for all measures = 80-91. (n) = number of responses included in analysis. \*\*\* $p \le .001$ ; \*\*  $p \le .01$ ; \*\*  $p \le .05$ .

Computing Identity. Table la presents the changes from Time 1 to Time 2 in the individual items related to identification with computing.

• Participants demonstrated significant improvement in their sense of belonging in computing overall.

Table 2a. Identification with computing as individual items.

/ V = significant increase/decrease; /	/V = no significant increase/decrease
--	---------------------------------------

•	•		
	Time 1	Time 2	
Identification with computing			
I see myself as a computing person. ***	3.87 [1.07]	4.44 [0.76]	
I feel welcomed in computing. ***	3.60 [1.06]	4.07 [0.90]	<b>A</b>
I feel like I belong in computing. ***	3.90 [1.06]	4.31 [0.84]	<b>A</b>
I feel like an outsider in computing. ***	2.84 [1.23]	2.41 [1.24]	•
Computing is a big part of who I am. ***	3.69 [1.07]	3.99 [1.12]	

Notes: Values represent means [and standard deviations] of each item. Responses were given on a five-point scale with higher numbers indicating greater agreement with each item. Statistical significance was determined using paired-samples t-tests.; \*p ≤ .05; \*\*p ≤ .01; \*\*\*p ≤ .001.

Imposter Syndrome. Table 2b shows the Time 1 and Time 2 mean scores on the imposter syndrome items. (Notably, lower scores represent agreement with the statement; thus, lower scores over time indicate improvement.)

- Participants significantly did not reduce their overall feelings of being an imposter on all the four survey items.
- They were more likely to give the impression that they are more competent than what they felt and were less likely to feel disappointed at times in their present accomplishments.

Table 2b. Imposter Syndrome as individual items.

▲ / ▼ = significant increase/decrease; ▲/▼ = no significant increase/decrease	crease		
	Time 1	Time 2	
Sense of imposter syndrome			
I can give the impression that I am more competent than I really am. *	2.90 [1.25]	3.11 [1.27]	
When others praise me for something I have accomplished, I am afraid I will not be able to live up to their expectations.	3.33 [1.31]	3.24 [1.21]	•
At times, I feel my success has been due to some kind of luck.	3.11 [1.41]	2.94 [124]	_
I am disappointed at times in my present accomplishments and think I should have accomplished much more by now. *	3.74 [1.16]	3.52 [1.23]	•

Notes: Values represent means [and standard deviations] of each item. Responses were given on a five-point scale with higher numbers indicating greater agreement with each item. Statistical significance was determined using paired-samples t-tests.; \* $p \le .05$ ; \*\* $p \le .06$ ; \*\*\* $p \le .06$ .

Confidence to succeed and communicate. Table 2c shows the Time 1 and Time 2 mean scores on the self-efficacy scale.

- Participants showed significant improvement in finding employment and being capable research in computing.
- To improve their confidence to communicate with members in computing professionally, attendees reported significant improvement to communicate technical solutions to different audiences.
  - Yet, we observed that attendees were less confident to articulate thoughtful answers about their work or presentation.

Table 2c. Self-efficacy in achievement and communication as individual items.

/ = significant increase/decrease; /	= no significant increas	e/decrease	
	Time 1	Time 2	
Confidence to succeed   "I am confident	that I can"		
be successful in a graduate computing program	4.41 [0.58]	4.47 [0.67]	
find employment in my area of computing interest. *	3.82 [1.03]	4.11 [0.80]	<b>A</b>
be a capable researcher in computing. **	4.00 [0.97]	4.24 [0.90]	
Confidence to communicate   "I am conf	ident that I can"		
articulate thoughtful answers to questions about my work during a presentation. **	4.43 [0.85]	4.12 [0.83]	•
introduce myself to new colleagues/peers at professional meetings.	4.10 [1.00]	4.25 [0.74]	
clearly communicate technical problems and solutions to a range of audiences. **	3.69 [0.97]	4.01 [0.77]	<b>A</b>
contribute to a research project in computing	4.80 [0.42]	4.70 [0.48]	•

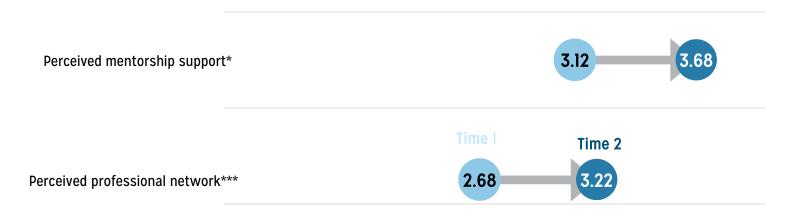
Notes: Values represent means [and standard deviations] of each item. Responses were given on a five-point scale with higher numbers indicating greater agreement with each item. Statistical significance was determined using paired-samples t-tests;  $*p \le .05$ ;  $**p \le .01$ ;  $***p \le .01$ .

### **Social Support**

#### Participants showed significant improvement in their social support system.

Another goal of GC-IDEALS is to cultivate a supportive community for participants through mentorship and peer networking. These vital sources of social support were assessed by having participants rate the extent to which they received support from mentors (perceived mentorship support) and from individuals with whom they engage professionally (perceived professional network).

Figure 2. Attendees showed significant improvement in their social support netwook between Time 1 and Time 2. Mentorship support ended with the highest posttest score.



Notes: Values represent mean responses for each composite item. Responses were given on a five-point scale with higher numbers indicating greater agreement with each item. Statistical significance was determined using paired-samples t-tests. N for all measures = 80-90. (n) = number of responses included in analysis. \*\*\* $p \le .00$ ; \*\*  $p \le .00$ ; \*\*  $p \le .00$ .

Also, CERP present the outcomes of participants' perceived mentorship support and professional network from Time 1 to Time 2 as individual items.

- Participants reported significant change in their perception of mentorship support and perceived professional network from Time 1 to Time 2.
  - o For a more detailed breakdown of the analysis by individual items within each composite measure, please refer to Table 3.

Table 3. Changes in all perceived mentorship support and professional network as individual items.

/ V = significant increase/decrease; / V = no significant increase/decrease				
	Time 1	Time 2		
Perceived mentorship support   "To what extent do yo	u have a mento	or who"		
helps you improve your computing skills. ***	2.72 [1.38]	3.39 [1.32]		
shows compassion for any issues you discussed with them. ***	3.41 [1.37]	3.93 [1.10]		
explores career options with you. ***	2.83 [1.34]	3.43 [1.23]		
encourages you to do the best you can in your coursework. ***	3.07 [1.32]	3.69 [1.14]		
supports your research ideas. ***	3.60 [1.37]	4.13 [1.03]		
Perceived professional network   "To what extent are	Perceived professional network   "To what extent are the following available to you"			
People with whom you can discuss professional development questions. ***	2.85 [1.13]	3.37 [1.08]		
A strong network of peers to interact with at conferences. ***	2.46 [1.03]	3.09 [1.07]		
A strong network of mentors to interact with at conferences. ***	2.14 [1.02]	2.79 [1.08]		
People who would be excited to learn about your professional successes. ***	3.06 [1.22]	3.56 [1.04]		
People with whom you can discuss issues you are having. ***	2.93 [1.24]	3.00 [1.22]		

Notes: Values represent means [and standard deviations] of each item. Responses were given on a five-point scale with higher numbers indicating greater agreement with each item. Statistical significance was determined using paired-samples t-tests;  $*p \le .05$ ;  $**p \le .01$ ;  $***p \le .01$ .

#### Career Interest

#### Attendees were more likely to pursue a computing related career than a research career.

Finally, GC-IDEALS intends to provide participants with opportunities to learn from speakers with a variety of backgrounds and career paths. CERP measured whether the workshop made an impact on participants' broad career intentions. Specifically, participants rated the degree to which it was likely that their future career would have a computing-related focus and that their future career would have a research focus.

• Participants' beliefs about their future careers did not change after attending the workshop (Time 2) as compared to before the workshop (Time 1).

Figure 3. Attendees showed more interest in pursuing a computing g-related career at Time 2.



Notes: Values represent mean responses for each composite item. Responses were given on a five-point scale with higher numbers indicating greater agreement with each item. Statistical significance was determined using paired-samples t-tests. N for all measures = 80-90 (n) = number of responses included in analysis. \*\*\* $p \le .00$ ; \*\*  $p \le .00$ ; \*\*  $p \le .00$ ; \*\*  $p \le .00$ .

#### Attendees showed more preference to be employed in industry at both time points.

There were no statistically significant changes over time in participants' preferences for any of the employment sectors measured, as shown in Figure 4. That is, participants were equally interested in academia, industry, government, self-employment, or something else after the workshop as compared to before it

Figure 4. Attendees showed a little improvement in their preference to be employed in academia.

Notes: Values represent mean responses for each composite item. Responses were given on a five-point scale with higher numbers indicating greater agreement with each item. Statistical significance was determined using paired-samples t-tests. N for all measures = 80-91 (n) = number of responses included in analysis. \*\*\* $p \le .00$ !; \*\*  $p \le .05$ .

Government

Self-employment

**Academia** 

### **Chapter Summary**

Industry

In this section, CERP examined mean differences from Time 1 (before the workshop) to Time 2 (after the workshop) in several outcome measures. Results indicated that after attending the workshop, Between Time 1 and Time 2, there were significant changes in participants' reports of their identification with computing, and confidence to succeed or persist in their programs. Participants also had stronger perceptions of mentorship support and professional networks after the workshop than they did before it. However, there were no significant improvement in the likelihood of having a computing or a research career, or interest in a particular employment sector over time (e.g., academia versus industry).

Something else

## INTERSECTIONAL EVALUATION FINDINGS

Grad Cohort IDEALS attracts a diverse range of participants, and it's important to understand how it impacts their educational and academic pursuits across different cultural identities and backgrounds. To achieve this understanding, CERP combined participants' gender identity with other demographic variables such as race, disability, first-generation status, and citizenship (Table 4). See Analysis section for more details on the findings.

Table 4. Intersectional Model for Analytical Process

Gender	Other Demographic Variables	Intersectional Model
	Race/Ethnicity	
	0 = Non-underrepresented/Asian or White (AW) 1 = Underrepresented/Black, Hispanic, or Native American (BHN)	
0 = Man 1 = Woman  Note: No data for participants who identify as gender-queer, so this was excluded from the	Non-underrepresented or AW includes participants who are Caucasian/European/White, Arab/Middle Eastern, South Asian, East Asian, or Other Asian Underrepresented or BHN includes participants who are African/African American/Black, Hispanic or Latinx origin, Native American/Alaska Native/Indigenous, Native Hawaiian/Pacific Islander.	Gender X Race
analysis.	Disability Status	
,	0 = No disability 1 = One or more disability	Gender X Disability Status
	Citizenship Status	
	0 = U.S. Citizen 1 = Non-U.S. Citizen	Gender X Citizenship Status
	First-Generation Status	
	0 = Continuing Generation 1 = First Generation	Gender X First Generation Status
	Family Socioeconomic Status (SES)	
	0 = Low SES 1 = Middle-High SES	Gender x SES

### **Overall Findings**

Results indicated that changes in attendees' overall perceived social support and imposter syndrome were influenced by their gender identity or other identities, such as family/parent socioeconomic and generation status. This suggests that the workshop had differential impact on all attendees based on their demographic background

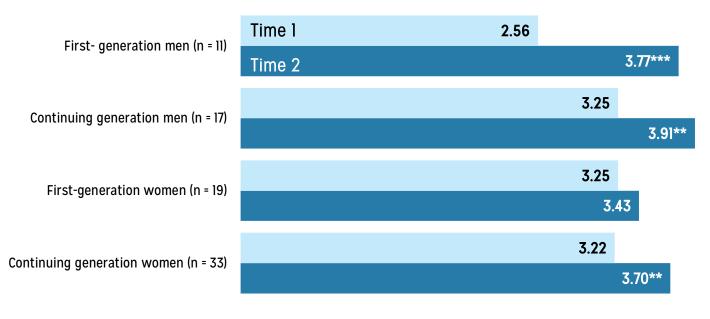
In addition to the significant interaction effects, post-hoc analyses revealed notable mean differences in participants' outcomes among specific demographic groups, regardless of survey timing. See the summary of results below

#### **Gender and Generation Status**

#### Mentorship Support

- Changes in the attendee's overall mentorship support in their programs were influenced by their gender identity and generation status.
  - o Both continuing generation men and women attendees exhibited a statistically significant increase from Time 1 to Time 2.
  - First-generation men also showed a significant increase over time as well, but this was not true for first-generation women attendees.

Figure 5. Changes in attendees' perceived mentorship support over time by gender and generation status.

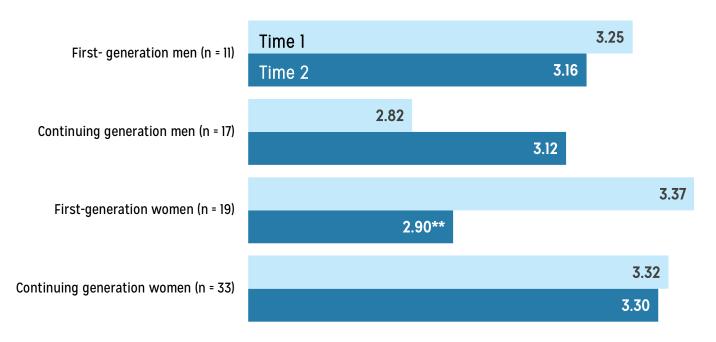


Notes: Values represent mean responses for each composite item. Responses were given on a five-point scale with higher numbers indicating greater agreement with each item. Statistical significance was determined using paired-samples t-tests. \*\*\* $p \le .01$ ; \*\*  $p \ge .01$ 

#### **Imposter Syndrome**

- Changes in the attendee's sense of imposter syndrome were influenced by their gender identity and generation status.
  - o First-generation women attendees exhibited a statistically significant decrease in their feelings related to being an imposter from Time 1 to Time 2.
  - o Although these are statistically non-significant, all other groups showed a decrease in their scores, except for continuing generation men.

Figure 6. Changes in attendees' feelings of imposter syndrome over time by gender and generation status.



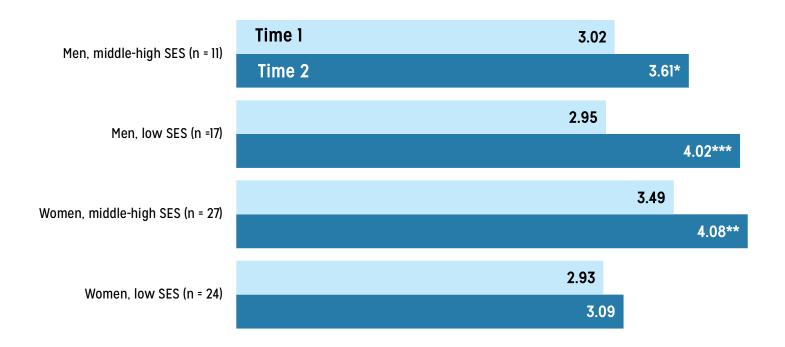
Notes: Values represent mean responses for each composite item. Responses were given on a five-point scale with higher numbers indicating greater agreement with each item. Statistical significance was determined using paired-samples t-tests. \*\*\* $p \le .00$ ; \*\*  $p \ge .00$ 

#### Gender and Socioeconomic Status

#### Mentorship Support

- Changes in the attendee's overall mentorship support in their programs were influenced by their gender identity and parent/family socioeconomic status.
  - o Both men and women from families with middle-high SES exhibited a statistically significant increase from Time 1 to Time 2.
  - o Men from families with low SES also showed a significant increase over time as well.

Figure 7. Changes in attendees' overall mentorship support over time by gender and family/parent socioeconomic status.



Notes: Values represent mean responses for each composite item. Responses were given on a five-point scale with higher numbers indicating greater agreement with each item. Statistical significance was determined using paired-samples t-tests. \*\*\* $p \le .01$ ; \*\*  $p \ge .01$ 

## **DISCUSSION & SUMMARY**

In our analysis examining changes from Time 1 to Time 2, we found <u>all</u> participants of GC-IDEALS 2024 reported a stronger identification with computing, confidence to succeed and persist in computing. However, we did not observe any significant changes in their confidence to communicate professionally with others and feelings related to be an imposter.

"Overall, it was a super useful workshop. As a master's student, it helped me gain context into my research and my career as a researcher if I opt for a PHD."

Pre- and post-workshop survey respondents also believed that they had stronger mentorship support and a stronger professional network after the workshop as compared to before it. There were no statistically significant changes in their interest to pursue certain career paths; however, attendees favored to pursue a career in the industry field.

CERP also analyzed findings by intersectional demographic characteristics of the workshop. The results revealed that attendees' social/mentorship support and imposter syndrome differed across different backgrounds, combining gender, family/parent socioeconomic, and first-generation status. Further post-hoc examinations showed significant differences in how individuals perceived their support from their mentors and feelings of being an imposter.

One notable finding is the influence of gender identity and generation status on attendees' sense of imposter syndrome. Changes in their feelings of being an imposter were influenced by these factors, with significant reduction observed among first-generation women attendees. Although the other groups' results were non-significant, all other groups showed a decrease in their scores, except for continuing generation men. These findings underscore the importance of recognizing intersectionality in evaluating the workshop's impact, as

individuals' experiences in imposter syndrome vary across different demographic backgrounds. By acknowledging and addressing these intersecting identities, organizers can better tailor workshop content and support mechanisms to meet the diverse needs of participants. This approach not only enhances the effectiveness of the workshop but also fosters a more inclusive and supportive environment for all attendees.

"A major takeaway from the Grad Cohort IDEALS was the privilege to network with my peers, share experiences and interact with other computing scholars from the industry."

Overall, GC-IDEALS 2024 made a positive impression on attendees based on the evaluation findings. CERP will conduct a follow-up with past Grad Cohorts participants to measure any long-term impact of the workshop.

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