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CSEdGrad Pathways Survey Report
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Purpose

In recent years, computer science (CS) undergraduate enrollment has risen dramatically with interest in computing courses coming not only from majors, but also minors, students in CS+X programs, and students exploring computing [1] [2] [17] [5]. Interest and opportunities for K-12 students to take CS courses has also increased and led to a plethora of efforts to provide pre-service and in-service training for K-12 CS teachers. The growth of Computer Science Education (CSE) research, which forms and informs this work, struggles to keep up with this rapid expansion. For example, the relatively small number of evidence-based studies supporting this growth are proof of these discrepancies [7] [4].

One reason Computer Science Education research lags behind is the small number of doctoral programs training researchers in CSE [6] [10]. The number of faculty whose research focuses on CSE and who have doctoral students pursuing a CSE-related PhD or EdD is limited. As recognition of the importance of this field grows, and graduate students continue to pursue doctoral degrees in this field, there is an opportunity to learn from their experiences, motivations, and current challenges to inform the development of CSEd graduate training pathways. Current faculty are in a position to identify -- and act on-- systemic and structural opportunities for clarifying, strengthening, and expanding graduate training opportunities in CSE. The CSEdGrad Graduate Student Pathways and Advisor Pathways surveys were developed to generate an empirical picture of the state of graduate preparation in CS Education. Both graduate students and faculty advisors were surveyed as each group provides a unique perspective within the systems of graduate education.

Overview of survey constructs

These survey instruments were intended to glean information across a set of constructs. Several of these were created in parallel across instruments with the intent that the results being analyzed in tandem will demonstrate faculty and graduate students' perspectives on the same phenomena. The survey contained both closed and open ended questions.

The surveys were structured chronologically across a graduate pathway to encourage respondents to reflect on: 1) entering the CSEd pathway, 2) progressing through the CSEd pathway, and 3) exiting a formal academic pathway into a career or another outcome.

Specifically, we asked graduate students to reflect on their motivations for pursuing CSEd and factors that influenced their decision to pursue a doctoral program focused on CS Education. We were also able to develop a profile of graduate students' prior experience with teaching, their own previous exposure to CS, and prior work experience (and in which sectors). Graduate students reflected on the challenges and supports arising from their experiences within Ph.D. programs, including types of support available, feelings of preparedness to enter a career in CSEd, and unmet needs. We included a battery of questions

about mentoring to better understand the network of CSEd across institutions, including a question about how existing professional organizations (SIGCSE, CRA) can better support this emerging and growing community of scholars and researchers.

For faculty advisors we asked a series of questions about their own academic backgrounds and pathway into CS and their level of experience with mentoring students both in CSEd and in other fields. We asked faculty advisors the same question as graduate students regarding their motivations to pursue CSEd research, as well as their motivations to be a mentor for graduate students pursuing CSEd. additionally, we asked faculty advisors about their experiences mentoring Ph.D. students in the CSEd field and the challenges that they face as faculty mentors. The faculty advisor survey included a parallel battery to the graduate students' survey about their own knowledge of available career paths and the job market for Ph.D. students in this field. Advisors were also asked to reflect on how existing professional organizations can better support the emerging and growing community of CSEd scholars and researchers.

Both faculty advisors and graduate students were asked to complete a short demographic battery at the end of their respective surveys. We used this information to get a preliminary sense of the demographic composition of our survey sample, but also to suggest a preliminary view of the demographics within the CSEd research community.

Validity
The instruments achieved face validity with a panel of content experts and were piloted with a small sample of faculty and graduate students currently doing research in CS Education.During survey development, researchers consulted with a CSEd faculty member for the advisor survey and graduate students with knowledge of CSEducation in Botswana, Brazil, Puerto Rico, Scotland, Spain, and the United States. These consultations resulted in several changes to question wording and response options to ensure that the survey would be understood across the diverse perspectives and experiences represented in the CSEdGrad community.

Recruitment
We heavily relied upon our established CSEdGrad community and mailing list for the outreach for these two surveys. The CSEdGrad community represents 104 graduate students from 59 institutions representing 10 countries and 46 advisors across 36 institutions representing 6 countries. These figures represent the community at the time of survey distribution and represent the population from which we sampled. The current size of the CSEdGrad community, which continues to grow.

Administration
Both surveys were administered online via Alchemer. The survey remained open for the month of February 2021. The survey link was distributed through a combination of mass email distribution and individual outreach to increase the response rate, particularly among the faculty advisors.

Our final response rate for each survey is 28/46 (54%) for advisors and 51/104 (49%) for graduate students.

Using participant funding (originally slated for in-person activities), we created an incentive structure to encourage as much participation as possible. Each graduate student who participated in the survey was given the opportunity to collect $25 upon completion.

Limitations

Though we were able to achieve fairly robust response rates for each of our survey populations, we recognize that this is a relatively small sample, given what we know about the growing size of the CSEd field. These results are perhaps reflective of an already well-connected, engaged segment of this population. Additionally, despite the global reach of CSEdGrad and international development of CSEd as a field of inquiry, we recognize that this survey instrument is US-centric in many ways, including some terminology and assumptions about how graduate students progress through a doctoral pathway. Lastly, we did not provide a bounded definition of CSEd, so this response set likely represents many different definitions of and relations to CSEd.

Summary Discussion

Finding the Pathway

Prior Experience

Current graduate students come equipped with experience related to CSEd across at least three levels: education, as manifested through teaching experience and understanding of learning sciences; computer science, as manifested through reported formal and informal experiences with CS; research experience as manifest through understanding of research methodology, prior work on grants and work history. While CS-based graduate students do not get the same exposure to rigorous education research methods, they do have experiences teaching and some contextual background to which they can apply education theory to deepen their understanding. Education-based grads self-report CS training supportive of their research if not future CS teaching responsibilities. Furthermore, analysis revealed that CS-based grads are more likely to have taught at the postsecondary level and ed-based grads were more likely to have experience in K-12 teaching environments. These experiences likely influence how the groups think about teaching and learning, student development, and computational pedagogies.

Entering the Field

Ph.D. students primarily learned about the field of CSEd through their faculty advisor or mentor or through their own research. This both points to the strength of the existing network of faculty in recruiting, but also highlights a potential area for action around spreading awareness of the existence and growth potential of this field. It also highlights another key point about this sample of graduate students -- they are driven to pursue this work because it aligns with their research interests, and allows them to work on thorny societal issues around equity and broadening participation. In their open response comments, many graduate students expressed a belief they could have a positive impact in the world, "...making CS more accessible to historically discriminated students and students with non-traditional STEM backgrounds."

Navigating the Pathway

By its very nature, Computer Science Education is an interdisciplinary field, yet this interdisciplinary character is not being mindfully supported in programs and organizational structures for graduate students pursuing training in CSEd. Most faculty reported that the CSEd pathways available at their institution are informal. We know that academia is not currently well-structured to support inter disciplinary research ventures, despite a recognition that this type of research is needed to solve the most challenging problems of our time [3]. Many of the factors associated with the challenges of interdisciplinarity, such as course taking policies, physical space, engagement with future employers, and open discussion of the politics of interdisciplinarity, are compounded by the relative informality of computer science education as a field of inquiry, particularly as applied to K-12 education.

Overall, graduate students and faculty are in agreement that they are being well-prepared to enter into a career in CS Education research. This sample of graduate students seems well-supported by the current mentoring they are receiving, and graduate students and faculty agree that mentoring needs are being met most or some of the time.

Each group did speak to the challenges of working in an emerging field. One challenge identified by both graduate students and faculty is lack of access to graduate-level CSEd courses. Beyond availability of these courses, other concerns were raised around a lack of defined programs of study and burdensome or conflicting course requirements for the home discipline of the graduate student.

One aim of graduate education programs is building strong professional networks through meaningful collaborations both with other graduate students and faculty. Graduate students and faculty agree that graduate students have access to one CSEd faculty at their institution, but that level of agreement drops considerably when asked if graduate students have access to two or more CSEd faculty at their institution. This could point to an opportunity for faculty members to make more deliberate introductions and connections to other faculty for their graduate students. An alternative explanation could be that faculty members and graduate students are defining CSEd faculty in different ways.

Graduate students were more likely to have meaningful collaborations with other students at their institution; however this changes dramatically when asked about collaborations with students at other institutions. Thirty-five percent of faculty respondents indicated having a meaningful collaboration with a student at another institution, while no graduate students reported the same. This indicates an opportunity for developing more robust peer mentoring networks.

One Path Leads to Another (or, From Training to Career)
The wealth of experiences position these graduate students to be able to robustly meet the existing and growing demand for research and programmatic interventions for Computer Science Education. Graduate students do not universally see a career path into academia as the default goal of their graduate training [11]. This holds true for this survey sample as well. If the expectation for graduate training continues to be predominantly focused on academic career pathways, then these graduate students will continue to face challenges gaining acceptance. On the other hand, if we recognize the broader career paths and societal needs beyond academia, we may better be able to appreciate and utilize the experience, competencies and values being developed and manifested by these and future graduate students.

Despite the relatively high levels of confidence that graduate students will be able to find an enjoyable career and achieve their career goals, neither graduate students nor faculty feel knowledgeable about the current job market for the CS Education field. In a separate study, CSEdGrad project team members have been working to develop a snapshot of the types of careers currently available, and related skills needed, within CSEd.

Thinking more broadly about career development and support, we asked faculty and graduate students if there are institutional supports available to graduate students to help prepare for 1) the faculty hiring process and 2) careers outside of higher education. For the faculty hiring process, nearly 70 percent of current faculty indicated that there are supports available to graduate students, while just over half of graduate students said the same. Fewer respondents across both surveys indicated that institutional supports exist for careers outside of higher education. These results indicate that graduate students may

benefit from earlier connection to faculty career supports to boost their awareness of these resources. Additionally, the entire CSEd field could benefit from increased information about and discussion of how to prepare for careers outside of academia.

Supporting Current Graduate Students and Faculty

As noted above, one aim of graduate education programs is building strong professional networks. We found that *only 47% of graduate students* (compared to 76% of faculty) feel somewhat or very confident that they are being prepared to develop a strong network within the field of CSEd.

We gave faculty and graduate student respondents an opportunity to tell us what they think organizations like SIGCSE, CRA, ICER, and others can do to support academic and career success for CSEd graduate students. Many of the comments focused on providing career connections for students, through job boards or job fairs dedicated to CSEd, networking and mentoring opportunities for graduate students (both with each other and with faculty at other institutions), and opportunities to present their work with a lower bar for entry than traditional conference submission routes.

Graduate students also identified conference cost as a barrier to participation and would like to see financial support become available from these organizations. Additionally, they want more information generally about these conferences, affiliated opportunities, and career and professional development support.

Several faculty discussed ways that they themselves would like to be supported, including wanting more information about CSEd courses at other institutions, frameworks for graduate curriculum in CSEducation research, and connections to CSEd graduate students. We know that faculty advisors face barriers in being able to support CSEd graduate students. The top three barriers reported by faculty are availability of coursework (61%), clarity of CSEd pathways (50%), and acceptance of scholarship in home discipline (44%). It's worth noting that acceptance of scholarship in the home discipline is a barrier regardless of home discipline. Organizations like SIGCSE could provide the convening space and logistical support for faculty to strategize about how to overcome these barriers.

Sense of Belonging

Research has demonstrated the importance of feeling a sense of belonging in computing as a factor for retaining marginalized students in the field, both at the undergraduate and graduate levels. The importance of sense of belonging can be extrapolated to graduate training for CS Education. The survey data shows that most graduate students, as well as a sizable percentage of faculty in our sample, do not feel a sense of belonging to a CSEd research community. If part of belonging includes feelings of legitimacy [8], it's no wonder that graduate students pursuing training in CSEd – who often have to accomplish extra work to be recognized within their home discipline and do not see formalized training pathways – are not feeling greater degrees of belonging. An important element of the way we phrased our questions is that we asked both about belonging within an institution and beyond their institution. SIGCSE and other scholarly and professional communities have the opportunity to impact these broader feelings of belonging and connectedness for current graduate students and faculty.

As [9] demonstrate, goal-affordances are an important aspect of sense of belonging. Our data suggests that graduate students pursuing training in CS Education fundamentally enjoy the work and they have a strong motivation to make change, not only for CS and STEM broadly, but societal change. Graduate students want to research equitable instruction, policy and curricula development, and interventions specifically supporting students with marginalized identities. We have an opportunity to support these graduate students in their endeavors, with the recognition that these graduate students are the best equipped to achieve the diversity, equity, and inclusion goals we have collectively set for ourselves.

Currently literature on sense of belonging has been conducted mostly with established disciplines, particularly for research focused on graduate students. Stachl and Baranger (2020) studied graduate student and faculty sense of belonging in a Chemistry department, and found that being accountable to an advisor, as well being viewed as a serious scholar impacts graduate students' sense of belonging [15]. Paired with O'Meara et al.'s (2017) finding that organizational context has a large impact on graduate students' sense of belonging [13], this raises important questions about how to support those seeking graduate training in CS Education. If we want to retain these current graduate students and attract new ones to the field, then we need to be creating structures and pathways that promote a sense of belonging. Moreover, graduate students need to feel as if they belong in this field in order to feel some sense of power to change the field, to make it more responsive to the diverse students whom we are trying to recruit into computing majors, who share aspects of the graduate students' identities.

Shifting CSEd and CS
To our knowledge no systematic study of the demographic characteristics of members of the CSEd faculty, researcher, and graduate student communities have been conducted. This survey provides a limited snapshot of the demographics of a small set of faculty members and graduate students. Though we caution against drawing conclusions about demographic trends with this data, these comparisons do suggest that graduate students are more diverse across a range of characteristics than current faculty members, highlighting a potential opportunity for Equity and Broadening Participation work within the CSEd field.

Notable differences include the greater percentage of women in the graduate student pool, and even the presence of nonbinary respondents. If broad demographic trends continue, we can anticipate more non-binary individuals in future graduate student cohorts. We also saw notable differences in the racial and ethnic diversity of the graduate student respondents compared to faculty advisors (33% White graduate students vs 77% White faculty advisors). Twenty-two percent of graduate students identify as Asian or Asian American (7% faculty advisors), and another 12% of graduate students identify as Black or African American (0% faculty advisors). Our sample of graduate students were slightly more likely to be based outside of the US (25% graduate student vs 11% advisors).

Our survey sample suggests that there are shifts occurring in the makeup of the CS Education researcher workforce. Current graduate students hold a range of identities and knowledge, and come to CSEd via myriad pathways. This diversity with respect to gender-identity, ethnicity and race, as well as academic

background presents an incredible opportunity for the future of CSEd research. These researchers and scholars in training are and will continue to have an impact on the ability of CSEd and CS more broadly to recruit, retain and support the diverse students that we want to attract into computing majors. To the degree that these graduate students are welcomed into CS departments, they have the opportunity to make the field more open and inviting to others [12]. The charge now is to apply (and expand) the literature on systemic inclusion of these graduate students to set the foundation for CSEd as a discipline that grows and changes, and is open to the new perspectives, lines of inquiry, and methods that these graduate students bring with them.

We create our future. Computer Science Education is truly an emergent field that current faculty and researchers have the opportunity and responsibility to mindfully build. Graduate students pursuing training in CS Education come with a wealth of experience in teaching and CS. They want to impact not only the field, but the world through their work. These graduate students also embody many of the diversity of identities and backgrounds that the field says that it wants to attract. Yet, the state of graduate pathways, and the professional opportunities available are not adequately supporting graduate students at this time. It is troubling that so few graduate students did not feel a sense of belonging within the CSEd research community. We can either continue practices that we know will lead to marginalization of CSEd in other disciplines, or we can honor and celebrate the incredibly diverse and driven graduate students which are the future of CS Education by ensuring that our structures, programs, and policies reward their risk-taking. The perspectives, experiences, and changes that these graduate students are bringing to the field are critical to the long-term success of CS Education as a driver of social change.

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Detailed Readout - All Respondents

In this section we present the underlying data tables behind our results section above. We also analyzed graduate student survey results by primary school or college, years in a Ph.D. program (<2 or >2 years), and by US-based graduate students and international graduate students.

Demographics

Table 1: Participant Demographics

	Count
Total Graduate Students	51
Total Advisors	28

Table 2: Participant School/College

	Count		Percent of Total	
	Grad.	Adv.	Grad.	Adv.
School/College of Information / Computer Sciences	23	12	45%	43%
School/College of Education	14	8	27%	29%
School/College of Engineering	10	4	20%	14%
School/College of Sciences (Natural, Physical...)	1	1	2%	4%
Other	2	1	4%	4%
Unknown	1	3	2%	11%

Table 3: Participant Gender

	Count		Percent of Total	
	Grad.	Adv.	Grad.	Adv.
Male	11	12	22%	43%
Female	28	13	55%	46%
Non-binary	2	-	4%	-
Unknown	10	3	20%	11%

Table 4: Participant Race/Ethnicity

	Count		Percent of Total	
	Grad.	Adv.	Grad.	Adv.
White	17	20	33%	71%
Asian or Asian American	11	2	22%	7%
African American or Black	6	-	12%	-
Hispanic, Latinx or Spanish Origin	4	1	8%	4%
Middle Eastern or North African	2	-	4%	-
Not listed here or prefer to self-describe	1	-	2%	-
Two or more	4	3	8%	11%
Unknown	6	2	12%	7%

Table 5: Graduate Student Participant US/International

	Count		Percent of Total	
	Grad.	Adv.	Grad.	Adv.
US	37	25	61%	64%
International	13	3	25%	11%
Unknown	1	-	14%	25%

Table 6: Graduate Student Participant Year in Degree Program

	Count	Percent of Total
0-2 Years	24	47%
>2 Years	26	51%
Unknown	1	2%

Table 7: Master's Degree Earned Prior to Ph.D. (Graduate Students)

	Count	Percent of Total
CS or other STEM field	21	42%
Education or other Social Science	9	18%
CSEd or similar	1	2%
Other	1	2%
None	18	36%

Other:
- Library and Information Science

If [you earned a master's degree prior to your PhD], what influenced your continued pursuit of a Ph.D.?

- I am doing a startup called [COMPANY] which financially incentivizes the lifelong learning of developers. I wanted to do research on how best to train them, and that's what my research is about: helping them make that transition from novice to expert software developer.
- I was always interested in teaching. After my Masters I worked in an EdTech startup as a software developer. After that I became a CS instructor and taught engineering students for 1.5 years. These experiences led me to pursue my PhD in Computing education.
- My mentor from my undergraduate studies. He inspired me through his efforts in recruiting and mentoring students of color in Computer Science. It became a passion of mine to do the same in academia.
- Multiple reasons. [I am] interested in doing research and [have] a love for CS in general and also living and studying abroad since my undergrad and master was in another country.
- Desire to further learn, explore, and experiment with what computing education can provide to address novice students' problems in their learning to program.
- I started a Phd. because this is the minimum level [of education] required to be a faculty here in [COUNTRY/TERRITORY].

- Great people in the lab, research being interesting work, seeing many opportunities to be gained from PhD.
- I wanted to research and develop new tools for technology in education and the learning sciences.
- The qualification was part of my job requirements as a lecturer.
- I would like to be a professor at a public university.
- Career growth and a desire to discover something new
- I realized I want to pursue an academic career.
- Spent time in industry, did not enjoy it
- I want to teach at a collegiate level
- I wanted to have an higher degree
- Would like to be a professor
- Work experience in education
- Wanting to work in academia
- Wanted to do more
- Academic freedom

Advisor-Only Items (n = 28 unless otherwise listed)

In this section we look at only those items asked of Faculty Advisors (Tables 8-14)

Table 8: CS Graduate Students Advised (n = 26)

	Count			Percent of Total		
	CS (Formal)	CS (Informal)	Other	CS (Formal)	CS (Informal)	Other
0	3	7	7	12%	27%	28%
1-2	7	5	2	27%	19%	8%
3-4	8	3	3	31%	12%	12%
5-6	3	2	4	12%	8%	16%
7-8	3	-	-	12%	-	-
9-10	0	4	2	0%	15%	8%
11-12	1	1	-	4%	4%	-
13-14	-	-	-	-	-	-
15+	1	4	7	4%	15%	28%

Table 9: Are there formal or informal CSEd pathways at your institution? (n = 26)

	Count	Percent of Total
Formal	6	26%
Informal	13	57%
Both	4	17%

Table 10: What is your primary motivation for pursuing CSEd research? (n = 26)

	Count	Percent of Total
Broaden Participation	9	35%
Improve undergrad CS	8	31%
Improve K-12 CS Education	7	27%
Other (please describe)	2	8%

Other:
- I'm interested in the question of how humans come to understand and control computational agency
- WAS improve undergrad until 2013 NOW Improve K-12r

Table 11: What is your primary motivation for mentoring CSEd graduate students? (n = 26)

	Count	Percent of Total
Improve CS Ed research	9	35%
Train more CS Ed faculty	8	31%
Improve CS teaching and learning	7	27%
Other (please describe)	2	8%

Other:
- Support my funded research
- Make CS Education Accessible for Disabled Students

Table 12: Have you experienced any of the following barriers in supporting the academic and career pathways of your CS Education doctoral advisees? (n = 18)

	Count	Percent of Total
Availability of coursework	11	61%
Clarity of pathways	9	50%
Acceptance of scholarship in home discipline	8	44%
Funding	6	33%
Finding additional faculty committee members	2	11%
Ill-defined PhD requirements	2	11%
Other	2	11%

Other:

- Departmental requirements for graduate program: inappropriate qualifying exams, inappropriate course requirements, requirement for advisor in student's department

How can professional organizations (ex. CRA, ICER doctoral consortium, SIGCSE, AERA) assist in supporting the academic and career pathways of your CS Education doctoral advisees?

Table 13: Themes from the advisors open-end responses to the above question (n = 17).

Themes	Nº of Participants
INNOVATE	
Create initiatives	**9**
- mentorship program/space	5
- workshops/webinars/forum (e.g discussion, research methods training, addressing mental health)	3
- exchange programs/internships/volunteer jobs for students	2
- interdisciplinary collaboration	1
- training for PhD students	1
Offer guidance	**6**
- CS Ed career and professional development	3
- framework for graduate curriculum in CS Ed	3
APPRECIATION	
Appreciation of the professional organizations efforts	**3**
SUPPORT	
Support conference participation	**2**
Financial support (e.g. admission fee, publication, research, etc.)	**1**
Encourage networking	**1**

Open-end responses:
- The SIGCSE DCs are great and the CSEdGrad activities are great! As I'm outside the US, I'm not sure what NSF, CRA, etc. can do directly, but just making more "noise", having more organization, and more faculty making ground in CSEd is important.
- They can push to provide more tenure-track positions in academia for CS Education focused research. For CS-based CS Ed students, the job market could also support salaries closer to that of CS graduates and not purely education folks.
- Visibility and discoverability of career opportunities that intersect with research would help a lot. I know they exist but they're very hard to find and organize.
- ICER DC is great. SIGCSE provides funding and created ICER. I haven't noted much organizational interest from AERA or CRA in supporting Computing Ed Research.

- Provide smaller, more easily accepted student proposals. Opportunities to volunteer and get connected to the bigger names in the field.
- discussion forums, online resources (such as a course on the use of AI methods in CSED, standard methodologies in education research)
- Provide mentors and networking opportunities for isolated students and faculty in institutions with minimal CS Ed presence
- Because I'm in a college of education, I'm not sure I have many of the problems that my colleagues in CS depts have.
- 1. Doctoral Consortium 2. Job Board with CS Ed as a filter 3. Facilitate research to practice events or workshops
- I need a way to FIND CS Education PhD students. So far, I haven't been able to locate any.
- Opportunities for webinars and/or doctoral student meetings with mentors at conferences.
- Provide universities with more examples of cs ed phd programs and how they were started.
- Provide more funding, provide training for mentors, provide training for PhD students.
- Doctoral consortia are great; student-only networking opportunities also help
- More opportunities for students to form a cohort between universities
- Framework for graduate curriculum in CS Education research
- Develop course proposals and curriculum.
- Be more interdisciplinary
- CRA, SIGCSE

Are there any other thoughts or reflections that you would like to share with us related to Computer Science Education graduate education, either at your institution or more broadly across the field?

Table 14: Themes from the open-end responses to this question (n = 3).

Themes	Nº of Participants
Support and guidance from SIGCSE is important	**1**
CS Ed grad programs have to benchmark from programs in other fields	**1**
CS Ed has to be inclusive	**1**

Open-end responses:
- Generally, CS Education research has not been strong with marginalized groups, particularly with students with disabilities. It is improving, but there needs to be more emphasis on this.
- CS Ed graduate programs should learn from graduate programs in engineering education, which began in the U.S. around 2004.
- Without SIGCSE I'd be alone, adrift.

If you have any feedback about how or why we have asked for demographic information, please provide it here.
- Always glad to give it. These days people are so reluctant to share. Also, the way you asked the gender questions, and the fact that you asked the sense of belonging questions, and really the entire design and content of this survey is fantastic! Keep up the good work and if you need anything, you know where I am (I think).

Graduate-Only Items (n = 51 unless otherwise listed)

Table 15: Teaching Experience Prior to PhD.

	Count	Percent of Total
Informal teaching	26	51%
Postsecondary TA	16	31%
PreK-12	15	29%
Postsecondary lecturer	11	22%
None	3	6%

Table 16: CS Experience Prior to PhD. (n = 50)

	Count	Percent of Total
Yes, formal experiences (courses, work experience)	22	44%
Yes, informal experiences (self-guided learning, coding clubs)	9	18%
Both formal and informal experiences	18	36%
No, neither formal nor informal experiences	1	2%

Table 17: Work Experience in CSEd prior to PhD

	Count	Percent of Total
College/university	28	55%
Industry	23	45%
K-12 Ed	14	27%
Other non-profit/private	10	20%
Self-employed	6	12%
Gov't	5	10%
Non-gov't research	5	10%
None	7	14%

Table 18: Learned About CSEd Field from… (n = 50)

	Count	Percent of Total
Faculty advisor/mentor	34	68%
My own research	22	44%
Another faculty member	6	12%
Non-college/university organization	5	10%
Another student	3	6%
Seminar/course	3	6%
Other	2	4%

Other:
- I found an advertisement for this PhD position by chance, but once I read it I knew I had to apply.
- Through CSEd blogs e.g. Blogs of Mark Guzdial, Amy Ko

Table 19: Reasons for Choosing CSEd Field (n = 50)

	Count	Percent of Total
Alignment with research interests/ability	42	84%
Advisor/mentor advice	25	50%
Equity/BPC work	24	48%
Knowledge of career opportunities	12	24%
Relationships with other grads in field	9	18%
College/university reputation	9	18%
Funding opportunities	9	18%
Other	3	6%

Other:
- Not advice of my advisor/mentor necessarily but I heard my advisor speak about her work at a visit day (after I had already applied and decided to go to grad school) and knew that I wanted to do similar work. So my advisor, but not her advice because she wasn't even my advisor yet.
- Ability to work at a university in a more influential position
- It gave me more time to explore my options

Table 20: Participated in… (n = 45)

	Count	Percent of Total
Participated in: CS Ed research	39	87%
Participated in: K-12 CS Ed implementation	21	47%
Participated in: NSF or other federally-funded project	15	33%
Participated in: Other Ed research	13	29%
Participated in: Eval of CS Ed projects	8	18%
Participated in: Eval of RPP/similar projects	4	9%

What are your primary motivations for pursuing CSEd Research?

Table 21: Themes from the graduates open-end responses to this question (n = 44).

Themes	Nº of Participants
Alignment of the field to my interests (research, teaching, education)	11
Improve teaching of CS	11
Ability to pursue Diversity, Equity, Inclusion, and Justice-oriented work	10
Social impact	10
Broaden participation	8
Opportunity to learn about CSEd and research	5
Prepare for the current job role (lecturer, teacher, …)	5
Opportunities from an emerging field	3

Open-end responses:
- My motivations have changed throughout my PhD career. Initially it was because I had been doing CSEd research for about a year before accepting my PhD offer and was enjoying the work for the most part. Since starting the PhD, a lot of my research has been focused on the gender gap in CS and how we can better support women. As someone who discovered CS in high school and highly considered majoring in CS for undergrad (only to finish a different engineering degree and later head back to school to pursue CS), I know how much familial and societal cues can prevent women from pursuing something they are interested in. I did not originally realize that the decision I had made for undergrad was not quite my own and that a lot of what was said to me, particularly from my father, discouraged me from computer science. Although my family has always been very supportive and believed that I could pretty much succeed in whatever I wanted, I remember my dad asking me if I really wanted to spend my day in front of the computer. I was between studying CS and biomedical engineering, having just graduated as valedictorian of my high school class, and I think I chose the later because of all the conversations I had with others. After coming to this realization, the work that I have been doing on the gender disparities in CS has become all the more important.
- The choice for Computer Science Education was motivated by the difficulty I had understanding programming logic, since my professors expected that I, as a freshman, already knew what that tangle of meaningless letters meant. In my master's degree, I investigated ways to support the teaching and learning of programming. Afterward, I managed to put my theoretical knowledge into practice by teaching undergraduate students in a [COUNTRY/TERRITORY] public university. Being a lecturer made me realize that the traditional learning process needed to be questioned, and something should be done. The desire to improve how Computer Science has been taught motivated me to start my Ph.D. in Computer Science.

- I want to do research that can help me give my organization [ORGANIZATION] a technological competitive advantage. [ORGANIZATION] is a network of diverse developers who are financially incentivized to engage in lifelong learning. Our mission is to help teams drop location constraints that unknowingly and implicitly overlook qualified and efficient people of color from roles they're perfect for. Given the rise of remote distributed teams in the new normal, we believe that global collaborations are the future. In order to do this, we need proper tooling to help such students transition from being intro-CS MOOC takers (who are a dime a dozen) to real experts.
- The first questions were about my previous studies and I could only choose one, but actually I have two Master's degree, one in upper secondary education (within mathematics and CS) and one in CS. I studied a combined 5 years program. My main motivations to apply for this PhD position were that I wanted to keep learning and combining my two favorite topics, education and CS. I also saw the PhD position as a perfect fit, since it would allow me to teach (which I love), deepen my knowledge in the CSEd field and (hopefully) also contribute to the body of knowledge with my research.
- I am interested in providing valuable, impactful informal computer science education experiences to students in an effort to help broaden participation in computing by providing students with meaningful, good experiences with computer science. I want these students to feel like they can be computer scientists. I pursue CS Ed Research so I can understand best practices for providing these types of experiences and better understand the student perspective.
- Teaching computer science is the only thing I've found that gives me dopamine. After completing my undergrad in computer science here at [INSTITUTION], I watched a wide variety of students have very different experiences in the major. As a queer DSP non binary femme these issues hit close to home. Computer science knowledge is vital in the current global market and I am motivated to offer this knowledge to everyone.
- I want to make a difference in CSEd research, development and outreach in [COUNTRY]. Right now, apart from my institution, there aren't any other departments actively pursuing CSEd research. There are certain places, where certain CS faculty are pursuing certain aspects of CSEd, such as tool development, but these are not their primary research areas.
- I feel as though I stumbled into the CSEd space. I am pursuing a PhD in Psychometrics, and learned about CSEd through some RA work. I've really become drawn to the field because of how much work there is to do (particularly in assessment), and the increasing importance more broadly of the kinds of skills that CS students are learning.
- To be able to teach better. To be able to guide others to teach better. Better = more effectively and more efficiently, causing better emotions for both students and the teacher, being scalable, ...
- Improving the overall temperament of CS higher education and the tech industry by making CS more accessible to historically discriminated students and students with non-traditional STEM backgrounds.
- To broaden CS pathways so that all learners have an opportunity to experience CS education, and so that more secondary teachers feel equipped to lead those experiences equitably.

- My primary motivation for the Ph.D. is to be able to teach CS. I want to pursue research in my doctoral studies that will reinforce that for both myself and others.
- I have long taught CS at the K-12 level and really want to explore how to help students from underrepresented groups feel comfortable and thrive in the field.
- Desire to further learn, explore, and experiment with what computing education can provide to address novice students' problems in their learning to program.
- To design tools that would augment CS K-12 teachers' capabilities to provide students individualized support and guidance when teaching programming.
- I am passionate about computing education, because I find the content very enjoyable, and I know that computing education can change peoples' lives.
- To learn how to identify and address barriers in equity and inclusion of people from marginalized and underrepresented populations in CSEd
- Because it is a relatively new field, I felt like there were opportunities to shape CS ed in an equity oriented way from the beginning.
- Saw it being done poorly in industry and hoped I might be able to learn about what contributes and how it might be improved.
- CSEd Research is a relatively exciting new field and I am passionate about equity and inclusion for underserved communities.
- Gain experience to work on the Education Technology field, so I can lead decisions on the design with a technological focus.
- I mostly want to document the experiences of women in CSEd work, assist and create curricula, and work with policy.
- I found the work interesting, relevant, and important to our current students and the changing nature of our society.
- I wanted to do meaningful work with my computer science degree and I have always been passionate about education.
- My primary motivation was to improve CSEd, focusing on: - female representativeness - appreciation of soft skills
- - Making the educational experiences better for students - learning and using sound research methods
- I love teaching in undergrad and like CS, so CSEd research seemed like the perfect fit
- To improve programming teaching methods, resulting in reduced student drop out rates.
- Curiosity + opportunity to broaden participation in a growing, elite field
- I found it interesting to teach computational thinking to young kids.
- Learn about how to teach computer science with a critical mindset.
- Broadening participation and wanting to make a difference in CS
- to become a better teacher and help others to become better
- I want to help the next generation to have a better CS ed.
- To contribute answers to many of the questions
- low number of female students in the field
- Improving CS education in my country.
- Emerging field with job opportunity;

- Interest in education and computing
- Improving education in my country.
- My own research interests.
- To qualify as a lecturer
- Improve my CS teaching
- My research interests

Please provide any additional information that would be helpful in understanding your pathway into the CSEd Research field.

Table 22: Themes from the graduates open-end responses to the above question (n = 23).

Themes	Nº of Participants
INFLUENCE	
Influenced by previous experience	**10**
- from academic research experience	3
- from learning experience	3
- from teaching experience	3
- campus visit	1
Coincidence through advertisement	**3**
Influenced by advisor/mentor/supervisor	**2**
MOTIVATION	
Pursuing CS Ed research will be useful	**9**
- have a social impact through CS	6
- contribute to growth another area through CS Ed Research	2
- prepare for current job role	2
Alignment of interest	**5**

Open-end responses:
- Honestly, the opportunity just kind of fell into my lap. It was not something I specifically set out to do. I have always enjoyed tutoring and teaching others and so when this opportunity came along, I thought maybe I would teach at the university level. As someone that was switching fields and trying to find a way into the CS field, I felt like doing a PhD would give me more time to develop the skills I would need to be competitive in industry. I was never sure that I would finish my PhD until this past summer when I signed an offer in industry that was contingent on me finishing. Although my immediate plan after graduation is to go into industry, I am considering returning to academia after 5 years in industry to teach and possibly do a small amount of research.
- As I already wrote, I found the advertisement for this open PhD position by chance. Before I read that I had no aspiration to pursue a PhD, and I honestly didn't know that type of position even existed. Lots of my friends were looking into PhD positions but with a technical focus and I just

figured that would not suit me at all and I had dismissed the idea of staying in academia. When I read through the advertisement I remember just sitting there quite shocked that the description was almost word by word of what I had been telling my family and friends that I wanted to work with after graduation. So I just knew I had to apply, because it really sounded like the position would be a perfect fit.

- For the question for undergraduate degree/major, I had 2 majors: Computer Science and Math but I wasn't able to choose that. I was always interested in education in some part. Initially I wanted to be a math teacher, then a math professor, then a CS professor (after I thought I didn't want to go to math grad school). I was interested in going into an area of CS that would involve helping people and considering the effects of CS on the end user/people in general. When I heard about CS education work I was super interested because I felt that it merged my interest to do this with my interest in education.

- Everything started when I was offered a position of a TA during my undergraduate studies. Then, a few years later on, the faculty opened a new course aiming to train the TAs ("the Teaching lab"). I was so inspired by the course that I gradually started teaching it myself, reading into CSEd research and eventually publishing some CSEd research as well. Note that this is something I found a bit later and is not the formal aim of my PhD (I'm doing usable security). CSEd is more of a "free-time research desire" for me.

- As an undergraduate, I enjoyed teaching people programming. I worked with [VOLUNTEER TEACHING ORGANIZATION] to teach scientists about basic programming. As I trained to become an instructor, I learned about research that could inform teaching approaches in computing. I found this work fascinating, and I was inspired to pursue research in computing education. I decided to work as a staff person at a college first, and then after three years I went to a PhD program.

- My first research project as a PhD student involved computer science education and middle school girls. This experience made me realize that despite a natural affinity toward it, I never even know CSEd was an option due to lack of opportunities/information. And as a prior secondary teacher, I immediately had ideas of how I could have integrated it into my classroom had I the resources/support.

- I went to the software industry aiming to use my knowledge in solving meaningful problems. The position didn't have what it took to positively impact people's lives using technology, though. I was not as free as I wanted to lead my own projects or share my ideas. This experience was pivotal in making me realize the path I wanted to take as a researcher.

- I was one of a few Black CS majors during undergrad and often the only one in my classes. Having a mentor, who was the only Black faculty member in the department, was one of the key factors in my success in pursuing my degree. I want to, in turn, be able to help other students of color succeed in pursuing their degrees in computing.

- I've always cared about education and education models, but during my undergrad, I realized that I wanted that to be part of my career. So, I started my PhD so that I could have expertise in both tech and education

- My pathway into CSEd research is influenced by my past teaching experiences with K-12 students and the need for better-designed tools that would benefit teachers in their practices when introducing programming.
- When applying to PhD programs in CS, I was torn between more "CS/technical" interests (systems/networking) and CSEd. It wasn't until I started visiting schools that I realized CSEd was the right area for me.
- I've been teaching at [INSTITUTION] ever since I completed my second CS course here. CS Ed research is my future as I am enrolling in grad school. I hope that you will see more of me in the future.
- I am interested in Physical computing, and this area is still in its infancy, I hope to contribute significantly to the growth of this area of study through research.
- I think there needs to be more room in computer science as a whole for students with multiple passions or who pursued other fields prior to engaging with CS.
- I was employed in the department of CS Education where I had to train teachers who will teach CS in schools therefore this was preparing me for this role.
- I've been interested in documenting and enhancing women's and transwomen's voices in CSEd, CS, and video game studies within education.
- Previously researched how students understand programming concepts as part of an undergraduate research project.
- Experiences working at and learning through coding bootcamps led me to think about what is good CS education.
- I started researching in the field of Computer Science Education whilst in my undergraduate course.
- Mainly my advisor. I liked to work with her and she gave me a lot of freedom to do what I wanted
- There was no option for "social sciences" for an undergrad degree. My BA is in anthropology.
- I haven't officially started yet, I'm still in a master's program that's wholly unrelated.
- I am a math ed researcher and approach CS ed through integration with math.
- I found it interesting to teach computational thinking to young kids.
- I started Pascal programming since third grade in elementary school
- Learn about how to teach computer science with a critical mindset.
- I'm conducting CS education research at the level of K-6 level.
- Broadening participation and wanting to make a difference in CS
- What are your primary motivations for pursuing CSEd Research?
- to become a better teacher and help others to become better
- I want to help the next generation to have a better CS ed.
- To contribute answers to many of the questions
- Show the importance of computing for society.
- low number of female students in the field
- K-12 programming and basic CS principles
- Improving CS education in my country.
- Emerging field with job opportunity;

- Interest in education and computing
- Improving education in my country.
- My own research interests.
- To qualify as a lecturer
- Improve my CS teaching
- My research interests

Please provide any other information that you feel would help us understand your academic experience as someone pursuing a graduate degree in CS Education.

Table 23: Themes from the graduates open-end responses to this question (n = 14).

Themes	Nº of Participants
CHALLENGES	
Challenges of CS Ed as a new field	**5**
- pioneer in CS Ed Grad	3
- limited information on opportunities	2
- the program is not well defined	1
- is marginalized	1
- there is not a connection or collaboration between education and CS	1
EXPERIENCES	
Pursuing an interdisciplinary graduate study	**7**
- primarily from computer science, drawing from another area (e.g. CS Ed, Education, Social Science)	5
- primarily from education from another area (e.g. Computer Science)	2
Experience in academic activity	**5**
- involved in CS Ed project/ research grants	3
- organized or attended seminars/study groups/conferences	3
Academic job experience	**4**
- as a teacher/lecturer	3
- as a TA	**2**

Open-end responses:
- I been working as a course coordinator, responsible for a online CS1 course, and as a teacher/lecturer of a teacher training course. I have also been working as TA in different CS1 courses. For my research, some smaller projects have been funded by research grants, and I have also been working with some projects that are outside the scope of my thesis project, but has been part of what funded my position. The largest part of the funding for my position is from my supervisors' department money, as I have understood it it's mainly from the money they are

given as part of the basic funding (this comes from the Swedish system of how Universities are structured, where they are given a certain amount as funding from the state -as you might know higher education is free in Sweden, and as a PhD student you are typically employed by the university and receive a monthly salary. You are not allowed to fund a PhD position with loans or personal funds, and no tuition fee is charged). My main advisor is knowledgeable in CSEd, and there are some other faculty members at my institution too. However, I'm the only PhD student in this field at my institution, so in that sense I am alone. There are some seminars/study groups in similar or related topics (engineering education, digital learning, TEL) which I have tried to be a part of but I always felt like the outsider in them. I have taken CSEd courses at other universities.

- I have taken several classes outside of my department (education classes) but I wouldn't say it is necessarily encouraged but it is allowed. There are no CS education classes, nor are there research methods classes in the CS department so I felt that I really did need to take education classes, particularly since my advisor isn't really familiar with qualitative research (she does a lot more ITS stuff and works more with quantitative analysis). I have also maybe done evaluation but I'm not sure what counts. I've written some experience reports and helped my advisor write yearly reports for the NSF.

- Considering that I am enrolled in a Computer Science program, I would say that CS Education is my research area. In this sense, it is important to highlight that this type of research is still very marginalized and little valued. In the context of my program, algorithms and technical solutions are more valued. It is also difficult to find perspectives for further research in the country, since the area is still very incipient.

- As already mentioned earlier, my original/primary focus is usable security. But I got into CSEd research in the meantime and it will be a part of my dissertation. We organically formed a group of similarly minded master/phd students and apart from improving the teaching, attempt some CSEd research (also collaborating with some PhD students abroad).

- The program that I am studying at is new (less than 10 years old). I'm the second cohort of students that started in it. Because of this, the focus of the program has not been defined, and most of my academic experience within my Ed.D experience has been trying to find courses and opportunities in [COUNTRY/TERRITORY] in CSEducation.

- I think the teaching experience gave me a natural test bed to test my research and that's what kept me going in this field. I did feel a bit unfair sometimes that most surrounded students had RAs and I had to TA every semester since I started. But actually reflecting on it, I learned so much working as a TA or Instructor.

- I work full-time in addition to being a full-time dissertator. I am fortunate that my work supports opportunities for growth and development while helping pursue a route to help other students who don't have CS learning opportunities gain access to them and be successful in it.

- My program is focused broadly on educational technology and student learning within a college of education. I am not affiliated with a computer science department, but do have access to computer science professors as well as professors from the information school.

- While we can take classes outside of our departments, as an education-focused PhD student, I would not be able to take classes in the CS department due to prerequisites. There is not a connection or collaboration between education and CS departments currently.
- Most of my research has been in the context of undergraduate CS. One NSF project I worked on was in the context of teaching CS in middle school science classrooms, however I would not consider it an "implementation of a K-12 CS education initiative."
- Primarily a computer scientist, although drawing on areas of education and cognitive psychology within my research. Currently working as a full time associate lecturer.
- I'm doing a small project with a CSEd professor on the side, wholly unrelated to my current studies (since again, I'm not yet pursuing the grad degree in CSEd)
- My graduate program largely focused on HCI, enacted as a combination of computer science and social sciences.
- I am the first graduate student in my department to pursue research in CS Education.
- I have been part of organising committee is CSEd conferences

Table 24: Who is your mentor(s)? (n = 48)

	Count	Percent of Total
Grad advisor	45	93%
Another grad student	17	36%
Other CSEd faculty member at my institution	15	31%
Other non-CSEd faculty member outside my institution	12	24%
Other CSEd faculty member outside of my institution	5	11%
Other non-CSEd faculty member at my institution	3	7%
Other	2	4%

Other:
- CS Ed research scientist at my institution; also an education professor (non CS) and an engineering education professor, both at my institution which wasn't an option
- Non-faculty CSed researchers

Table 25: I see myself as a mentor for another graduate student(s) (n = 48)

	Count	Percent of Total
Yes	19	38%
No	16	34%
I'm not sure	13	28%

How can professional organizations (ex. ACM, CRA, ICER doctoral consortium, SIGCSE, AERA) assist in meeting your academic and career needs?

Table 26: Themes from the graduates open-end responses to the above question (n = 31).

Themes	Nº of Participants
SUPPORT	
Support conference participation	**11**
- space for young researcher/students to present/publish research	3
- financial support (e.g. admission fee, publication, research, etc.)	3
- access to information (e.g. conference dates)	3
Encourage networking	**8**
Improve accessibility to publications	**2**
STUDENT FOCUSED INNOVATIONS	
Create initiatives	**10**
- mentorship program	4
- workshops/webinars/forum (e.g research methods training, mental health)	4
- interdisciplinary collaboration	2
- exchange programs	1
- council/board of grad students	1
Offer guidance	**6**
- CS Ed career path and professional development	4
- publications/research	3
APPRECIATION	
Appreciation of the professional organizations efforts	**11**
- highlight the importance of CS Ed research	2
- doctoral consortium	3
- promote CS Ed grad networking/community	4

Open-end responses:
- The DCs are great! I wished I had the opportunity to go in the beginning of my PhD. I went to a summer school in CSEd after my third year of my PhD studies and that was really great. I also really appreciate the CSEd grad network, I think having these opportunities to meet other

students in the same field are very important. Maybe the organizations can help even more in facilitating similar activities. Being part of a community and meeting others in the field is really important for us who don't have many colleagues in the same field at our institution. I would also like to have more opportunities to talk about career paths within the field. Hearing some more inspiring stories would be nice.

- It would be great to disseminate the "standards" that people looking for faculty jobs in CS Ed are judged on. I know that right now these positions are so rare that there probably are no standards, but as time goes on and more CS Ed faculty are hired, it would be excellent to have a framework for what sort of characteristics departments are looking for. This can help graduate students make more informed choices early in their programs.
- Having a grounded community for graduate students pursuing CSEd research like this project has helped me immensely with feeling connected to the CSEd research community, especially given that this said community is quite small at my own institution. I hope the professional organizations continue such effort in the near future. I am certain future graduate students joining the community would equally appreciate it.
- I think that sharing the job information that they do is good and well as providing opportunities for networking. I am in my 3rd year so I haven't thought as much about what I need for a career. In terms of academic/research it would be super useful to have some webinars/resources about research methods, how to get CS Ed people to care about qualitative research, those kinds of things.
- Being able to participate in such conferences is a great start. ICER doctoral consortium was a start for me and I got to interact and learn interesting things about research is CSEd. So far I think the current structures really try to meet our needs. Issues of mental health should be visited more often to show students they are not struggling alone and their experiences are normal.
- I think it should provide a space and opportunities for students to present their latest research and network. In addition, CS is relatively new for most faculty in education, so a good PSA on the importance of CS research for non-CS faculty would go a long way. For the latest best practices, we can also look at how Code.org and CSTA do outreach to principals and counselors.
- I would like to see more avenues for the intersection of the future of work with ICT4D. I describe my thoughts on these subjects in: [BLOG LINK] This intersection is not sufficiently studied and more attention from these professional organizations to these future-of-work + diversity topics would be good. They are often studied separately.
- I think providing good networking and professional development opportunities is helpful. In addition, forums for the community to decide what it is--one thing I have struggled with somewhat is that CSEd feels like a fractured field, with some shared aspects, but wildly different goals/endpoints that researchers are working for.
- Helping early career PhD students build a mentorship network. I didn't feel fully integrated in a CSEd research community until I attended an ICER doctoral consortium at the end of my 2nd year. I definitely would've thought about quitting my PhD less if I wasn't so isolated in my first 2 years.

- Offering more opportunities to connect with others for long-term mentoring. Although I feel fortunate for all the people who serve as mentors to me, I still feel like I don't have enough mentors and that I would benefit from hearing other perspectives.
- Put value in qualitative research as it can feel like quantitative research is viewed as the standard. Have pathways that mix/encourage collaboration between education and CS (i.e., for those without a CS background).
- By organizing conferences and meetups as they do. Though the student admission for the conferences is still quite expensive and getting the money from the university if you don't have a paper accepted is difficult.
- Make sure students are aware of opportunities and deadlines for submissions. Perhaps offer guidelines on what is expected, or workshops on some CSEd conferences with common errors or tips.
- I'm not sure. with cheaper publication fees, and research funding. In [COUNTRY/TERRITORY] we don't have financing to fund our publications, most of the time it's us students who need to pay.
- feedback from the members is the most important thing. sometimes I don't get the feedback I need just because my mentor is not necessarily knowledgable in that specific thing
- I haven't sought mentoring from these types of organizations, so realistically, the first step would probably be informing me of what they have to offer.
- SIGCSE is the only way I know to meet the full swath of educators in this field. I look forward to seeing how they manage this upcoming remote offering.
- They are very important venues to highlight the importance of this type of research both in the country and in my institution.
- By providing a space for publishing my research and having open conversations with peers and faculty about CSEd-related issues
- Help develop relationships between students and post-docs and faculty where there is aligning research interests.
- Probably in helping find a mentor or a coach outside your home institution. I never had one and I regretted it.
- Most of the research that I have cited in my work comes from the publications done by these organizations.
- I think I can participate in the conferences these professional organizations administer.
- They could allow CSed young researcher to publish more easily
- more specific information directed toward CSEd researchers
- Build a council of grad student Provide exchange programs
- More access to resources (publications) and conferences
- With cheaper rates and more accessible information.
- organise community meeting and workshops
- Idk, I have yet to interact with them
- Continue to connect with mentors.
- annual meetings

Please provide any other information that you feel would help us understand your mentoring experience as someone pursuing a graduate degree in CS Education.

Table 27: Themes from the graduates open-end responses to this question (n = 15).

Themes	Nº of Participants
Positive mentorship experience	**10**
-support/encouragement	9
-provides people connections	2
-provides direction to opportunities (e.g. academic/professional)	1
Inadequate mentorship experience	**8**
-mismatch of interest besides research	3
- mentor has limited CS Ed information	2
-lack of mentor accessibility	1
Reasons given for need for mentorship	**8**
-psychological support/encouragement	5
-academic guidance	3
- guidance on CS Ed career and professional development	2

Open-end responses:
- I am currently facing the problem of thinking about what I will do after my phd. I am planning to finish until 02/2022 but I don't want to go back to university and be a professor. But I don't know any other possibility of staying in the CSEd area and not being a teacher / lecturer here in [COUNTRY/TERRITORY]. Almost always those with a phd work in universities, even more common those who have a doctorate with educational research. Having a mentor would be an incredible opportunity not to walk this path alone and have someone to share. My advisor is totally focused on research.
- I think it'd be useful to provide new students coming into this field with tools (community, mentoring, etc) to combat the challenges unique to a new interdisciplinary field of research. The first 2 years of PhD were incredibly isolating and demoralizing with me and my PI being ostracized because of our research. Things have since improved as I found community and other sources of mentorship, but I would hate for another student to go through what I did.
- I talk to my advisors about research related things but they have different backgrounds in academia and only my main advisor is in CSEd. I have also turned to some other colleagues for

advise, but at times, I have felt really alone. Attending a CSEd summer school and meeting some other PhD students made a huge change.

- So I selected oppression/marginalization support as something I go to my mentors for but most of the time I get this not from my mentors necessarily but from groups of students for this purpose (ex. GradPride and LGBTQ+ in STEM program). Outside of this context, I wouldn't think of the individual members as mentors.
- I feel that I need mentoring and support from other grad students, especially those in my program, but I don't feel like I've been able to access it during the pandemic and I feel like any advice I've gotten (online / from seminars) assumes in-person interaction and really no longer applies
- My graduate advisor has had some experience with CSEd, but I usually fill in a lot of the gaps re: recent directions/trends in CSEd for them. Thus, also having a community of CSEd graduate students who have been more recently active in the field as mentors is really helpful for me.
- My mentoring experience has been a positive one. My dissertation advisor has provided me useful feedback for my research as well as introduced me to PD and academic opportunities such as CSEdGrad.
- I think everyone has been extremely helpful in my Ph.D journey. The CSE is a very dedicated group of educators willing to make a difference and have a good foundation of equity and inclusion.
- I have very good experiences with my mentor. His constant encouragement has really helped me reach far. I think his positive attitude makes me get interested in my PhD research.
- I have fantastic support within my school because there are a number of people in this field, so I think I am less in need of the professional organization than others.
- my advisor is just a research advisor, we don't talk about career or personal development. I miss and am looking for a career and personal development mentor.
- I feel that the main conferences still have very weak representation of research in the K-8 spaces, especially K-5.
- Research cooperation with CSEd phd students from abroad gave me a lot, confronting other thinking and solutions.
- I am very lucky to have found my mentor in CSEd, she is incredibly supportive and well-connected to the field.
- I have found that I need a network of mentors to learn at the intersections of CS, education, and equity.
- I think my advisor is very supportive.

What are the most impactful supports you have used to develop your career pathway?

Table 28: Themes from the graduates open-end responses to this question (n = 25).

Themes	Nº of Participants
INTERPERSONAL SUPPORT	
support from experienced academic professionals	**12**
- offer or give direction to CS Ed career opportunities	6
- help to connect with CS Ed communities	2
Networking	**8**
- Connection with CS Ed community through social media (e.g. twitter, Slack)	3
- research collaboration	1
Support from other students	**2**
ORGANIZATIONAL SUPPORT	
Conferences participation	**7**
- doctoral consortium	2
Institutional support	**3**
- offer courses/workshop on career advice	2
Grad Job experience (e.g. teaching, internship)	**2**
INDIVIDUAL SUPPORT	
self support	**6**
- reading/research to gain career knowledge	4

Open-end responses:
- I have been interning every summer at the same company for the last four years and have been able to network and find a team that works in the context of CS education. I also completed a "preparing future faculty" semester-long workshop which was very helpful in understanding many of the opportunities within academia.
- I'm not too sure, since I just began my graduate studies (current 1st year) and have yet to make use of career-related resources provided at my institution. My network of professors have been kind enough to offer me neat opportunities related to CSEd that's helped boost my CV, but that's about it.

- I think that networking at conferences and hearing about what opportunities there are. There is also a career services person who is super awesome who will look over my resume, cover letter, help with interviews, let you do practice talks for academia, etc.
- I received funding from my department to attend conferences such as ICER 2018, as well as online conferences - ICER, ICSE, ITiCSE in 2021 Academic conversations in Twitter, as well as the CSEd graduates Slack channel has also been beneficial
- Meeting people at conferences. Since I'm looking at industry, those people have either talk me about the jobs they are looking at or connected me to the right people for those jobs.
- Conversations with faculty; opportunities to watch other students practice job talks; independently finding working groups at conferences to network/learn more about opportunities
- My PhD advisors. They have directed me towards fantastic opportunities and connected me with great communities. Talking with other graduate students has also been informative.
- I haven't had much success developing my career pathway. However, the fault lies squarely on me because I don't know what career I want to work towards.
- Connecting with other CS Ed grad students at doctoral consortiums and conferences, and other CS Ed researchers on Twitter
- I do a lot of research, look for opportunities and try to apply for all the opportunities that I think make sense to me.
- Lots of reading especially from Philip Guo at UCSD. Courses on preparation for academic job market.
- I reached out to a prof in the field, who encouraged me to get into the field. Idk if that counts.
- I have been looking for materials from universities and research centers that value CSEd.
- Opportunities to gain more teaching experience prior to starting my full time position.
- Most of the support has come from my advisor and the opportunities he has passed to me.
- - The [INSTITUTIONAL ORGANIZATION] has been supportive of my [COMPANY]
- Talking with my mentors and out-of-institution collaborations
- mentor outside my of my institution research stay abroad
- I would say my choices have been self-directed.
- Previous doctoral students who are now in jobs
- ICER doctoral symposium Twitter for networking
- reaching out to experienced researchers
- self taught myself about CS knowledge
- networking and attending events
- Conversations with my mentors.
- Talking to my advisor
- attending conferences

What are the biggest challenges associated with developing your career pathway?

Table 29: Themes from the graduates open-end responses to this question (n = 28).

Themes	Nº of Participants
PERSONAL CHALLENGE	
Uncertain about career path	**12**
- career planning difficulties	4
- Multidisciplinary Choice issue (CS vs Education career)	4
SUPPORT CHALLENGE	
Insufficient information/support	**13**
- career paths	7
- non-academic career paths	5
Lack of support and encouragement	**10**
- Career advice from institution	3
- Networking challenges	3
- discouraged by faculty/advisor to look for non-academic careers	3
- insufficient funds for career development	1
CAREER OPPORTUNITIES CHALLENGE	
Insufficient opportunities	**5**
- for an interdisciplinary grad study	2
- in native country	2
CS Ed research marginalised in the CS department	**2**

Open-end responses:
- I have many interests (software development, teaching, mentoring) and sometimes it feels I can only satisfy some at a time for each possible career path. Additionally, while I have enjoyed being a TA and tutoring in the past and I think I would love to teach, I have not had the time to be able to devote to teach an entire course as the main instructor. This may pose as a problem for me later when I try to look for teaching positions.
- There aren't any academic institutions in India doing CSEd research. I plan to apply for academic jobs soon (within the next 2-3 months), but the sense I'm getting from my seniors who have graduated is that CS departments are not very open to considering CSEd as a research area within CS. I still have to explore how I can position myself in CS departments or in other education departments.

- Beyond academia, I have had trouble finding what jobs are available and accessible to me as someone interested in CS education (emphasis on education). I feel like there is a gap between what I am told is available to me and what I want to do (kinda a CS vs. education gap). My advisor thinks I should be a professor so sometimes she isn't the most helpful.
- It is not a mainstream path and I feel that I have to shape it entirely myself. I feel that institutions and PhD programs are not very supportive of taking CS Ed from academia into practice. But arguably, this is very important because there's a lot of research but when it comes down to it, very little of it helps the people it should help.
- CS Ed doesn't fit cleanly into a single type of department. As a PhD student, you have to make a choice about which sub-area of CS Ed you want to be a part of, and then focus your publications to appropriate venues. Each sub-area has pros and cons in terms of salary, community, and job opportunities, making it a difficult choice!
- I don't think graduate students in my department have ever gone into a CSEd career post-graduation, so I potentially see this as an issue going forward (e.g., professors in department would not be able to give me a lot of advice regarding CSEd-specific job search).
- Even within CSEd it feels like there's a heavy skew towards the "Ed" part and away from the "CS" part. As someone who would consider CS more my home, it is difficult finding someone who can help me find those more technically-focused opportunities.
- There isn't a lot of support for developing pathways outside of academia. I've been told that I "don't know what I want" when I expressed interest in careers outside of academia.
- The biggest challenge associated with developing my career pathway is not knowing the opportunities I have. So, I don't know where I am going and I don't know how to plan.
- Finding the opportunities that match my interdisciplinary background. Even though the desire for this skill set is wanted, it is still hard to find the right role.
- CSEd is a new field in [COUNTRY/TERRITORY]. Due to the various challenges the island has faced I have to seek opportunities outside of my country.
- I had an idea of what I wanted to do, but based on my current higher ed experience I don't feel like I could comfortably do that job anymore
- Not having a clear idea of what opportunities exist outside of faculty, and being actively discouraged from looking for them.
- There's not a lot of information on it or opportunities being shared at my program level; lack of CS-specific degree
- Not knowing what the options are. For academia jobs, not knowing which institutions to consider applying to.
- lack of information, lack of long-term planning and lack of more people to share and talk about.
- Not having a clear understanding of what is possible, particularly outside of universities.
- Some CS faculty do not see CS ED research as being relevant to the department.
- The lack of opportunities for a multidisciplinary researcher, such as CSEd.
- Lack of support within my department in my specific research interests
- Learning about options outside of academia and how to get connected
- I am not sure of the different career opportunities available
- There is not enough information about available career paths

- My institution offers very little support in this respect.
- Knowing what I want to be when I grow up.
- funding and carriere advise
- Career Opportunities
- Procrastination
- Response rates
- networking

Are there any other thoughts or reflections that you would like to share with us related to Computer Science Education graduate education, either at your institution or more broadly across the field?

Table 30: Themes from the graduates open-end responses to this question (n = 9).

Themes	Nº of Participants
POSITIVE REFLECTIONS	
benefits from networking opportunities with CS Ed community	**3**
- through CSEd conference	2
Satisfied with CS Ed community	**2**
Support from advisor	**1**
NEGATIVE REFLECTIONS	
Challenges of CS Ed as a new field	**3**
- pioneer in CS Ed Grad	1
- limited information on opportunities	1
- the program is not well defined	1
Misses in-person conferences	**1**

Open-end responses:
- I feel connected to the CS ed researchers in my own lab at the my university but not to the researchers from the other labs or outside of CS at my university. But with the slack channel and this program (as well as conferences) I feel connected to CS ed students from all over.
- It can be really lonely if you are the only PhD student within the field at your institution. Networking opportunities and collaborations with other PhD students are great, and I really appreciate all the hard work that goes into facilitating those.
- There is a huge difference in the coursework that CS Ed graduate students complete. I find that at some institutions, the coursework doesn't cover as much useful theory / relevant prior works for CS Education researchers.
- Most of the connections that I have made started last year, when I moved to [COUNTRY/TERRITORY]. While in [COUNTRY/TERRITORY], most of the support came from my dissertation advisor.
- CSEd is a relatively new research area in my department and I do wish that this research direction was advertised by the department more.
- No thoughts at the moment, but I am open to being interviewed about my experiences if time permits.
- As a field it does not do enough to reach out to and embrace pure CS folks, see above.
- The community is great. I do miss in-person conferences though
- It's very academically strong and I have learned a lot.

We want to create an environment where all individuals can fully participate. What accommodations, if any, would ensure that the environment (both virtual and physical) facilitates your participation? For example, captioning during virtual panels and presentations.

Table 31: Themes from the open-end responses to this question (n = 7).

Themes	Nº of Participants
Inclusive environments	**6**
- possibility to include captions in virtual presentations	3
- explain abbreviation	1
- presentations that cater for the visually impaired	1
- consider hybrid conference/events	1
- accommodate different time zones	1
encourage networking	**2**
- small rooms to encourage interaction between participants	1
- conference-buddies system	1
Open communication to cater for necessity	**1**

Open-end responses:
- There aren't any accommodations that I can specifically think of. I think providing captioning is super helpful but not something I personally need (but I do like having it). When it comes to in-person environments, I find it sometimes scary/jarring to go into a room where I don't know anyone so maybe providing a conference-buddies system might be nice?
- As an international participant the time zone can be a hindrance (at virtual events). I feel my English level is fine to fully participate, my only concern regarding language would be if unusual abbreviations are used without explanation.
- Possibility to join virtually as your events would probably take place in America and I'm Europe-based (and it's expensive and not ecological to get there).
- Captioning, color palettes in presentations that are friendly for visually impaired, reaching out to participants re: potential needs prior to events
- It would be great if virtual panels have captioning.
- Creating space spaces Creating break out rooms
- courteous, and carrying all along
- Captioning please.

If you have any feedback about how or why we have asked for demographic information, please provide it here.

- I think it was refreshing to be asked how I identify in terms of gender rather than a list of options because often in the list of options you aren't able to select more than one option, which I what I would like to do. I would be okay with a list of options if you could choose more than one. I am curious why you didn't ask about sexuality as I know that there has been research about underrepresentation of LGBTQ+ people in STEM.

Shared Items Between the Two Instruments

Table 33: I/My Graduate Students Have Access to Grad-level CSEd Courses

	Count		Percent of Total	
	Grad.	Adv.	Grad.	Adv.
Yes	21	11	44%	44%
No	23	13	48%	52%
I'm not sure	4	1	8%	4%

Table 34: I/My Graduate Students Have Access to one CSEd Faculty

	Count		Percent of Total	
	Grad.	Adv.	Grad.	Adv.
Yes	44	24	92%	96%
No	2	1	4%	4%
I'm not sure	2	-	4%	-

Table 35: I/My Graduate Students Have Access to 2+ CSEd Faculty

	Count		Percent of Total	
	Grad.	Adv.	Grad.	Adv.
Yes	25	19	52%	76%
No	18	6	38%	24%
I'm not sure	5	-	10%	-

Table 36: I/My Graduate Students Have Access to Collaboration with Peers

	Count		Percent of Total	
	Grad.	Adv.	Grad.	Adv.
Yes	25	15	53%	60%
No	16	8	34%	32%
I'm not sure	6	2	13%	8%

Table 37: I/My Graduate Students Have Access to Interdisciplinary Research Opportunities

	Count		Percent of Total	
	Grad.	Adv.	Grad.	Adv.
Yes	33	23	69%	92%
No	8	1	17%	4%
I'm not sure	7	1	15%	4%

Table 38: I am/My Graduate Students are Encouraged to take Interdisciplinary Classes

	Count		Percent of Total	
	Grad.	Adv.	Grad.	Adv.
Yes	30	20	64%	77%
No	13	6	26%	23%
I'm not sure	5	-	11%	-

Table 39: I am/My Graduate Students are Financially Supported by… (Grad n = 48, Advisor n = 27)

	Count		Percent of Total	
	Grad.	Adv.	Grad.	Adv.
Teaching assistantship	22	20	46%	73%
Scholarship/fellowship	20	8	42%	31%
Research grant (primarily working on someone else's research)	18	6	38%	23%
University/department fellowship	15	6	31%	23%
Research grant (primarily working on my own research)*	12	25	25%	92%
Personal resources	12	4	25%	15%
Grad assistantship	7	3	15%	12%
Loans	4	-	8%	-
Training grant	3	-	6%	-

*Please use caution with this finding. We did not adjust survey text properly for this, so we believe the advisors may have interpreted this as graduate students working on faculty grants and graduate students would have interpreted this as their own grants.

Table 40: I/My Graduate Students Seek Support in… (Grad n = 48, Advisor n = 23)

	Count		Percent of Total	
	Grad.	Adv.	Grad.	Adv.
Research proj. feedback	45	22	94%	96%
Academic support	44	20	92%	87%
General support	35	19	73%	83%
Career/PD	32	20	67%	87%
Other	2	-	4%	-

Other (Graduate Students):What kinds of support do you seek from your mentor(s)?
- Raising a family while in grad school or as an academic. This has been difficult for me because I have been mentally ready for kids for a while now, but even though I would have had my advisor's support, the financial cost of being in grad school compared to having a full-time job has prevented me from trying - not to mention that my institution DOES NOT offer any parental support/leave for grad students.
- I would select the above but I have not found any mentors that I feel represent me.

Table 41: My mentor(s) meets my needs/I am able to meet my mentees' needs (Grad n = 48, Advisor n = 26)[1]

	Count		Percent of Total	
	Grad.	Adv.	Grad.	Adv.
Yes, most of the time	16	24	33%	92%
Yes, some of the time	31	-	65%	-
No	1	2	2%	8%

If no, what would better support you in meeting their needs? (Advisors)
- How to handle working with students with mental dis/abilities. How to help PhD students develop as independent researchers.
- *ALL* of their needs, no. That's why there's a committee.

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[1] Advisors were only given the option of "Yes" or "No". For the purposes of this table, "Yes" responses are counted as "Yes, most of the time".

Table 42: Institutional Knowledge (Grad n = 48, Advisor n = 26)

		Disagree strongly	Disagree some-what	Not sure	Agree some-what	Agree strongly
I know of research occurring at my institution related to my (advisee's) interests.	Adv	-	-	-	20%	80%
	Grad	2%	15%	2%	53%	28%
I (my advisees) have access to people at my institution who can support me in research dissemination	Adv	-	4%	-	28%	68%
	Grad	4%	13%	-	36%	49%
I (my advisees) have access to people at my institution who can support me in executing on a research project	Adv	2%	11%	2%	40%	45%
	Grad	-	4%	-	16%	80%
I (my advisees) have access to people at my institution who can support them in applying for external research funding	Adv	-	4%	4%	48%	44%
	Grad	11%	21%	2%	38%	30%

Table 43: How confident are you that you/your graduate student(s) can… (Grad n = 48, Advisor n = 26)

		Not at all confident	Somewhat unconfident	Somewhat confident	Very confident
Advance the knowledge base around teaching/learning	Adv	-	16%	32%	52%
	Grad	-	11%	56%	33%
Develop a strong network within the field of CSEd	Adv	8%	16%	28%	48%
	Grad	9%	24%	40%	7%
Succeed at accomplishing challenging coursework	Adv	-	4%	56%	40%
	Grad	2%	14%	50%	36%
Achieve my/their career goals	Adv	4%	8%	64%	24%
	Grad	2%	20%	62%	16%
Find a career in CS education that I/they enjoy	Adv	8%	12%	56%	24%
	Grad	4%	22%	62%	11%

Table 44: Do you feel knowledgeable about the current job market for CSEd? (Grad n = 44, Advisor n = 26)

	Count		Percent of Total	
	Grad.	Adv.	Grad.	Adv.
Yes	10	8	23%	31%
No	34	18	77%	69%

Table 45: Are there supports available at your institution to prepare you for the faculty hiring process? (Grad n = 43, Advisor n = 26)

	Count		Percent of Total	
	Grad.	Adv.	Grad.	Adv.
Yes	23	8	53%	69%
No	20	18	47%	31%

Table 46: Are there supports available at your institution to prepare you for jobs outside of higher education? (Grad n = 43, Advisor n = 25)

	Count		Percent of Total	
	Grad.	Adv.	Grad.	Adv.
Yes	18	14	42%	56%
No	25	11	58%	44%

Table 47: I have a sense of belonging to a CSEd research community at my institution (Grad n = 44, Advisor n = 26)

	Count		Percent of Total	
	Grad.	Adv.	Grad.	Adv.
A lot	10	14	23%	54%
A little	9	4	21%	15%
Not at all	25	8	58%	31%

Table 46: I have a sense of belonging to a CSEd research community beyond my institution (Grad n = 44, Advisor n = 25)

	Count		Percent of Total	
	Grad.	Adv.	Grad.	Adv.
A lot	14	18	32%	72%
A little	7	1	16%	4%
Not at all	23	6	52%	24%

Table 48: I have had meaningful collaborations with… (Grad n = 45, Advisor n = 26)

	Count		Percent of Total	
	Grad.	Adv.	Grad.	Adv.
Faculty members (home institution)	32	20	71%	77%
Faculty (other institution)	26	22	58%	85%
Students (home institution)	23	11	51%	44%

Other people (home institution)	10	10	22%	38%
None	1	-	2%	-
Students (other institutions)	-	9	-	35%
Other	1	4	2%	15%

Other (Graduate Students)
● K-12 teachers

Other (Advisors)
● Other researchers and non-profit folks engaged in CS education (including state and national governmental reps).
● Collaborators at research organizations (e.g. TERC, Digital Promise)
● people from open-source projects
● SIGCSE people

Appendix A: *Graduate Student Results by their "Home" School/College[2]*

Table 52: Teaching Experience prior to PhD?

Examine By (Grad)	School/ College of Information / Computer Sciences	School/ College of Education	School/ College of Engineering	School/ College of Sciences (Natural, Physical...)	Other
Grad N	23	14	10	1	2
Informal teaching	52%	43%	60%	100%	50%
Postsecondary TA	43%	14%	40%	-	-
Postsecondary lecturer	30%	14%	10%	-	50%
PreK-12	17%	64%	-	100%	-
None	4%	7%	10%	-	-

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[2] Most tables will include data for the school/college of Information/Computer Sciences, Education, Engineering, Natural Sciences, and Other. In some cases, no responses were received from students of certain colleges for certain questions, so their header is not included.

Table 53: Have you had formal or informal experiences with Computer Science prior to beginning your Ph.D. program?

	School/ College of Information / Computer Sciences	School/ College of Education	School/ College of Engineering	School/ College of Sciences (Natural, Physical...)	Other
Grad N	23	14	10	1	2
Yes, formal experiences (courses, work experience)	68%	7%	20%	100%	100%
Both formal and informal experiences	27%	36%	70%	-	-
Yes, informal experiences (self-guided learning, coding clubs)	5%	50%	10%	-	-
No, neither formal nor informal experiences	-	7%	-	-	-

Table 54: Work experience prior to PhD

Examine By (Grad)	School/ College of Information / Computer Sciences	School/ College of Education	School/ College of Engineering	School/ College of Sciences (Natural, Physical...)	Other
Grad N	23	14	10	1	2
College/university	61%	57%	40%	-	50%
Industry	52%	21%	60%	100%	50%
Other non-profit/private	26%	29%	-	-	-
K-12 Ed	17%	64%	-	-	-
Non-gov't research	9%	21%	-	-	-
Self-employed	9%	14%	20%	-	-
None	9%	-	40%	-	50%
Gov't	4%	21%	10%	-	-
Other	-	-	-	-	-

Table 55: Learned about field from...

Examine By (Grad)	School/ College of Information / Computer Sciences	School/ College of Education	School/ College of Engineering	Other
Grad N	23	14	10	2
Another faculty member	4%	14%	30%	-
Another student	9%	-	-	50%
Faculty advisor/mentor	61%	64%	80%	100%
My own research	35%	43%	50%	100%
Non-college/university organization	9%	21%	-	-
Other	4%	-	-	50%

Table 56: Factors for field choice

Examine By (Grad)	School/ College of Information / Computer Sciences	School/ College of Education	School/ College of Engineering	Other
Grad N	22	14	10	2
Alignment with research interests/ability	74%	86%	100%	100%
Equity/BPC work	48%	50%	60%	-
Advisor/mentor advice	39%	57%	60%	50%
Knowledge of career opportunities	22%	43%	10%	-
Relationships with other grads in field	17%	21%	10%	50%
Funding opportunities	13%	43%	-	-
College/university reputation	9%	29%	30%	-
Other	9%	-	10%	-

Table 57: Identity of mentor

Examine By (Grad)	School/ College of Information / Computer Sciences	School/ College of Education	School/ College of Engineering	Other
Grad N	22	14	10	2
Grad advisor	91%	93%	78%	100%
Another grad student	27%	43%	33%	50%
Other non-CSEd faculty member outside my institution	18%	29%	22%	50%
Other CSEd faculty member at my institution	18%	36%	44%	-
Other CSEd faculty member outside of my institution	14%	-	11%	-
Other non-CSEd faculty member at my institution	5%	7%	-	50%
Other	-	7%	11%	-

Table 57: Prior to PhD, participated in...

	School/ College of Information / Computer Sciences	School/ College of Education	School/ College of Engineering	Other
Grad N	22	14	10	2
CS Ed research	95%	64%	100%	100%
K-12 CS Ed implementation	24%	71%	57%	50%
NSF or other federally-funded project	24%	50%	29%	50%
Eval of CS Ed projects	14%	14%	29%	-
Other Ed research	5%	64%	29%	50%
Eval of RPP/similar projects	-	29%	-	-
Other	-	-	-	-

Table 59: Do you consider yourself to be a mentor for another graduate student pursuing CS Education?

	School/ College of Information / Computer Sciences	School/ College of Education	School/ College of Engineering	Other
Grad N	22	14	10	2
Yes	36%	43%	22%	100%
No	36%	21%	56%	-
I'm not sure	27%	36%	22%	-

Appendix B: *Graduate Student Results by Year in Program*

Table 60: Experience prior to PhD

Examine By (Grad)	0-2 years in program	>2 years in program
Grad N	24	26
Informal teaching	46%	58%
Postsecondary TA	38%	27%
PreK-12	21%	35%
Postsecondary lecturer	17%	27%
None	13%	-

Table 61: Have you had formal or informal experiences with Computer Science prior to beginning your Ph.D. program?

	0-2 years in program	>2 years in program
Grad N	24	26
Yes, formal experiences (courses, work experience)	43%	42%
Yes, informal experiences (self-guided learning, coding clubs)	9%	27%
Both formal and informal experiences	43%	31%
No, neither formal nor informal experiences	4%	-

Table 62: Work experience prior to PhD

Examine By (Grad)	0-2 years in program	>2 years in program
Grad N	24	26
College/university	42%	65%
Industry	42%	50%
K-12 Ed	29%	23%
None	25%	4%
Other non-profit/private	17%	23%
Self-employed	17%	8%
Gov't	17%	4%
Non-gov't research	13%	8%
Other	-	-

Table 63: Learned about field from...

Examine By (Grad)	0-2 years in program	>2 years in program
Grad N	23	26
Faculty advisor/mentor	62%	72%
My own research	50%	36%
Another faculty member	12%	12%
Another student	4%	8%
Non-college/university organization	8%	12%
Seminar/course	8%	4%
Other	-	8%

Table 64: Factors for field choice

Examine By (Grad)	0-2 years in program	>2 years in program
Grad N	23	26
Alignment with research interests/ability	92%	76%
Equity/BPC work	50%	48%
Advisor/mentor advice	46%	52%
Knowledge of career opportunities	25%	24%
College/university reputation	25%	12%
Relationships with other grads in field	8%	28%
Funding opportunities	4%	32%
Other	4%	8%

Table 65: Prior to PhD, participated in...

	0-2 years in program	>2 years in program
Grad N	23	26
CS Ed research	76%	96%
K-12 CS Ed implementation	38%	52%
NSF or other federally-funded project	24%	43%
Other Ed research	19%	39%
Eval of CS Ed projects	10%	22%
Eval of RPP/similar projects	10%	9%
Other	-	-

Table 66: Identity of mentor

Examine By (Grad)	0-2 years in program	>2 years in program
Grad N	23	26
Grad advisor	90%	100%
Other CSEd faculty member at my institution	38%	22%
Another grad student	33%	39%
Other non-CSEd faculty member outside my institution	14%	35%
Other CSEd faculty member outside of my institution	5%	13%
Other non-CSEd faculty member at my institution	-	13%
Other	5%	4%

Table 67: Do you consider yourself to be a mentor for another graduate student pursuing CS Education?

		0-2 years in program	>2 years in program
Grad N	1	23	26
I'm not sure	-	26%	29%
No	-	39%	29%
Yes	100%	35%	42%

It seems like there are some stark differences between those students who are upper division Ph.D students and lower-division Ph.D. students, in terms of level of prior experience with work and with research, and the extent to which they were influenced into this field by an existing faculty mentor.

Appendix C: *Graduate Student Results by US/International Institutions[3]*

Table 68: Experience prior to PhD

Examine By (Grad)	US	International
Grad N	37	13
Informal teaching	62%	23%
Postsecondary TA	35%	23%
PreK-12	32%	15%
Postsecondary lecturer	16%	38%
None	5%	8%

Table 69: Have you had formal or informal experiences with Computer Science prior to beginning your Ph.D. program?

	US	International
Grad N	37	13
Yes, informal experiences (self-guided learning, coding clubs)	32%	-
Yes, formal experiences (courses, work experience)	4%	92%
Both formal and informal experiences	61%	8%
No, neither formal nor informal experiences	4%	-

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[3] Please note that some respondents who are based in a US institution are not necessarily US citizens and may be international students themselves. We were unable to explore the nuance of graduate student experience by country of origin in this survey.

Table 70: Work experience prior to PhD

Examine By (Grad)	US	International
Grad N	37	13
College/university	49%	69%
Industry	41%	62%
K-12 Ed	27%	23%
Other non-profit/private	19%	23%
None	19%	-
Self-employed	14%	8%
Gov't	14%	-
Non-gov't research	11%	8%
Other	-	-

Table 71: Learned about field from...

Examine By (Grad)	US	International
Grad N	37	12
Faculty advisor/mentor	72%	54%
My own research	36%	62%
Another faculty member	17%	-
Non-college/university organization	11%	8%
Another student	6%	8%
Seminar/course	6%	8%
Other	-	15%

Table 72: Factors for field choice

Examine By (Grad)	US	International
Grad N	37	12
Alignment with research interests/ability	83%	85%
Equity/BPC work	58%	23%
Advisor/mentor advice	56%	31%
Knowledge of career opportunities	25%	23%
College/university reputation	22%	8%
Funding opportunities	22%	8%
Relationships with other grads in field	19%	15%
Other	8%	-

Table 73: Prior to PhD, participated in...

	US	International
Grad N	37	12
CS Ed research	84%	92%
NSF or other federally-funded project	48%	-
K-12 CS Ed implementation	45%	46%
Other Ed research	35%	15%
Eval of CS Ed projects	19%	8%
Eval of RPP/similar projects	13%	-
Other	-	-

Table 74: Identity of mentor

Examine By (Grad)	US	International
Grad N	37	12
Grad advisor	97%	92%
Another grad student	38%	33%
Other CSEd faculty member at my institution	31%	25%
Other non-CSEd faculty member outside my institution	22%	33%
Other CSEd faculty member outside of my institution	9%	8%
Other non-CSEd faculty member at my institution	3%	17%
Other	6%	-

Table 75: Do you consider yourself to be a mentor for another graduate student pursuing CS Education?

	US	International
Grad N		
Yes	4%	46%
No	52%	31%
I'm not sure	43%	23%