

# Computing Undergraduate Students' Participation in Internships

## Experiences, Preparation, and Barriers

### Committee:

- Dr. Christina Gardner-McCune (Chair, CISE)
- Dr. Kristy Elizabeth Boyer (CISE)
- Dr. Sharon Lynn Chu (CISE)
- Dr. Denise R. Simmons (External, Civil & Coastal)

### Presenter:

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# Agenda

- **Part I: Overview**
  - Introduction
  - Theoretical Grounding
- **Part II: Internship Participation**
  - ✓ Study 1: Why are internships important?
  - ✓ Study 2: Who is participating in internships and how?
  - Developing Personas: Fitting in altogether
- **Part III: Intervention & Evaluation**
  - ✓ Study 3: How can we improve our curriculum so that more students intern?
  - Study 4: How effective is our pedagogical intervention in preparing students for securing internships?
- **Part IV: Contributions & Conclusions**

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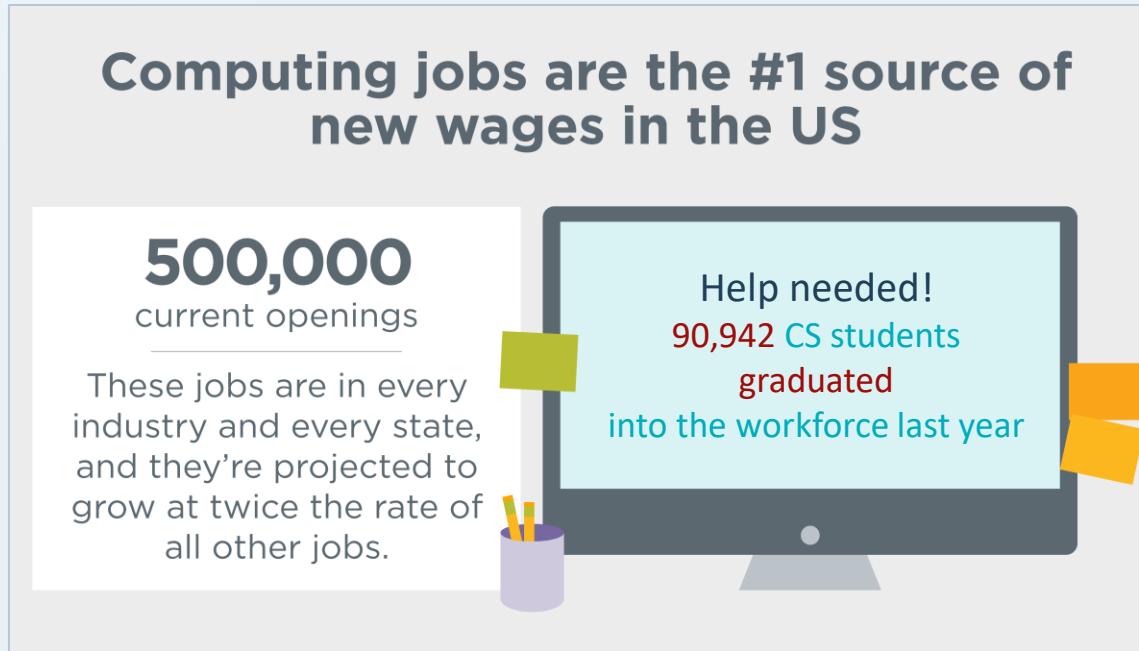
## ■ Part III: Intervention & Evaluation

- ✓ Study 3: How can we improve our curriculum so that more students intern?
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## ■ Part IV: Contributions & Conclusions

# Motivation

Gap between CS Graduates in the USA vs available jobs in computing



Source: [https://code.org/images/cs-stats/Slide6\\_Computing\\_Jobs.png](https://code.org/images/cs-stats/Slide6_Computing_Jobs.png)



Jobs in Computer and Mathematical occupations **2022-2032**; Software related jobs will grow 22%

Source: Occupational employment projections to 2032. U.S. Bureau of Labor Statistics

# Motivation

## Underprepared Computing Graduates

Underemployed CS Recent Graduates



Source:  
The Labor Market for Recent College Graduates  
<https://www.newyorkfed.org/research/college-labor-market#:~:explore:outcomes-by-major>

Employers report CS graduates **lack**

- Technical abilities, e.g., Testing Code
- Personal skills, e.g., Communication
- Professional skills, e.g., Teamwork

Sources:  
Brechner. Things they would not teach me of in college (OOPSLA 2003);  
Radermacher & Walia. Gaps between industry expectations and the abilities of graduates (SIGCSE 2013, ICSE 2014);

# Motivation

## Internships



Integral part of employers' recruitment process

46%

Employers consider prior experience when hiring new grads

- 🎯 💛 Apply classroom knowledge to real-world problems and projects collaboratively
- 💻 🛠 Work with modern technologies and gain hands-on experience

# RESEARCH QUESTIONS

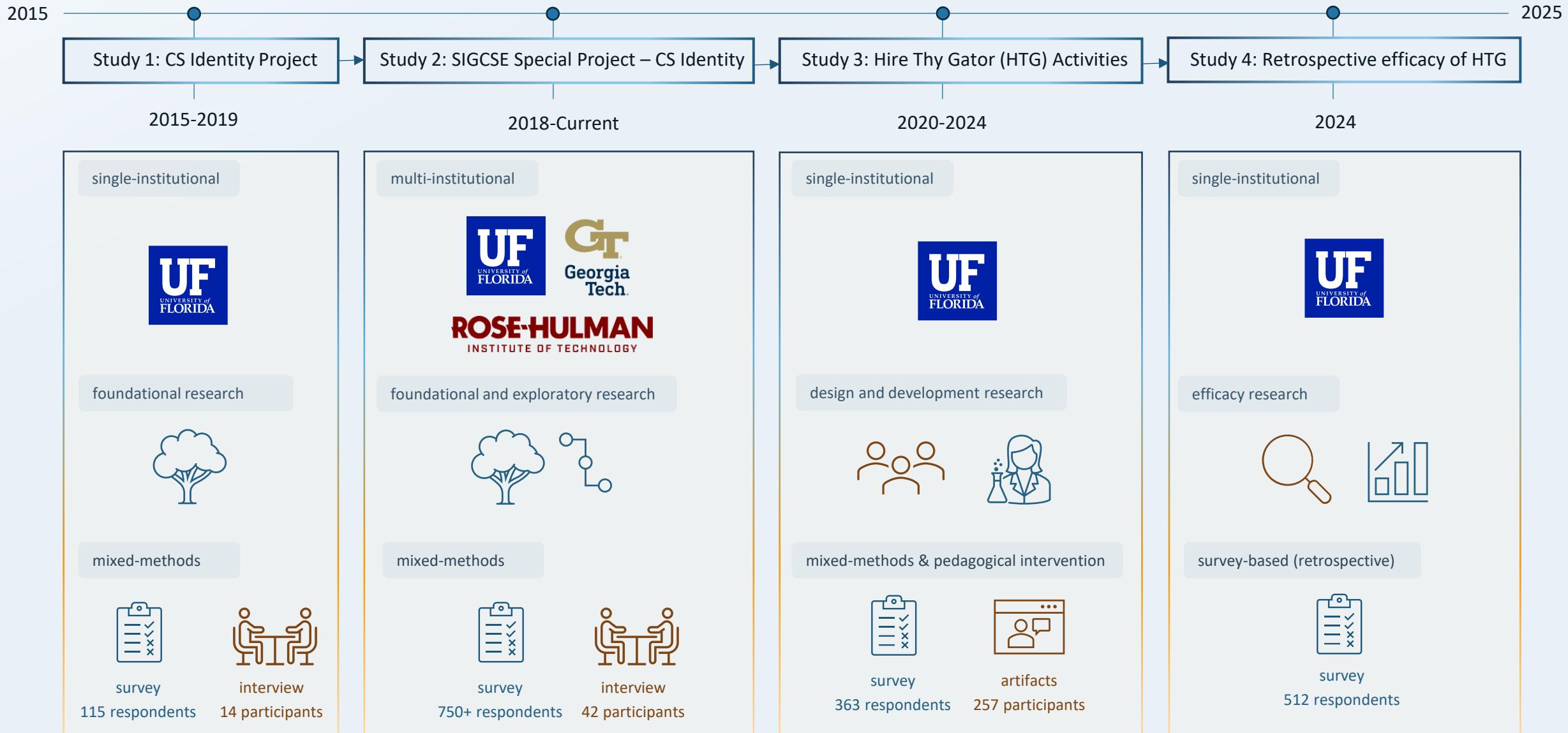
## Central Question

How do computing undergraduate students prepare and participate in internships? What barriers prohibit them from participating in internships?

## Sub-Questions

- Internship experiences and impact
- Internship participation
- Barriers to participation
- Preparation for securing internships
- Interventions that can help students secure internships

# Studies



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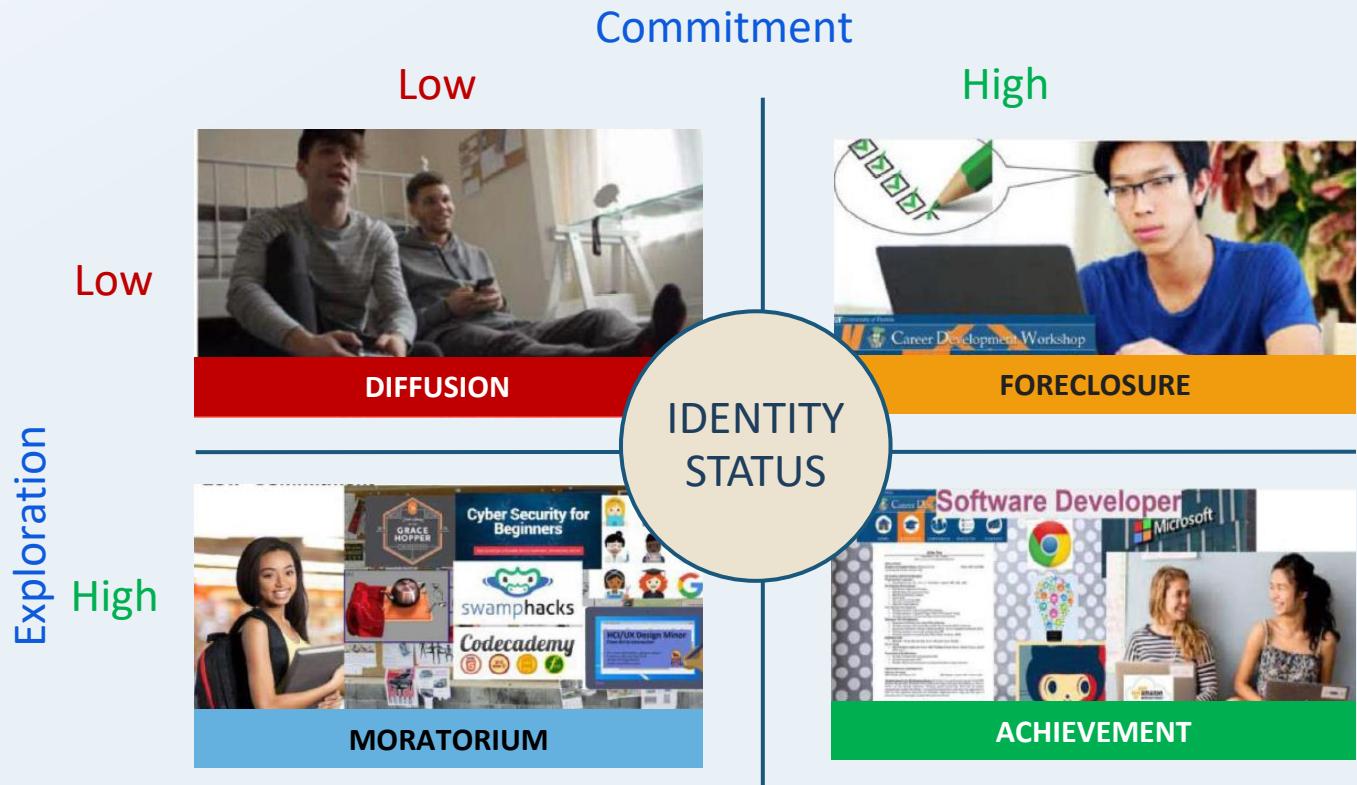
# Theoretical Grounding

James Marcia's  
Identity Status  
Theory

Bandura's  
Social  
Cognitive  
Theory

# Theoretical Grounding

## James Marcia's Identity Status Theory



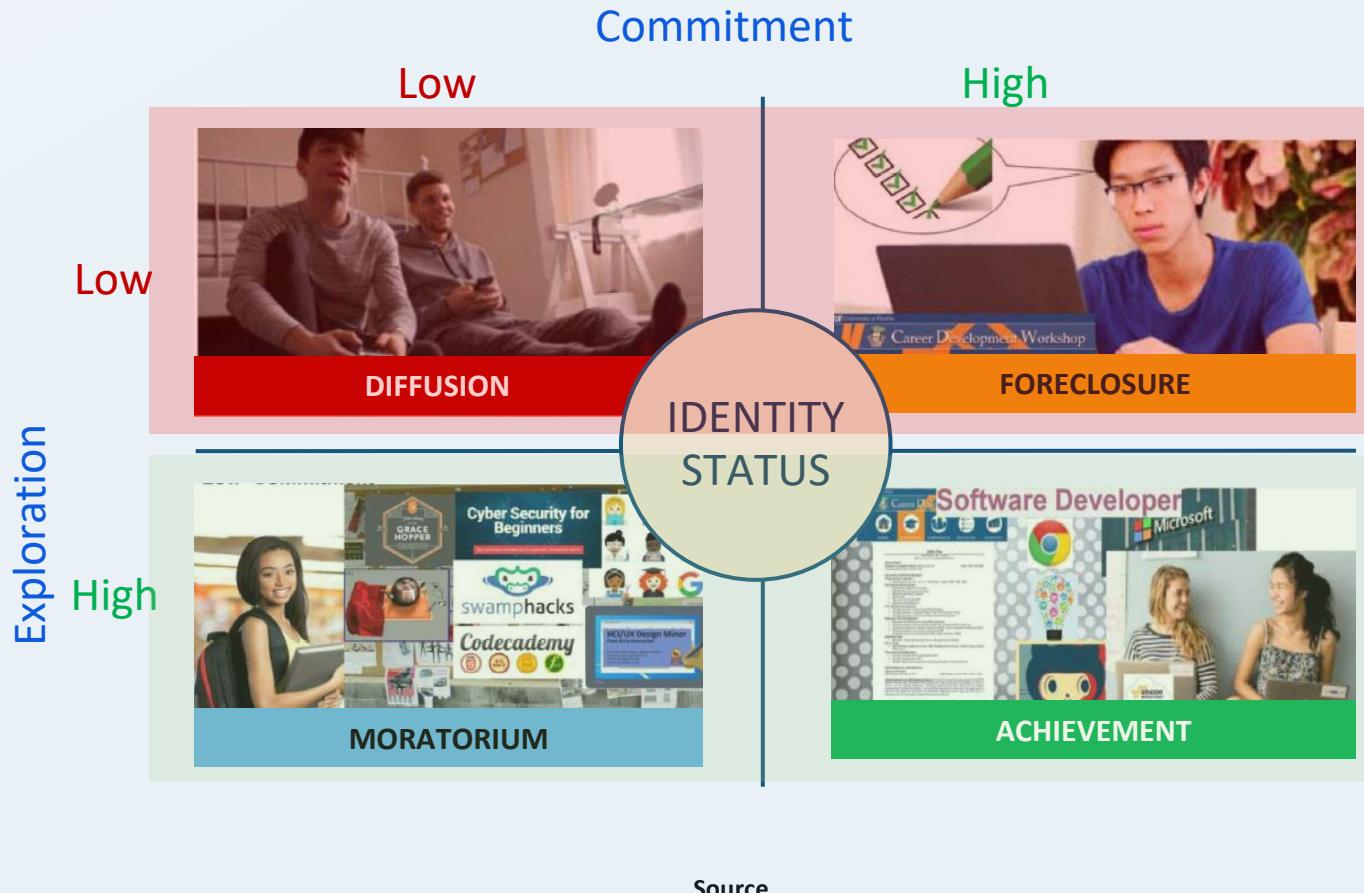
**Identity changes** over time based on a person's **active or passive exploration** and **commitment to a profession**.

### Source

Marcia (1966). Development and validation of ego-identity status

# Theoretical Grounding

## James Marcia's Identity Status Theory



## Use of this theory:

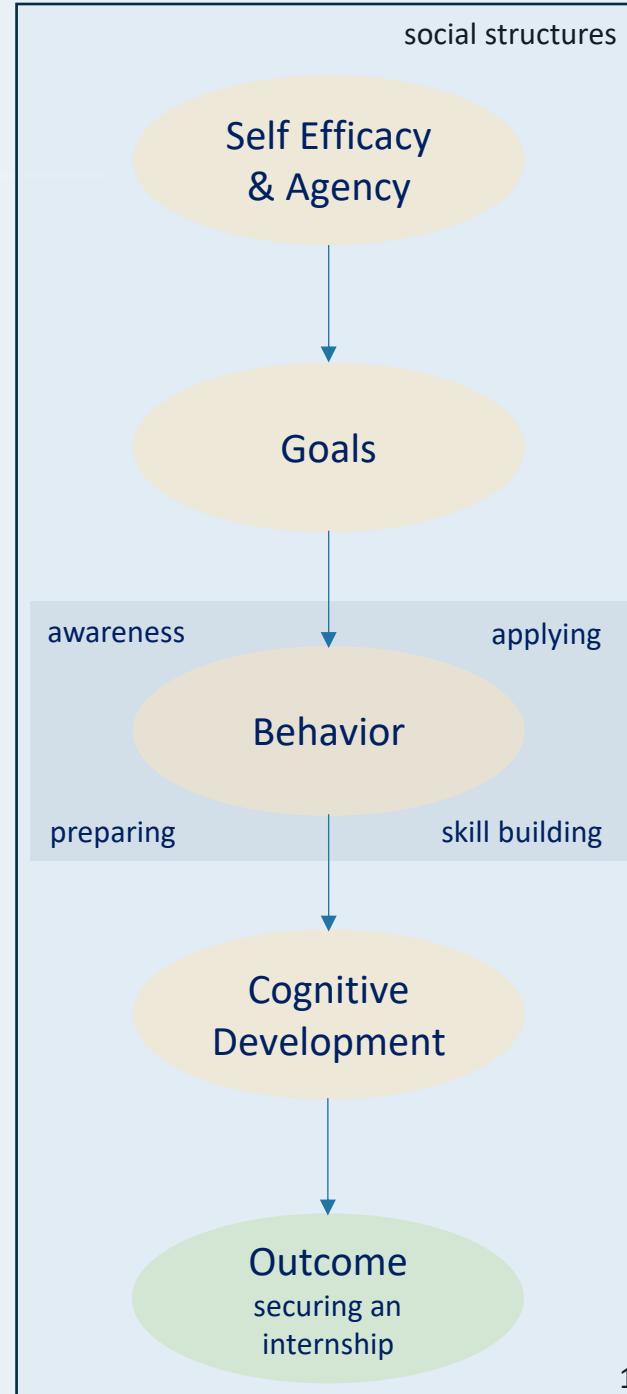
- Guide Research Design
  - Relationship between identity formation and participation in internships.
  - Extended Objective Measure of Ego Identity Status (EOM-EIS, Bennion & Adams, 1986) instrument in Study 2.
- Explain Phenomenon
  - Students in Moratorium and Achievement statuses are more likely to participate in internships compared to Diffusion and Foreclosure.

# Theoretical Grounding

## Bandura's Social Cognitive Theory (SCT)

**Self-efficacy:** belief that one has about their capacity for specific achievements, given domain-specific obstacles.

**Agency:** an individual's actual ability to deal with a complex task.



# Theoretical Grounding

## Bandura's Social Cognitive Theory (SCT)

**Self-efficacy:** belief that one has about their capacity for specific achievements, given domain-specific obstacles.

**Agency:** an individual's actual ability to deal with a complex task.



## Use of this theory:

- **Guide Intervention Design**
  - Study 3: Specific elements of the Intervention cater dimensions of agency.
  - Example: **Surveys after mock interviews promote self-reflectiveness** or **Panel** shows them how others strategize preparation and demonstrate **intentionality**.
- **Explain Phenomenon**
  - Study 2: Students who **exhibit agency** and have avenues that support agentic **properties** are **more likely to participate in internships**.

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# Study 1: Why are internships important?

2015

2024

Study 1: CS Identity Project

2015-2019

single-institutional



foundational research



mixed-methods



survey



interview

115 respondents

14 participants

Context and Outcomes for the CS Identity Project

## Context and Outcomes for the CS Identity Project

- Goal of the study: **assess CS students' professional identity formation**
- Data analysis and outcomes:

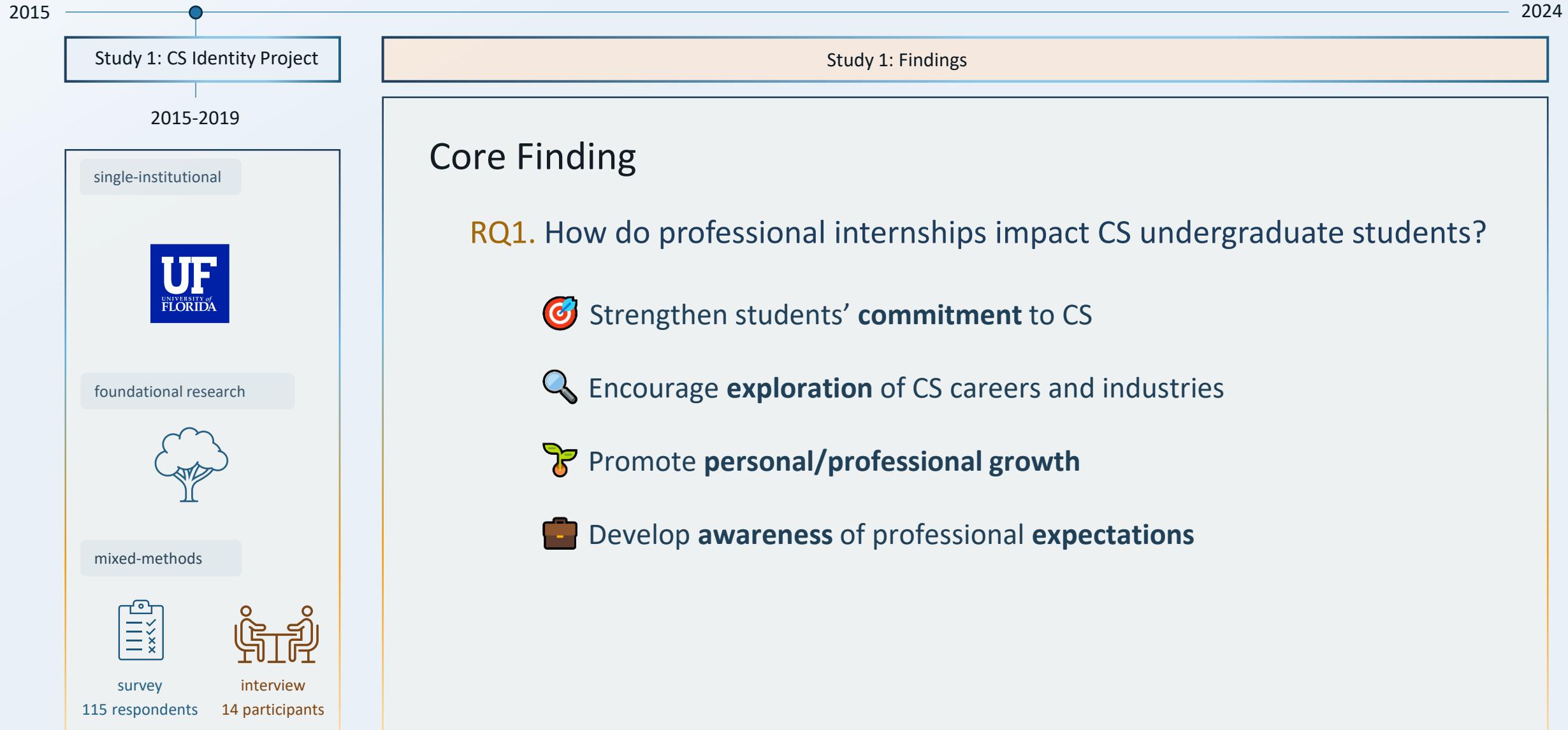
### ○ Papers

- ✓ *Understanding Professional Identities and Goals of Computer Science Undergraduate Student (SIGCSE 2018)*
- ✓ *Considerations for Switching: Exploring Factors behind CS Students' Desire to Leave a CS Major (ITiCSE 2018)*
- ✓ ***Understanding CS Undergraduate Students' Professional Development through the Lens of Internship Experiences (SIGCSE 2019)***
- ✓ *Understanding CS Undergraduate Students' Professional Identity through the lens of their Professional Development (ITiCSE 2019)*

### ○ Posters

- ✓ Understanding How Computer Science Undergraduate Students are Developing their Professional Identities (SIGCSE 2018)
- ✓ **Deconstructing Successful and Unsuccessful Computer Science Undergraduate Interns (SIGCSE 2019) 🏆**
- ✓ Understanding Aspiring UX Professionals' Professional Development (UXPA 2018)

# Study 1: Why are internships important?



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# Study 2: Who is participating in internships and how?

2020

Study 2: SIGCSE Sp. Project – CS Identity

2024

Study 2: Internship Recruitment Process

2018-Current

multi-institutional



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mixed-methods



survey



interview

750+ respondents

42 participants

## Internship Recruitment Process

### Apply

- Applying at Career Fairs
- Online for Paid/Unpaid/Co-op Internships in Computing Disciplines

### Screening

- Resume by Application Tracking System,
- Referrals, or
- Recruiters or a Technical/Aptitude Test

### Interview

- 0-4 remote or in-person Technical  
*Requires: Coding + Data Structures + System Design*
- Behavioral interviews.

#### Expectations:

- Technical Skills
- Professional Skills
- Working outside the curriculum

# Study 2: Who is participating in internships and how?

2020

Study 2: SIGCSE Sp. Project – CS Identity

2024

Study 2: Context and Outcomes

2018-Current

multi-institutional



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## Context and Outcomes

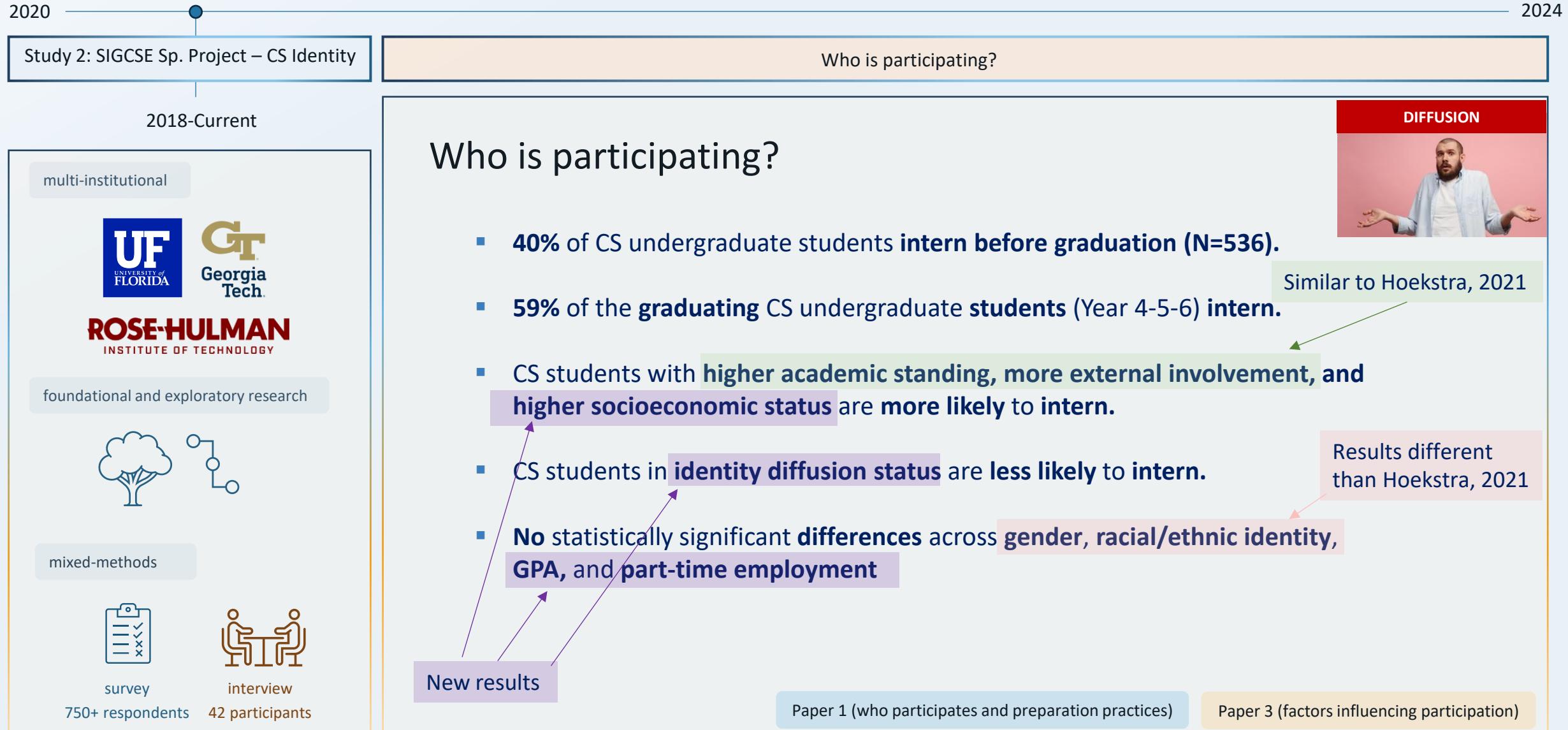
- Goal of the study: **assess participation in internships**
- Study 2 was designed during Fall 2018 and data was collected in 2019
- Cross-sectional mixed methods study at **three universities** based on a Concurrent Triangulation Design
- Data analysis and outcomes:
  - **Papers**
    - ✓ *Exploring the Participation of CS Undergraduate Students in Industry Internships* (SIGCSE 2020)
    - ✓ *Barriers to Securing Industry Internships in Computing* (ACE 2020)
    - ✓ *Modeling Determinants of Undergraduate Computing Students' Participation in Internships* (SIGCSE 2023, undergraduate students Megan Wolf and Charlie Hobson were first and third authors)

Contributions from  
Survey Data Analysis

Quantitative Model for Participation

Qualitative Model for Barriers

# Study 2: Who is participating in internships and how?



# Study 2: Who is participating in internships and how?

2020

Study 2: SIGCSE Sp. Project – CS Identity

2024

Why are students not participating?

2018-Current

multi-institutional



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## Why are students not participating?

CS students fail to participate in an internship due to :



Psychological constraints

e.g. low self-efficacy



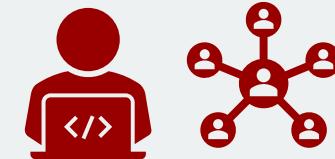
Social constraints

e.g. family responsibilities



Financial constraints

e.g. work responsibilities



Recruitment-process constraints

e.g. technical proficiency, involvement in projects & extra-curricular activities

Paper 2 (barriers to participation)

# Study 2: Who is participating in internships and how?

2020

Study 2: SIGCSE Sp. Project – CS Identity

2024

2018-Current

multi-institutional



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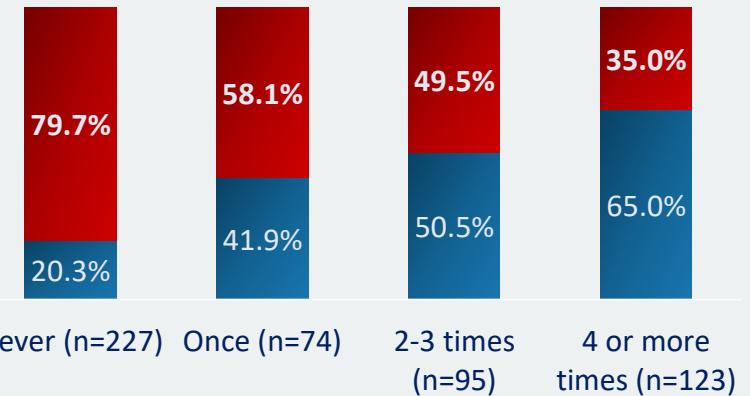
How are students preparing to participate?

## How are students preparing to participate?

✓ Interns were more **engaged in application process and interview prep** than students who did not participate in internships.

✗ Unsuccessful interns relied more on **coursework/GPA** for internships.

Participation in Internship vs Practice Problems for Technical Interview (N=519)



Internship Participation

■ Yes ■ No

	z	p-value	$\eta^2$
Yes	-8.75	<0.001	0.14

Paper 1 (who participates and preparation practices)

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# Developing Personas: Fitting in altogether

2020

2024

Study 2: SIGCSE Sp. Project – CS Identity

Study 2: Motivation

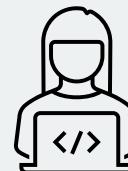
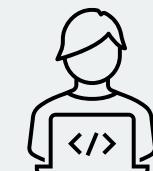
2018-Current

multi-institutional



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mixed-methods



survey



interview

750+ respondents

42 participants

## Motivation

RQ. How are computing undergraduate students who successfully secure internships different from those who have not interned?



Goal: identify and disseminate how students can secure internships to stakeholders involved in the career development

# Developing Personas: Fitting in altogether

2020



2024

Study 2: SIGCSE Sp. Project – CS Identity

Study 2: Prior Work

2018-Current

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survey

750+ respondents



interview

42 participants

## Prior Work

Personas are archetypes of users based on actual data that narrate realistic types of users based on clusters of *goals, attitudes, and behaviors*.

**Pedagogical tool in Classroom**  
(e.g., Mohan and Chenoweth, 2011)

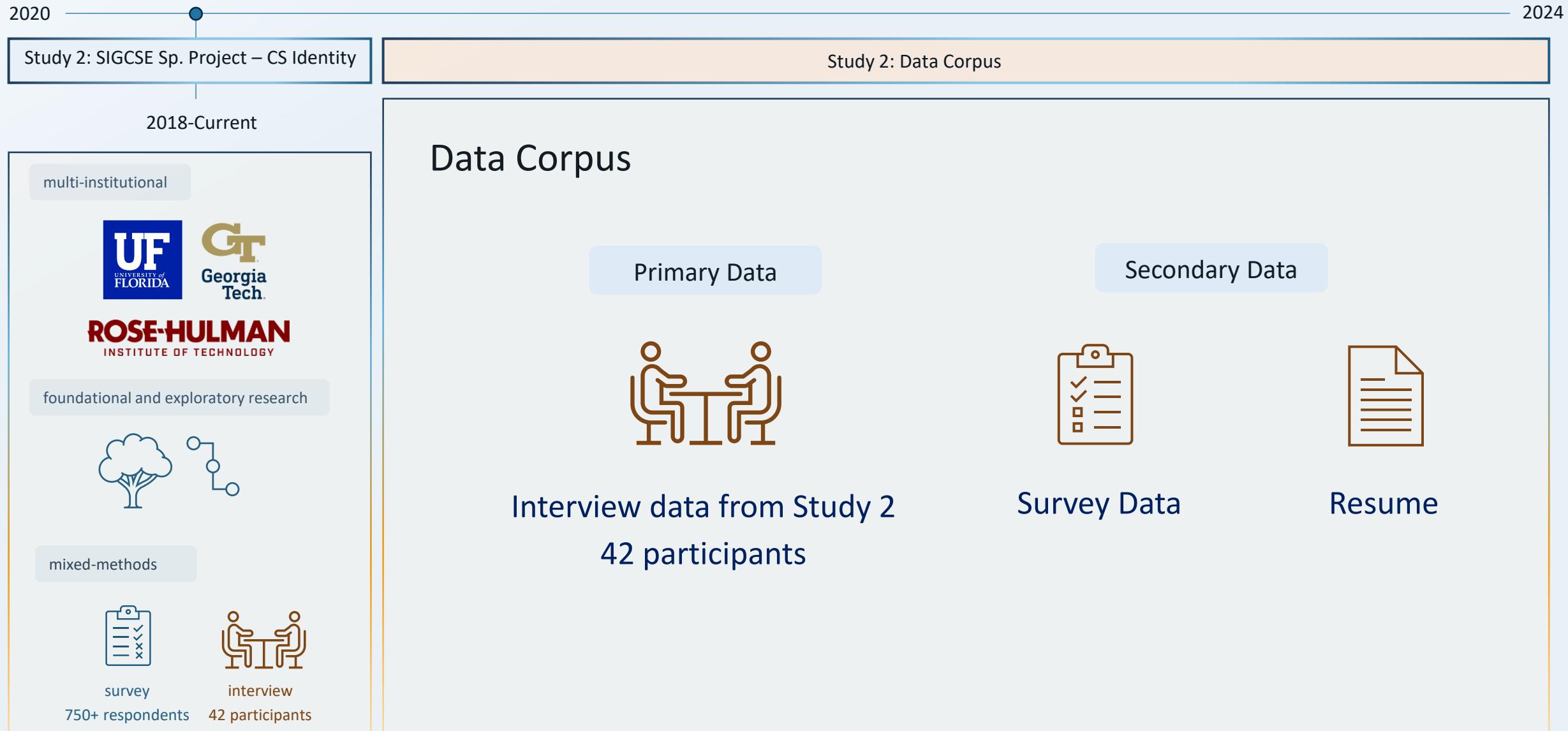
**Conceptual tool to guide research**  
(e.g., Letaw et al., 2021)

Personas in Computing Education Research

**Design tool to collect data**  
(e.g., Chinn and VanDeGrift, 2007)

**Analytical tool for visualizing data**  
(e.g., Giannakos et al., 2014)

# Developing Personas: Fitting in altogether



# Developing Personas: Fitting in altogether

2020

2024

Study 2: SIGCSE Sp. Project – CS Identity

Study 2: Participants

2018-Current

multi-institutional



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mixed-methods



survey

750+ respondents



interview

42 participants

## Participants

Purposeful sample (Suri, 2011) from the survey based on:

- (1) Internship status
- (2) Gender identity
- (3) Racial identity
- (4) Year in program
- (5) University affiliation

# Developing Personas: Fitting in altogether

2020

Study 2: SIGCSE Sp. Project – CS Identity

2024

Study 2: Participants

2018-Current

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survey

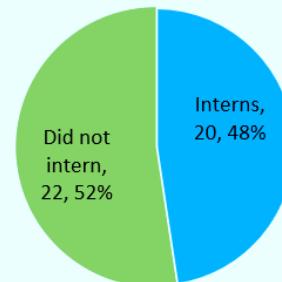


interview

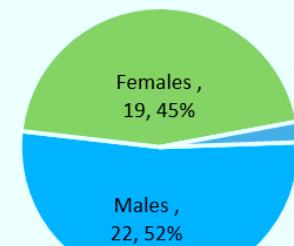
750+ respondents 42 participants

## Participants

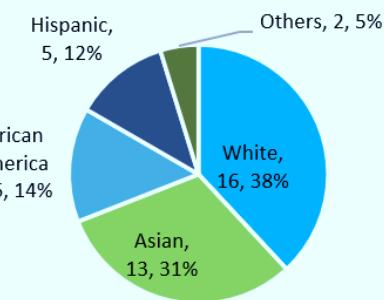
### Internship Status



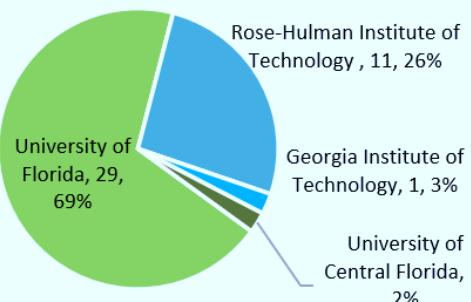
### Gender



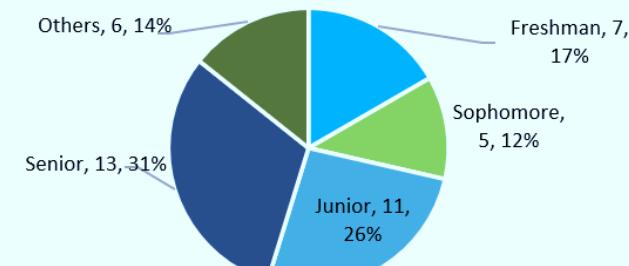
### Race



### University affiliation



### Academic standing (year in program)



# Developing Personas: Fitting in altogether

2020

2024

Study 2: SIGCSE Sp. Project – CS Identity

Study 2: Data collection

2018-Current

multi-institutional



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mixed-methods



survey



interview

750+ respondents

42 participants

## Data collection

Semi-structured interview questions (Study 2, 2019)

- based on our findings from Study 1
- developed with my advisor
- tailored based on student responses in the survey
- average interviewing time was 55 minutes (Range: 21-74 minutes, SD: 10)
- compensation via gift cards

# Developing Personas: Fitting in altogether

2020 ————— 2024

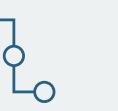
Study 2: SIGCSE Sp. Project – CS Identity      Study 2: Data collection

2018-Current

multi-institutional

   
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mixed-methods

survey      interview

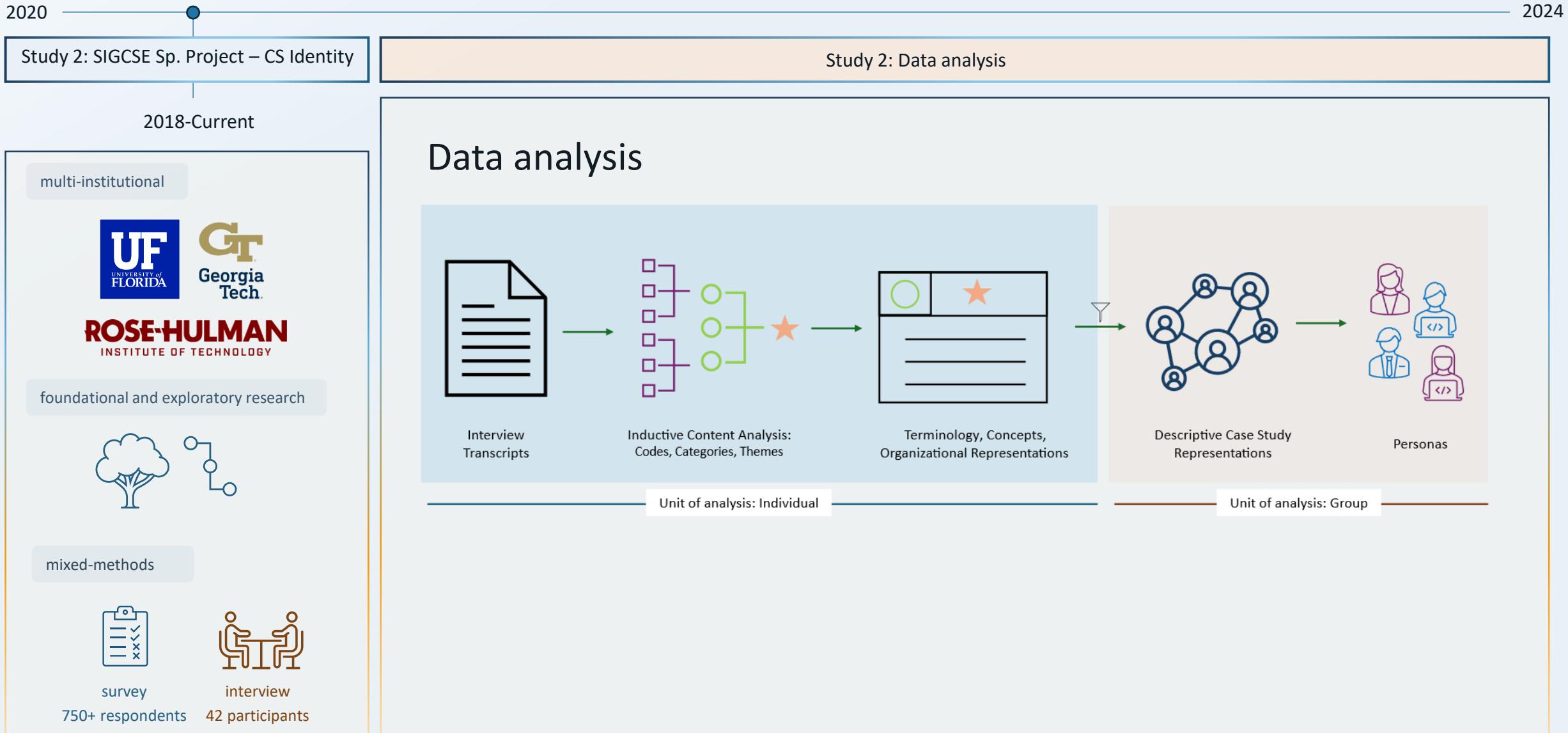
750+ respondents      42 participants

## Data collection

### Semi-structured interview script

Section	Example Questions
Grand Question	Why did you decide to pursue a Computer Science or Computer Engineering degree?
Career goals and choices	You mentioned you want to become a _____, can you tell me how you got interested in _____?
Preparation for Career	How are you preparing yourself to become a _____ and work in _____?
Professional Experience (e.g. Internships)	<b>Interned:</b> You indicated on the survey, you participated in internships in _____ year, tell me the story of how you got your first internship?  <b>Not an intern (Applied but failed):</b> Through prior research we found that only 40% of juniors/seniors pursue internships, why do you think you haven't secured an internship so far?  <b>Not an intern (Not applied due to lack of confidence, skills, etc.):</b> Through prior research we found that only 40% of juniors/seniors pursue internships, why haven't you applied for an internship so far?
Professional Development (e.g. Personal Projects, Clubs, etc.)	You have participated in _____ clubs/hackathons/projects. Out of all these, which was most beneficial for your professional growth as a _____?
Degree Program Experience	How has your CS coursework shaped your professional interest and identity?
Hypothetical	What mistakes did you make during the degree program, which you would advise your junior/brother/sister not to make, if they were to enroll into a similar program in future?

# Developing Personas: Fitting in altogether



# Developing Personas: Fitting in altogether

2020

Study 2: SIGCSE Sp. Project – CS Identity

2024

Study 2: Data analysis

2018-Current

multi-institutional



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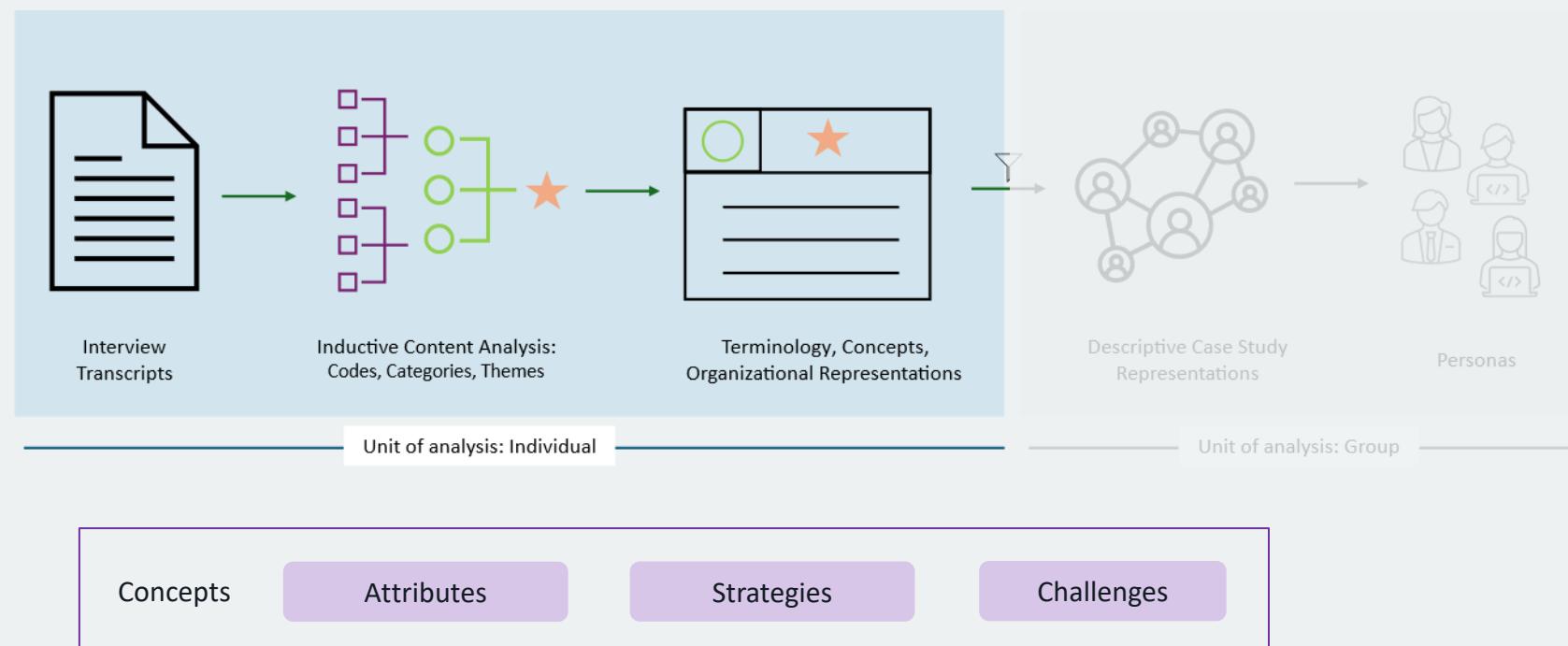
survey



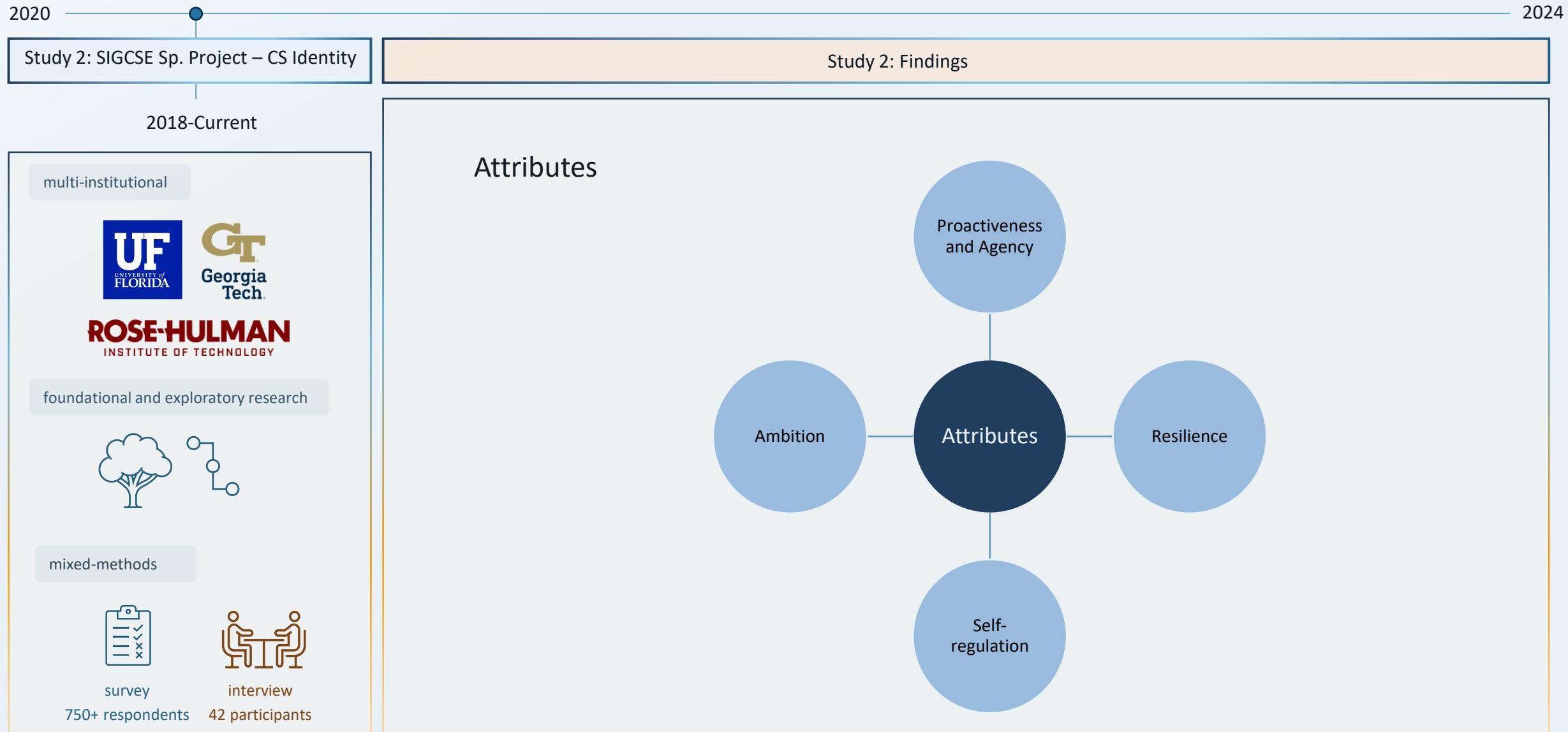
interview

750+ respondents 42 participants

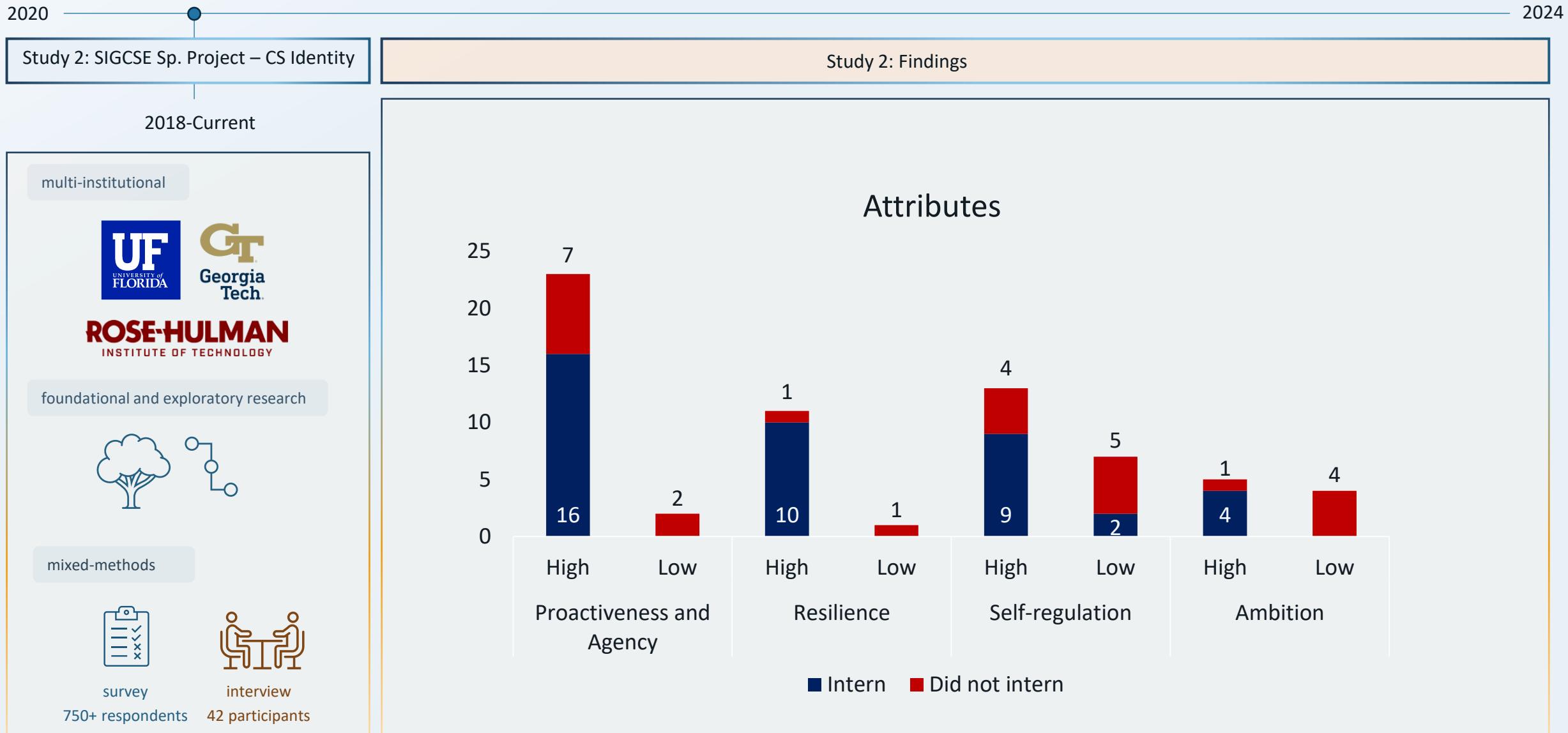
## Data analysis



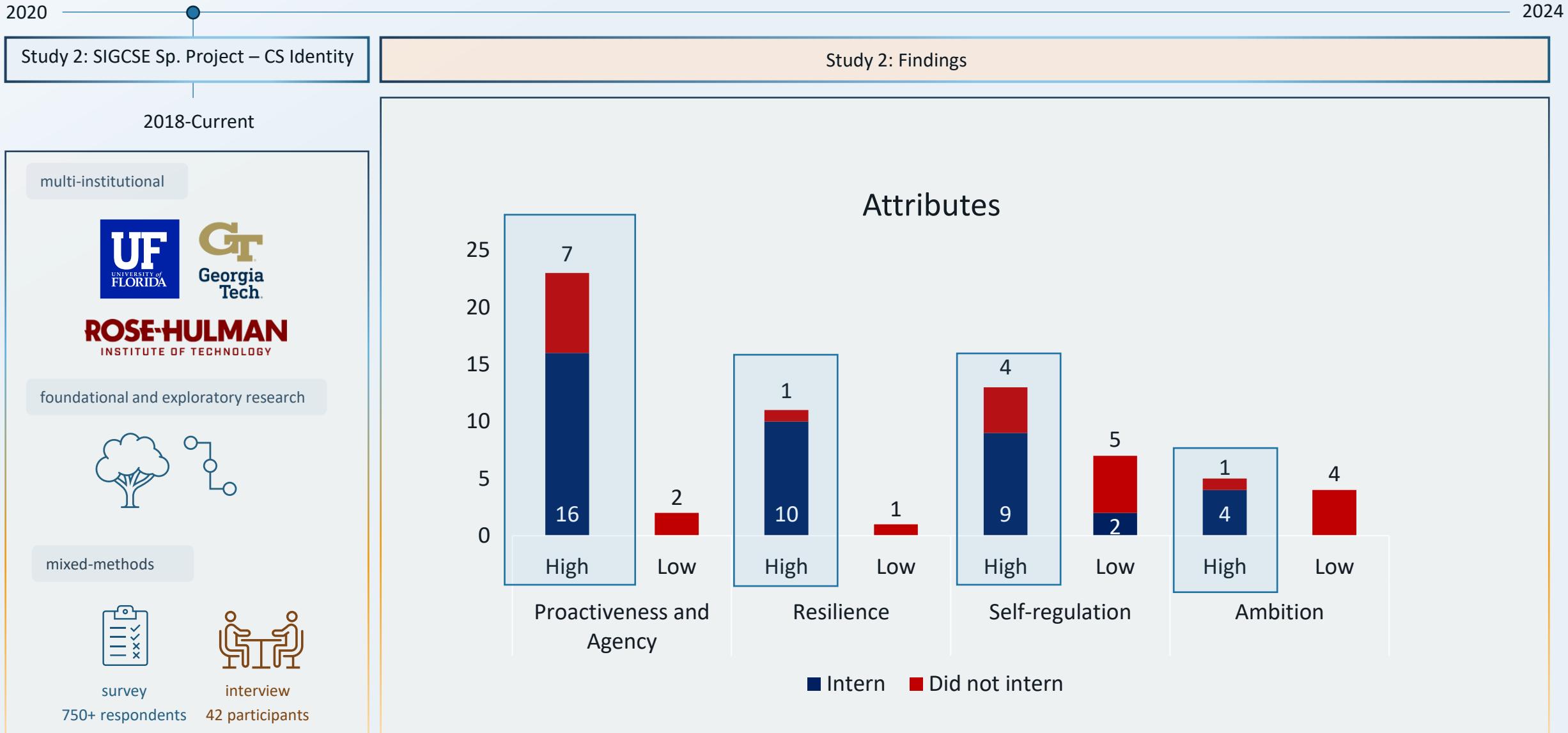
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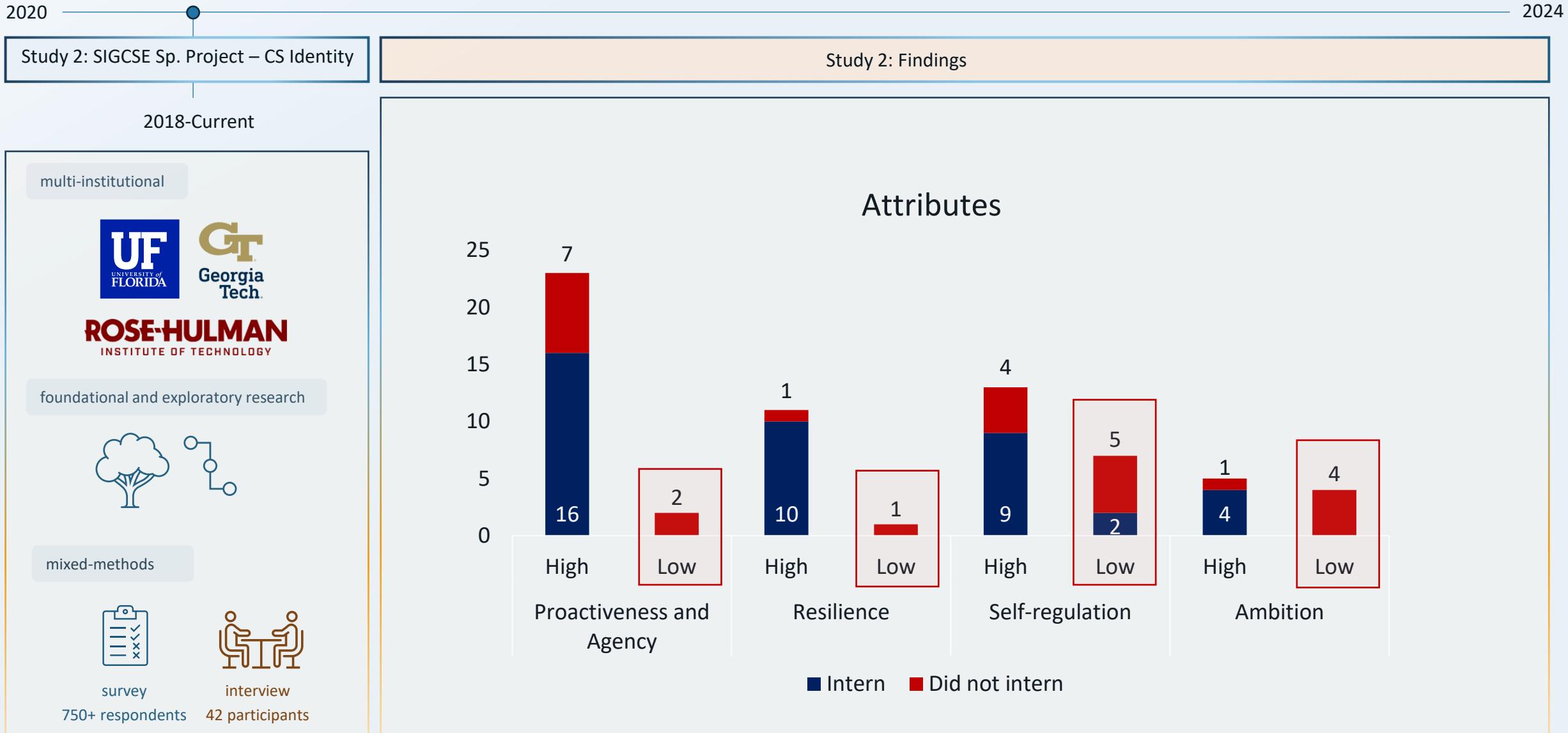
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# Developing Personas: Fitting in altogether



# Developing Personas: Fitting in altogether

2020

Study 2: SIGCSE Sp. Project – CS Identity

2024

Study 2: Findings

2018-Current

multi-institutional



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mixed-methods



survey



interview

750+ respondents

42 participants

## High Proactiveness and Agency



**High Intentionality:** Took initiative in their growth



**Skill Building:** Learned independently & collaboratively



**Internship Applications:** Applied & prepared for opportunities



**Active Engagement:** Joined clubs, hackathons, mentoring & research

I feel what has been **unique about me particularly is my proactivity**. I feel that being proactive has really set me forward, and so I say that I haven't seen the same proactivity in other students. [Proactivity is] **being willing to email, to reach out, talk to recruiters, go to CDW [career development workshop], practice for interviewing, going to interviews, so companies come to events or host events, going to those, it's talking to professors.**



P900



Male, Senior Year



2 Internships



2 at Big 5 Tech

# Developing Personas: Fitting in altogether

2020

2024

Study 2: SIGCSE Sp. Project – CS Identity

Study 2: Findings

2018-Current

multi-institutional



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survey



interview

750+ respondents

42 participants

## High Resilience



**Resilient Mindset** – Persisted through rejections & setbacks



**Determined Effort** – Kept applying despite multiple failures



**Long-Term Commitment** – Stayed motivated over years



**Growth-Oriented** – Learned from failures & improved

SpaceX isn't the best about getting back to you, but they did give me some feedback, though. For them, it was just other candidates had more experience at that time. **I wasn't deterred**, just every interview, whether or not you get turned down, is good experience, because it teaches you how to interview better the next time. **Each time you get interviewed, you learn what to say and what not to say, and you become more confident**, because a lot of the time the first time people get interviews, they're very shy, or they don't quite know how to respond correctly, with the certain amount of confidence, because it's very important not to have too much confidence, but it's also important to have a little bit. Just the right amount.

Avatar icon P679

Male, Super-Senior Year

Briefcase icon internship as a test engineer at a defense contractor

Pencil icon shared that he "applied from sophomore year to my senior year"

# Developing Personas: Fitting in altogether

2020



Study 2: SIGCSE Sp. Project – CS Identity

2024

Study 2: Findings

2018-Current

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survey



interview

750+ respondents

42 participants

## Summary of Attributes



### Participants who interned

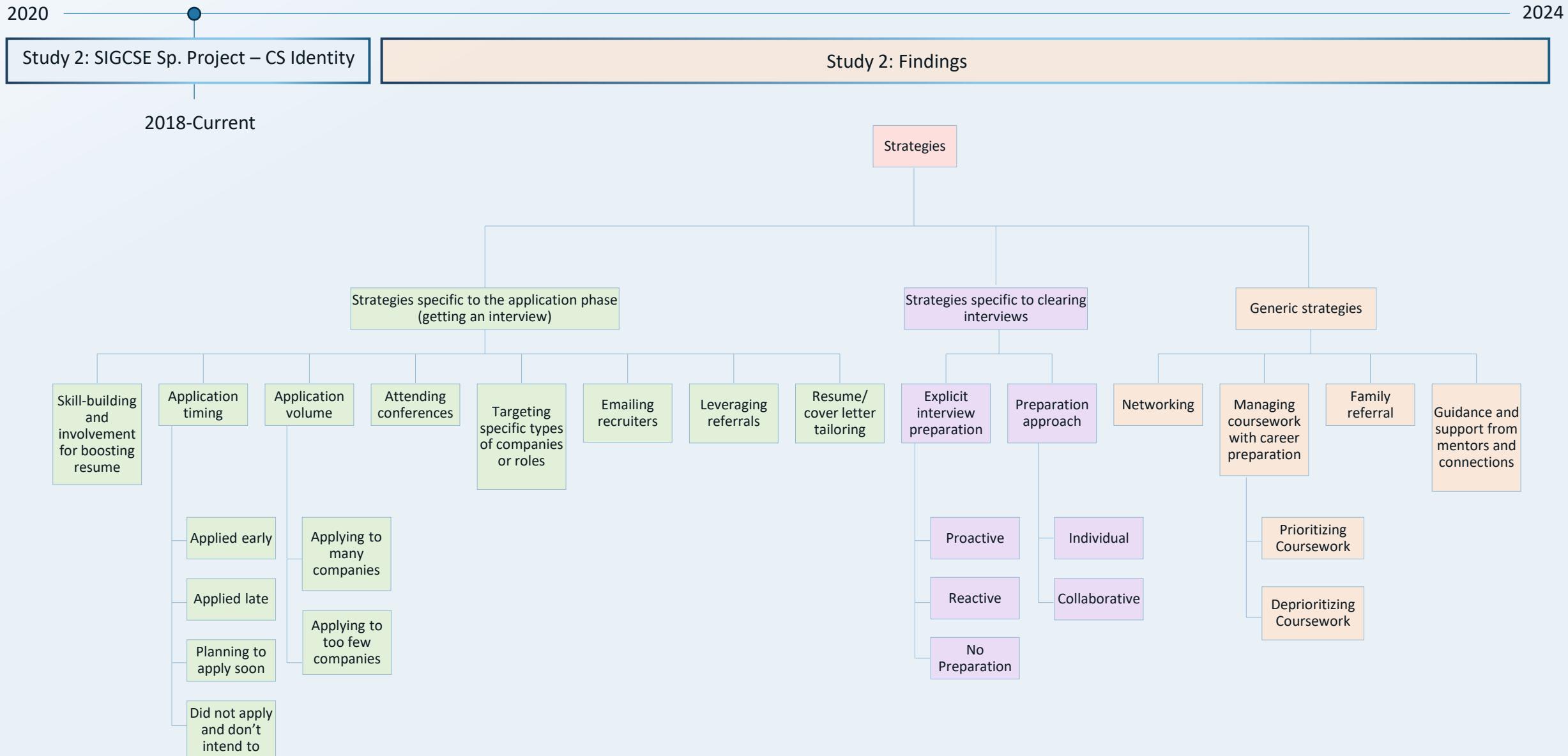
- ✓ **High Proactiveness** – Took initiative in career growth
- ✓ **Strong Sense of Agency** – Actively shaped their future
- ✓ **Resilience** – Bounced back from setbacks
- ✓ **Self-Regulation** – Managed time & goals effectively
- ✓ **Ambitious Career Aspirations** – Pursued long-term success



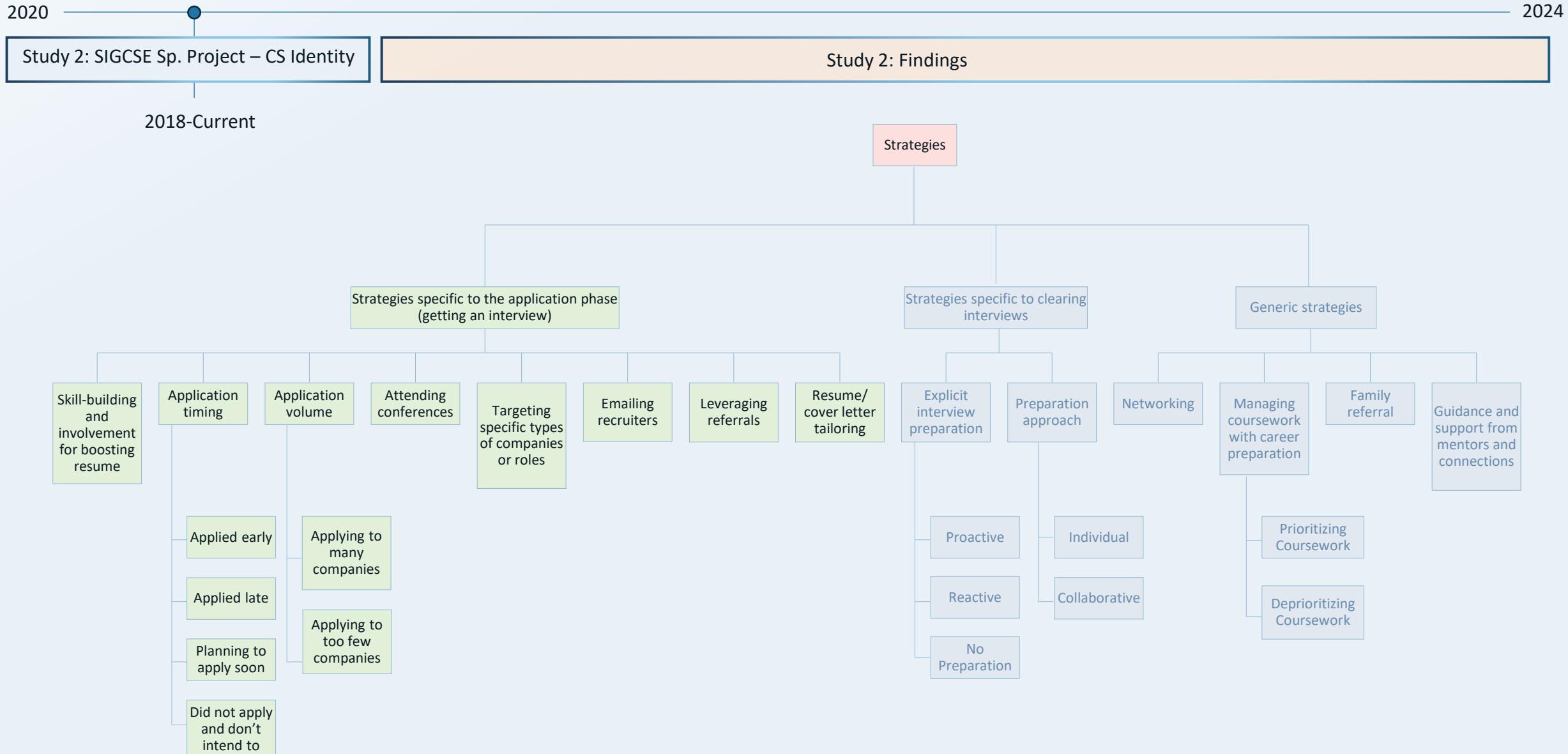
### Participants who did not intern

- ✗ **Lower Agency** – Less control over career preparation and goals
- ✗ **Reduced Proactiveness** – Fewer efforts toward opportunities
- ✗ **Weaker Self-Regulation** – Struggled with discipline & planning
- ✗ **Complacency Risk** – Limited motivation for skill development

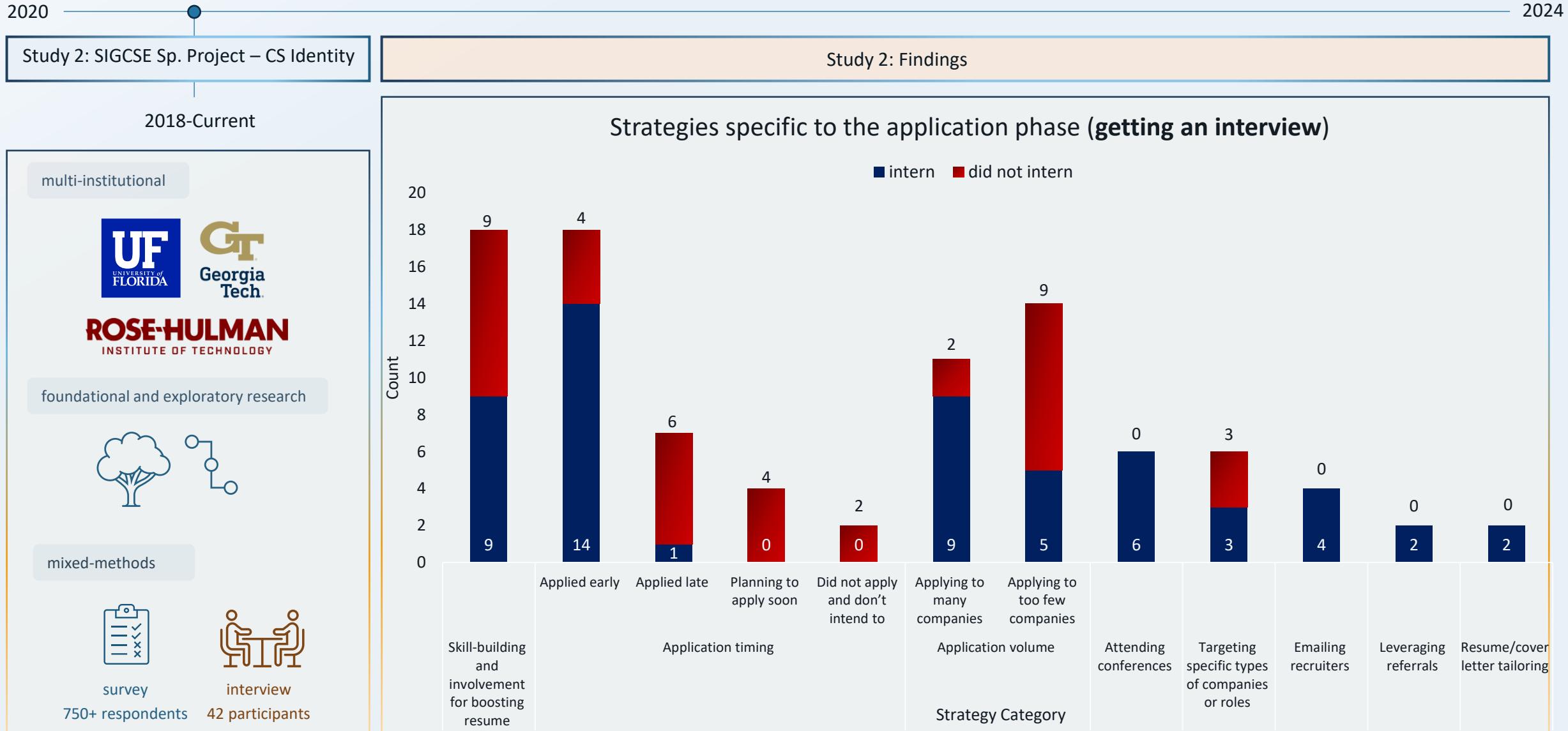
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# Developing Personas: Fitting in altogether



# Developing Personas: Fitting in altogether

2020

2024

Study 2: SIGCSE Sp. Project – CS Identity

Study 2: Findings

2018-Current

multi-institutional



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mixed-methods



survey



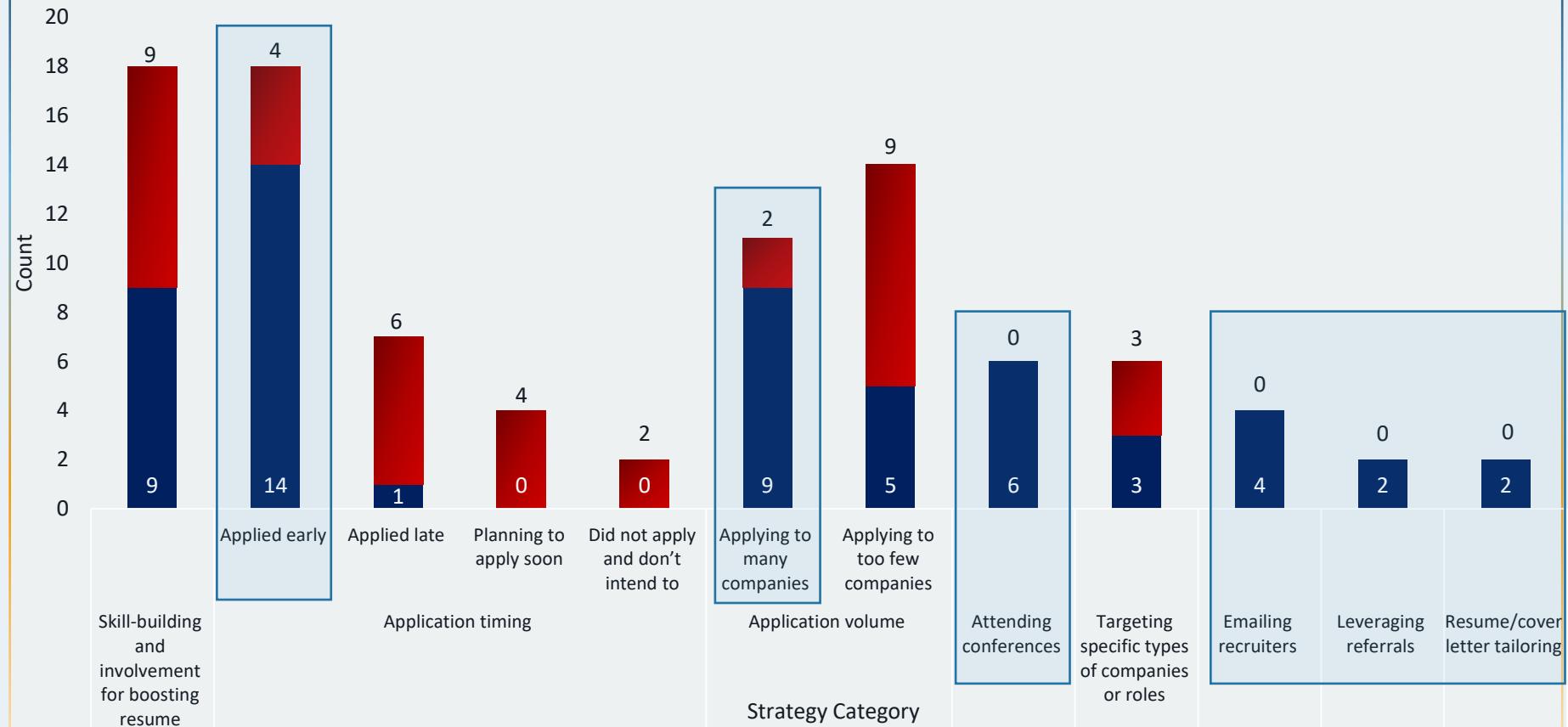
interview

750+ respondents

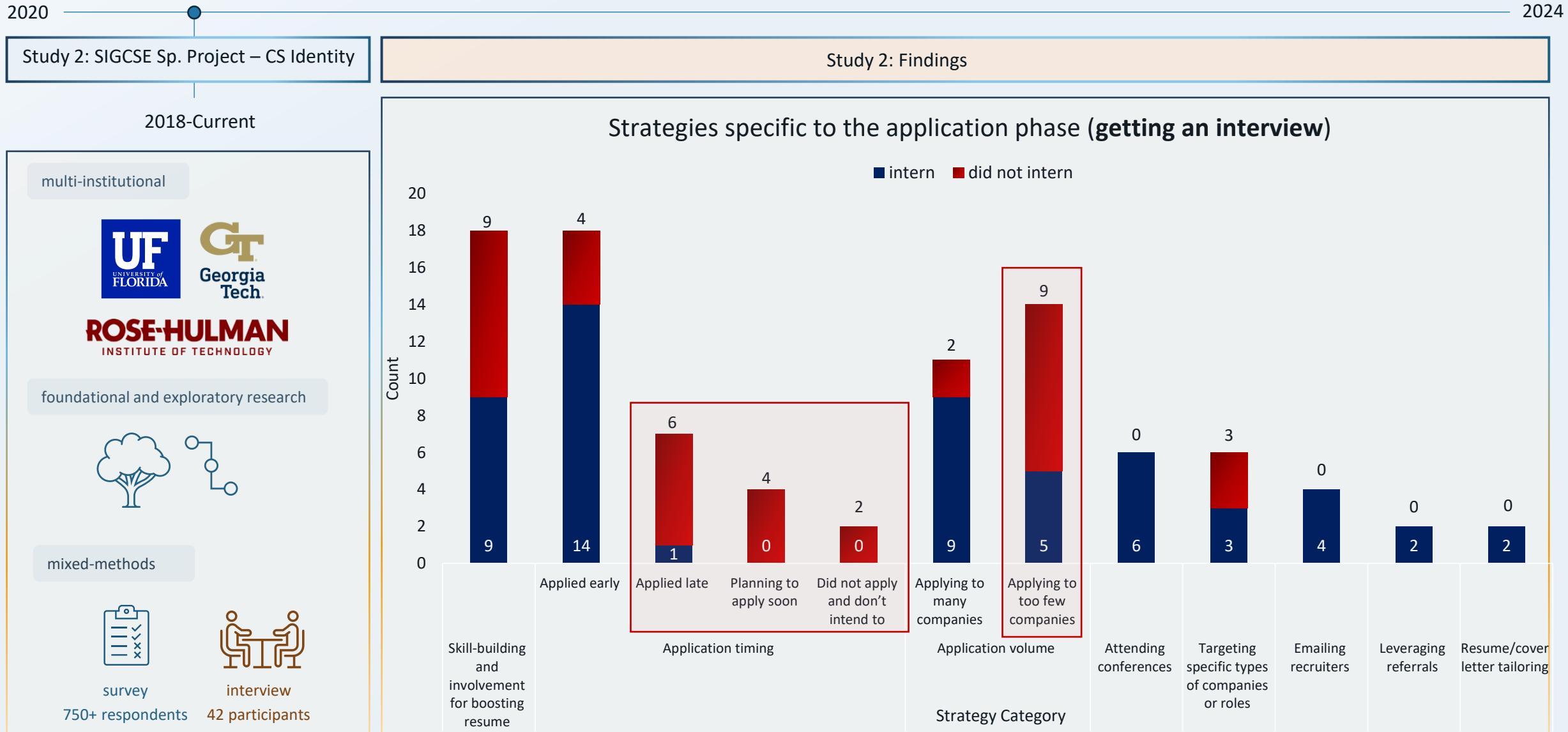
42 participants

Strategies specific to the application phase (getting an interview)

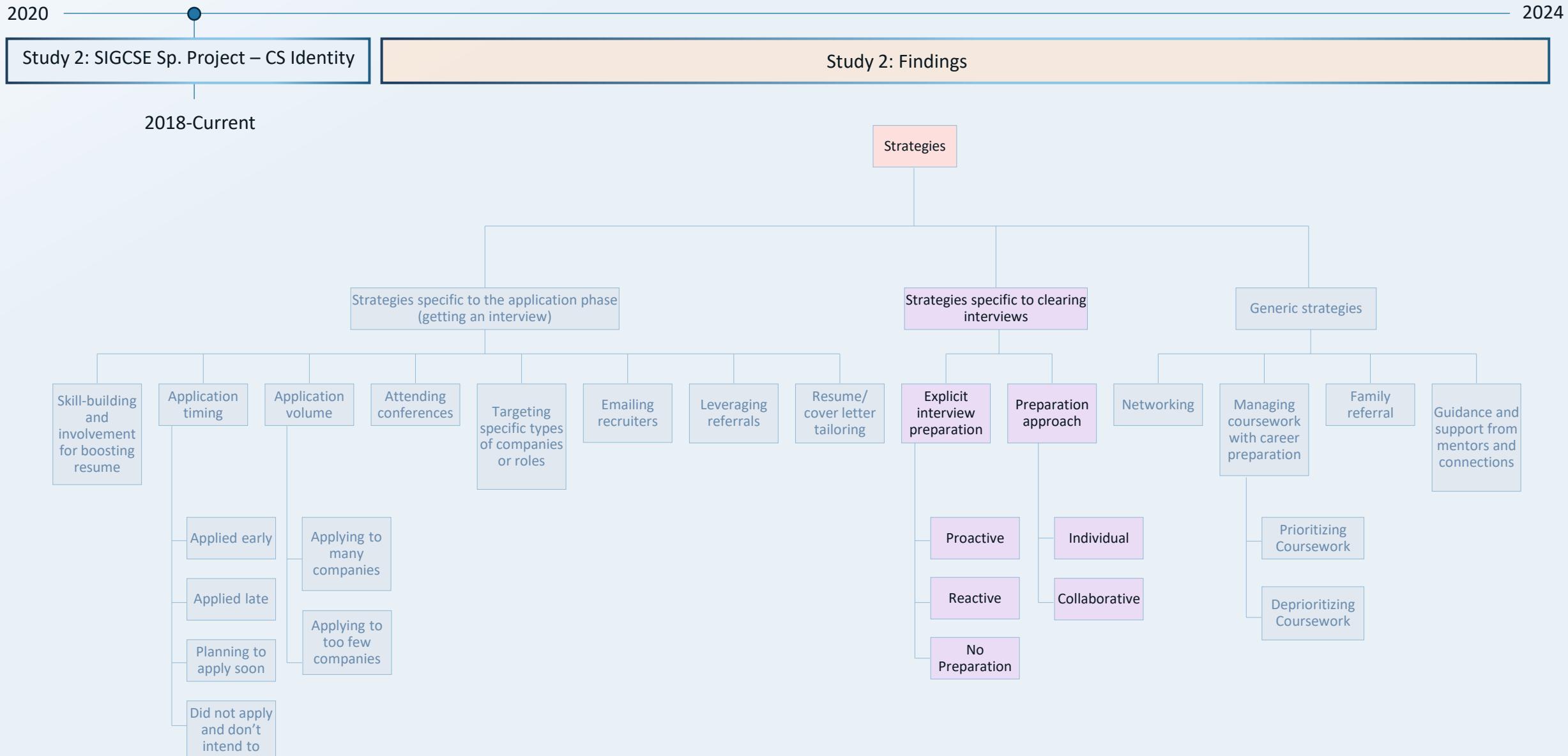
■ intern ■ did not intern



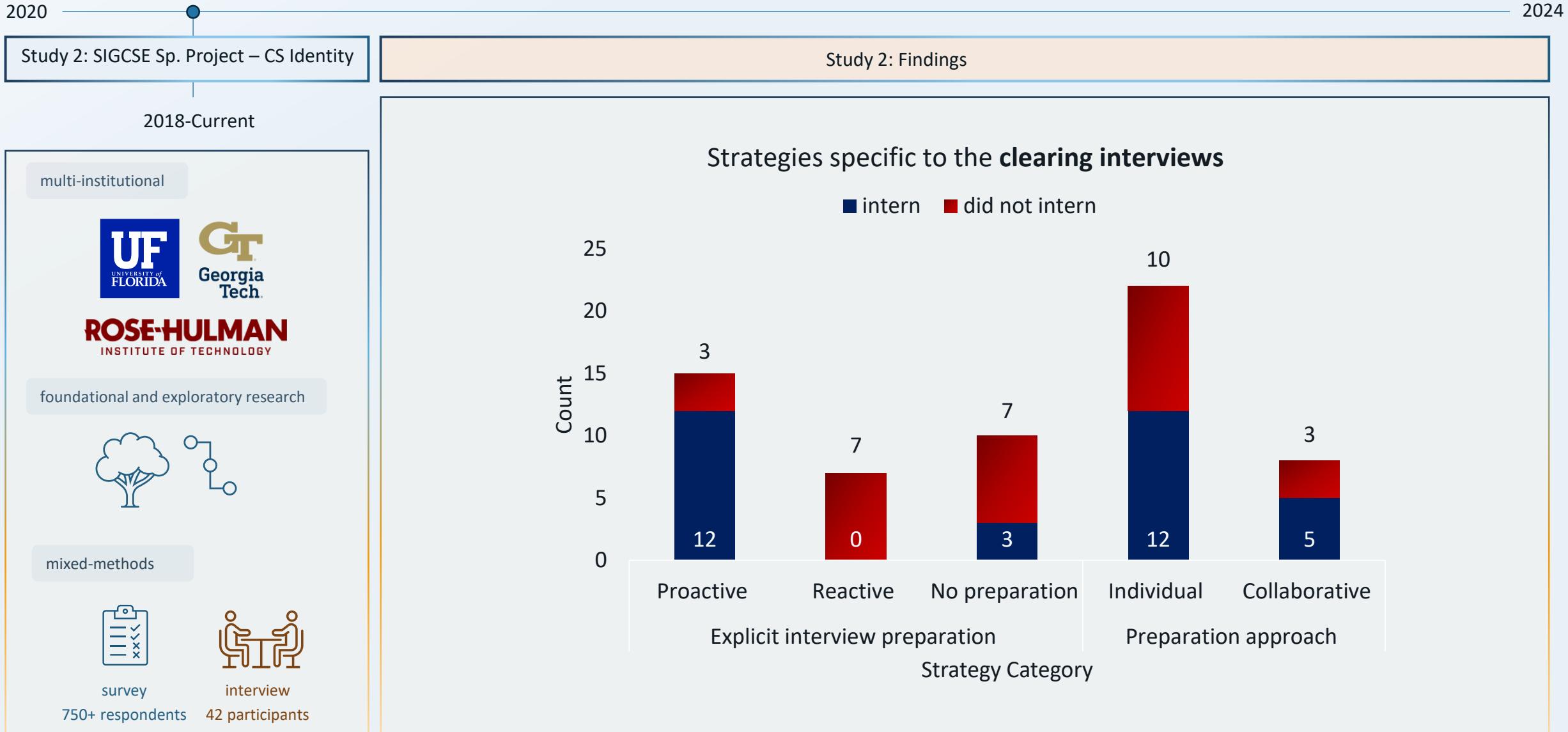
# Developing Personas: Fitting in altogether



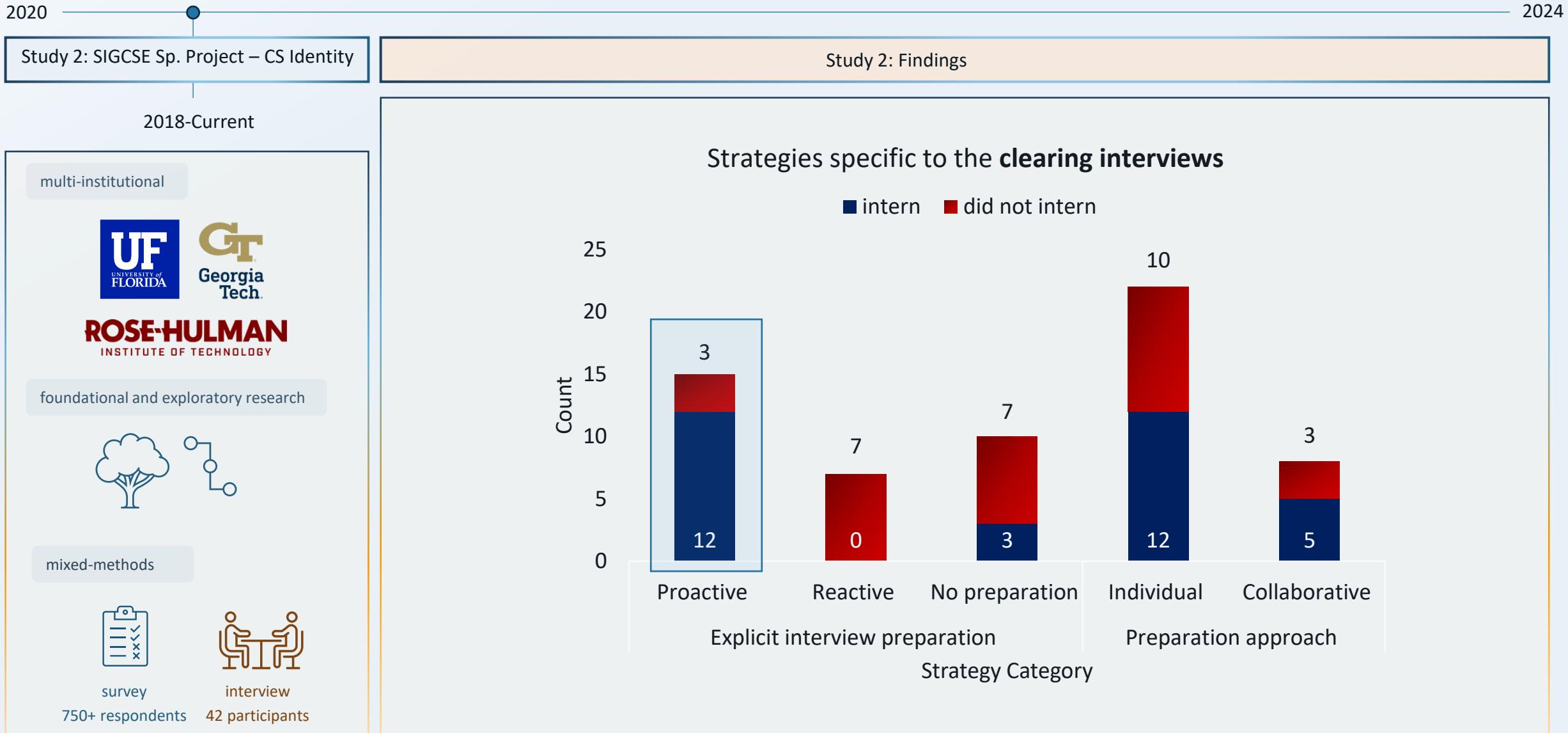
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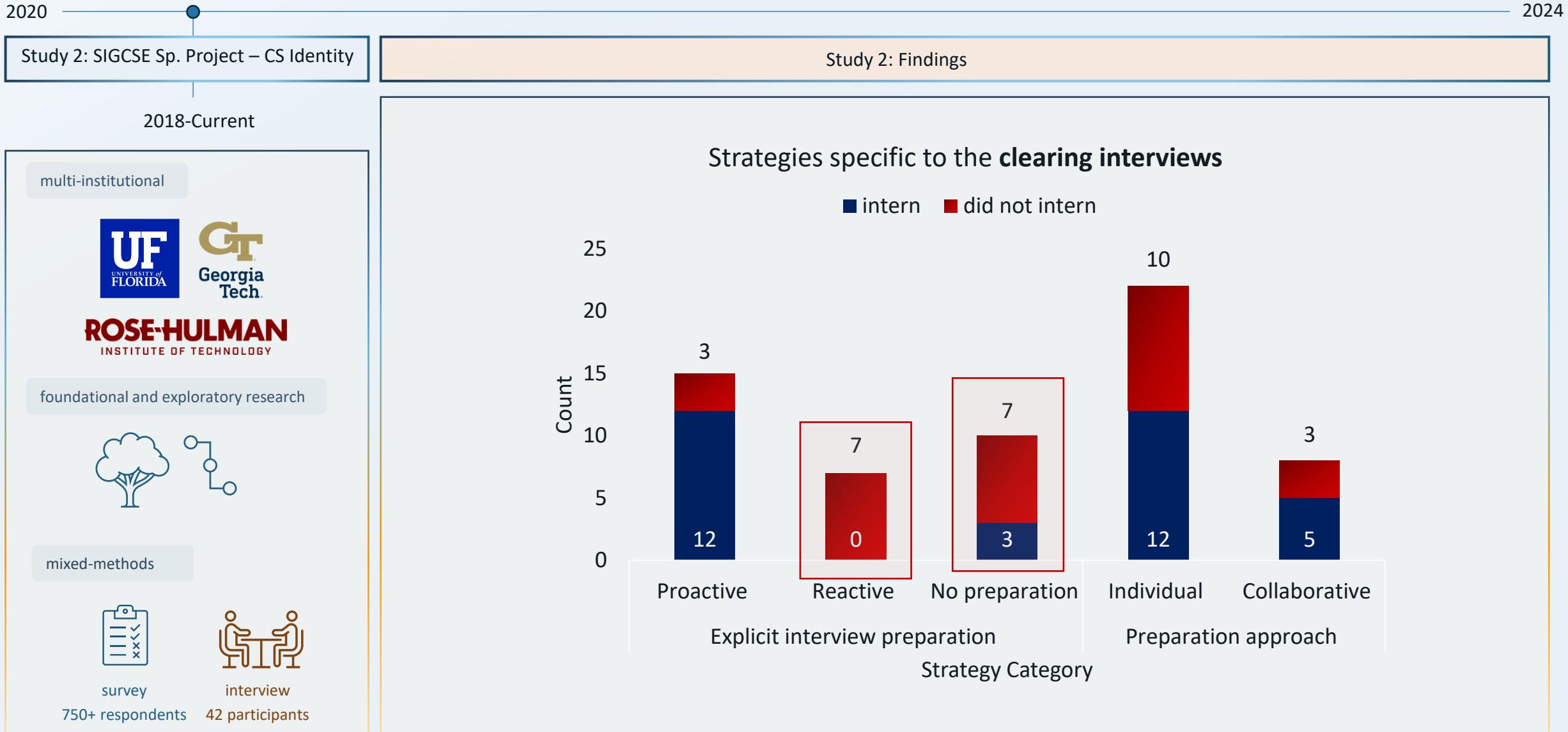
# Developing Personas: Fitting in altogether



# Developing Personas: Fitting in altogether



# Developing Personas: Fitting in altogether



# Developing Personas: Fitting in altogether

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survey



interview

750+ respondents

42 participants

## Proactive Interview Prep

I did probably **60 [Leetcode] questions [before interview]**, which is very on the lower end. I know a lot of people who do 300+ to get these jobs. And I did a mixed bag. So, I did **five dynamic programming questions, five tree problems, five graph problems, so forth, just to like have a general grasp of how to handle these problems.** [...] And I **did a lot of mock interviews.** So, me and my friends, I'd mock interview one of them, they'd mock interview me. Then we'd handle the next guy. So, it was **probably 15, 20 mock interviews** throughout the semester.

## Reactive Interview Prep

**Before the Arizona [interview] last Friday or last Thursday, I spent a few days, two hours each, looking at the top 50 Java questions.** And then, if I ran out, I just go to the next website with those top 50 interview questions.

👩 P341  
graduation cap icon Female, Senior Year  
🚫 Did Not Intern

## No preparation

I haven't really ventured into taking, I know I have some friends who do like leetcode and stuff like that, but I haven't really touched anything like that. It's mainly just classes right now.

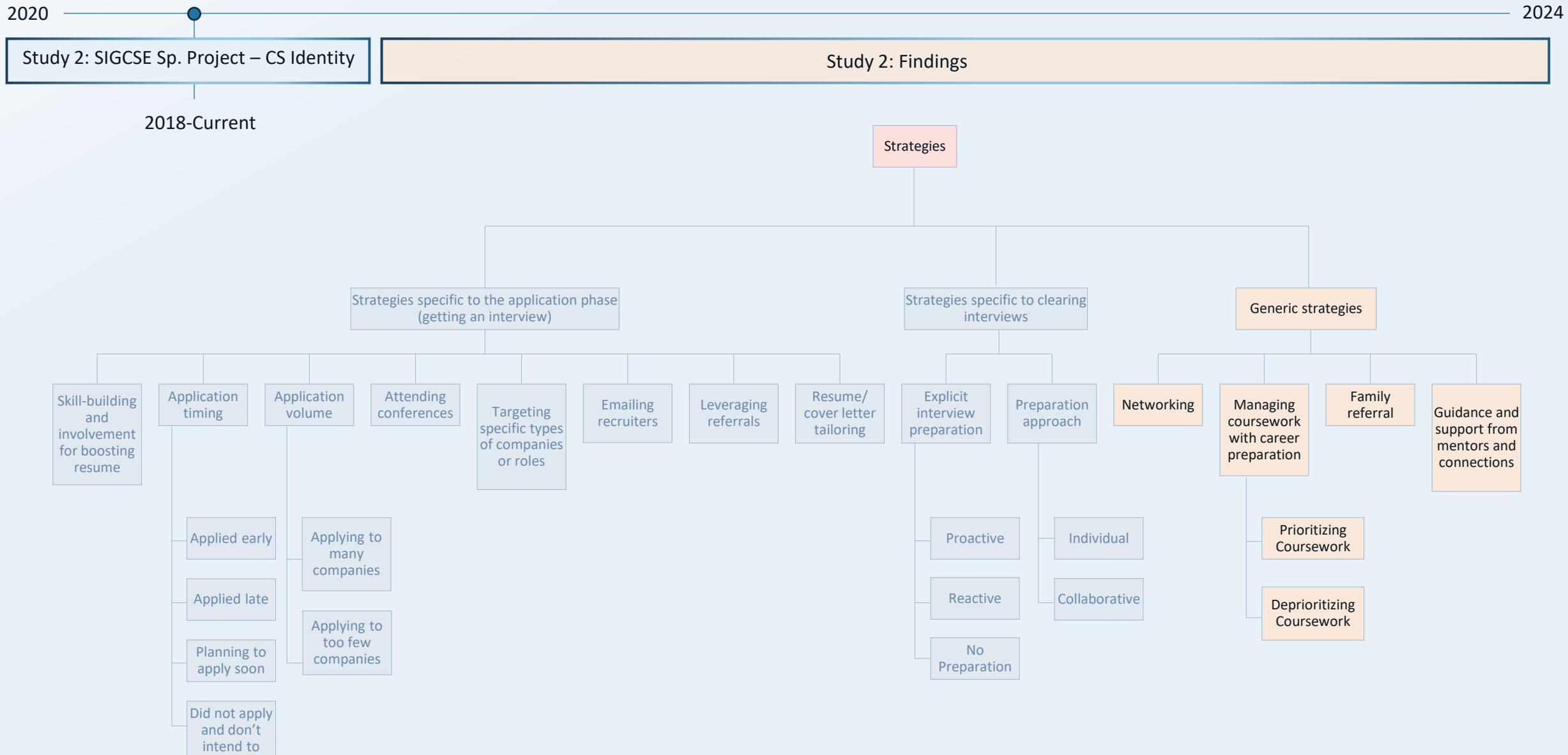


P690

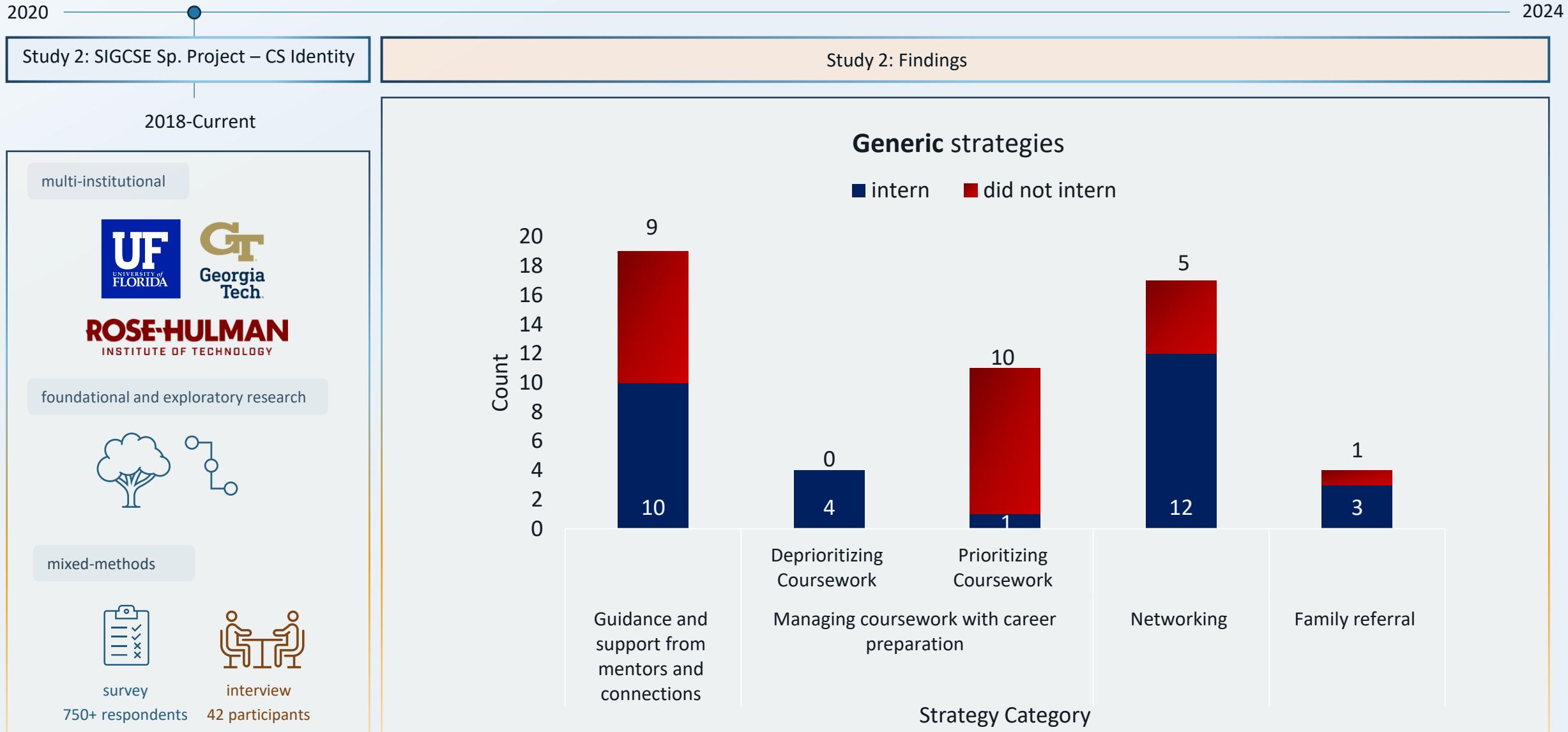
🎓 Male, Senior Year  
🚫 Did Not Intern  
🔴 No Interview Prep – Only got resume 📄 ✓

👨 P794  
graduation cap icon Male, Junior Year  
💼 3 Internships  
💻 2 at Big 5 Tech

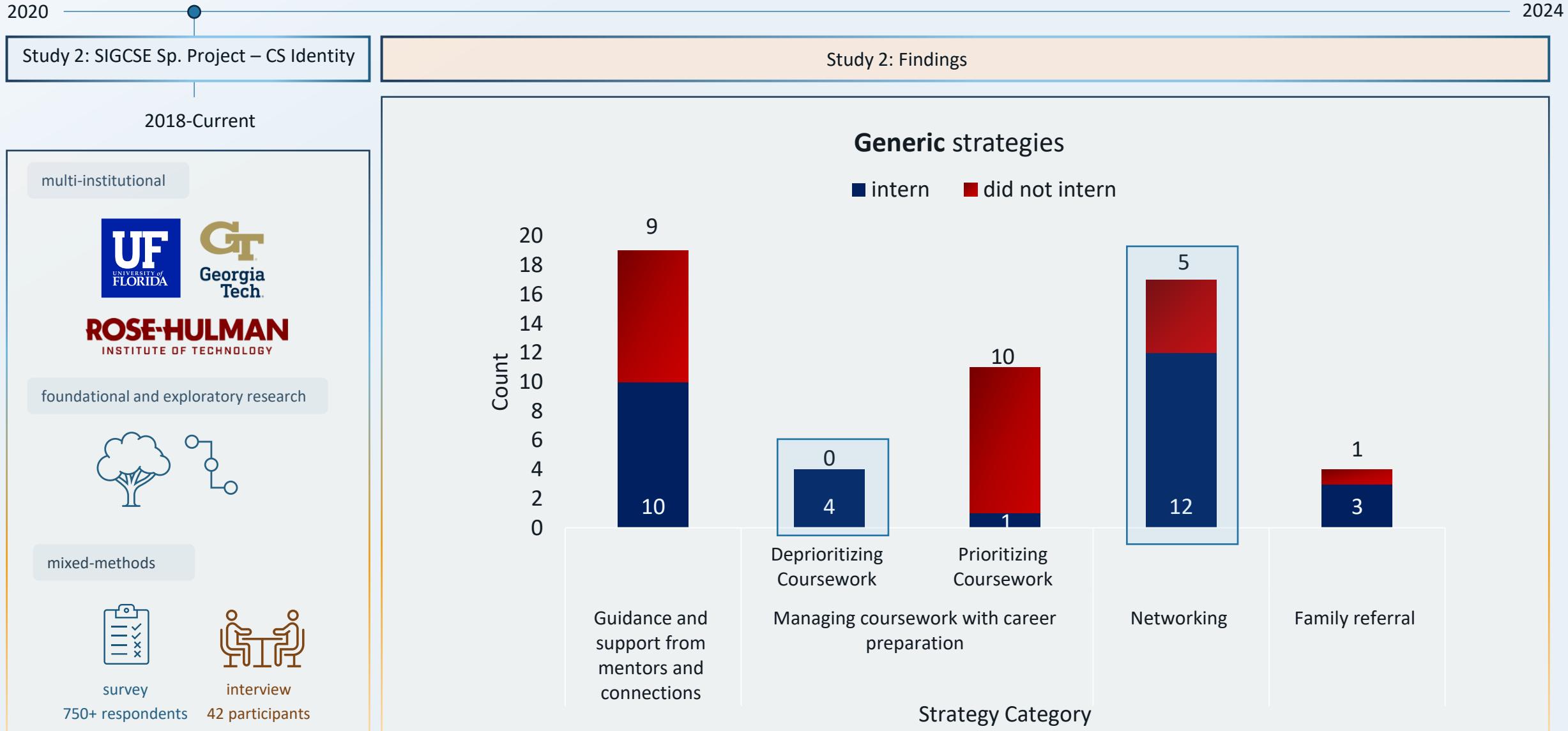
# Developing Personas: Fitting in altogether



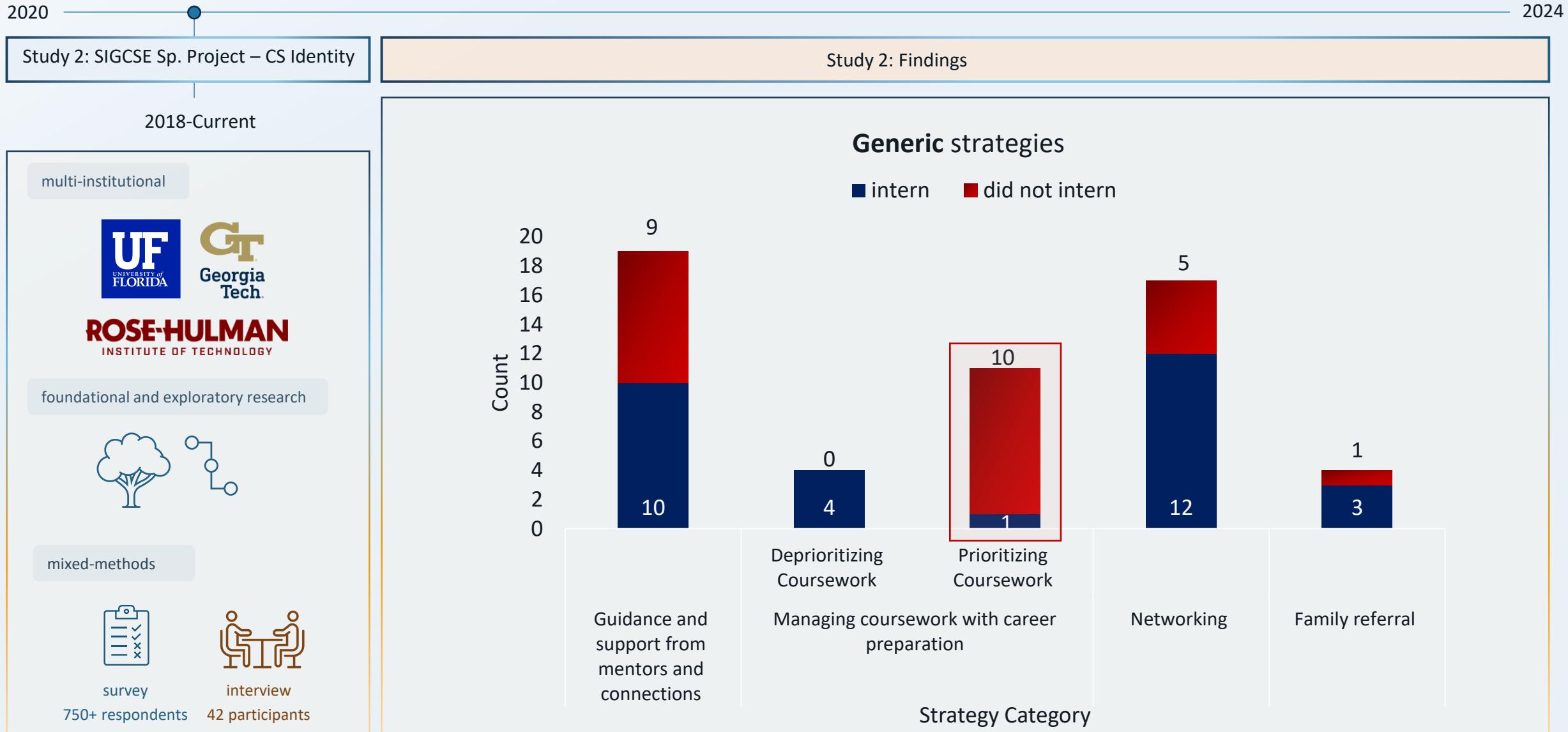
# Developing Personas: Fitting in altogether



# Developing Personas: Fitting in altogether



# Developing Personas: Fitting in altogether



# Developing Personas: Fitting in altogether

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survey



interview

750+ respondents

42 participants

## Deprioritizing Coursework

We [group of three peers practicing technical interviews] realized that since we had interviews already at all these major companies, we realized that we had to **step our game up** in terms of getting the job now. So, we **didn't give as much priority** as we should have to **class coursework**, and we kind of prioritized other things more than we did class work. So before doing my interview prep, I had a 4.0 GPA, after taking my interview prep, I can't say I have a 4.0 GPA anymore.

🟡💻 P440 | 🎓 Male, Junior Year  
💼 2 Internships | 💼 1 at Big 5 Tech

If I have proof that I'm going to interview and I have to fly out because they're flying me out, let me miss class. Let me miss a quiz, **because your quiz isn't more important than my career**.

🟡💻 P665 | 🎓 Male, Senior Year  
💼 1 Internship

## Prioritizing Coursework

I have **not attended any of them** [career fairs]. No. They usually **conflicted with my class schedule**.

🟡💻 P690 | 🎓 Male, Sophomore Year  
🚫 Did Not Intern

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survey



interview

750+ respondents

42 participants

## Summary of Strategies

### ✓ Participants who interned

- ⌚ **Applied Early** – Started in freshman/sophomore years
- ✉️ **Applied Broadly** – Sent applications to many companies
- 🎯 **Strategic Approach** – Attended conferences, networked, & emailed recruiters
- ⚖️ **Balanced Priorities** – Managed coursework & internship prep
- 🛠️ **Proactive Preparation** – Prepared for interviews before applying

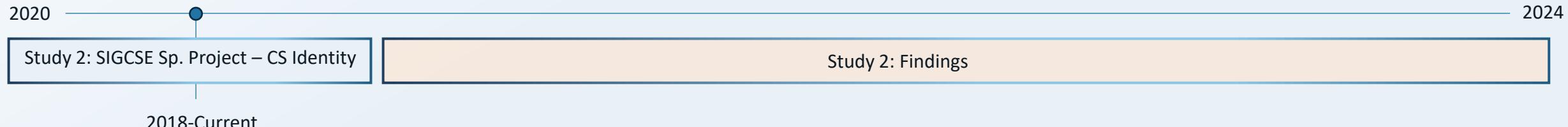
### ⚠ Participants who did not intern

- ⌚ **Applied Later** – Started applying in later years or still developing skills
- 📈 **Fewer Applications** – Sent applications to fewer companies
- 📚 **Prioritized Coursework** – Focused more on academics than job search
- ⌚ **Reactive Preparation** – Prepared for interviews only after getting one
- 🚫 **No Prep** – Some did not prepare for interviews at all

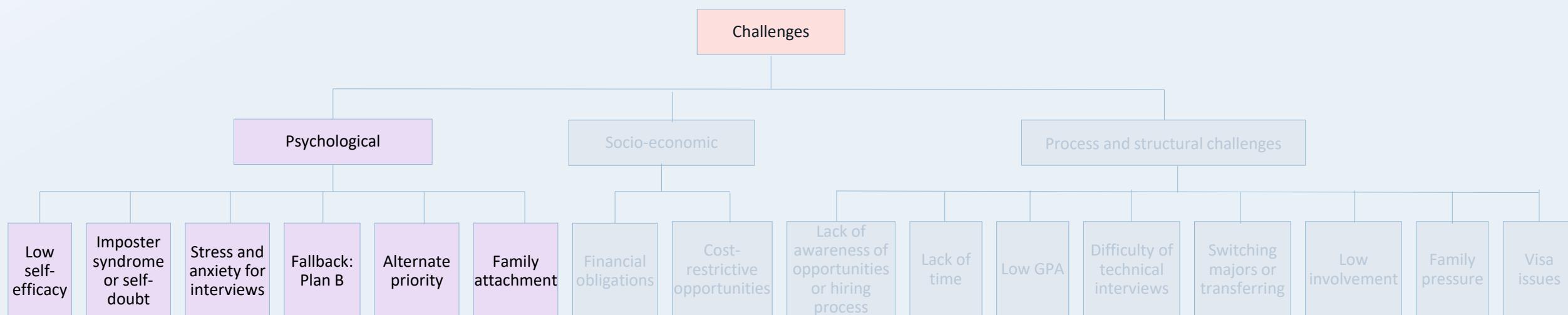
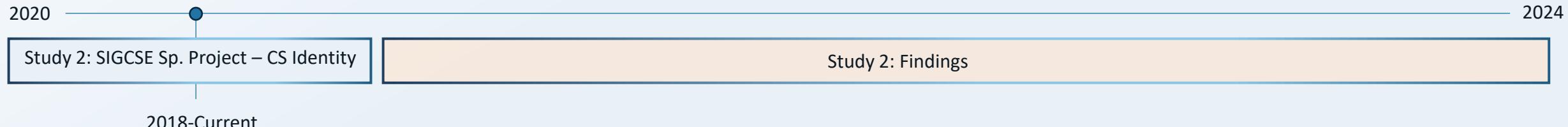
### ⌚ Common Factors

- 🛠️ **Skill Building** – Worked on improving technical & professional skills
- 💡 **Sought Guidance** – Learned from mentors & professional connections

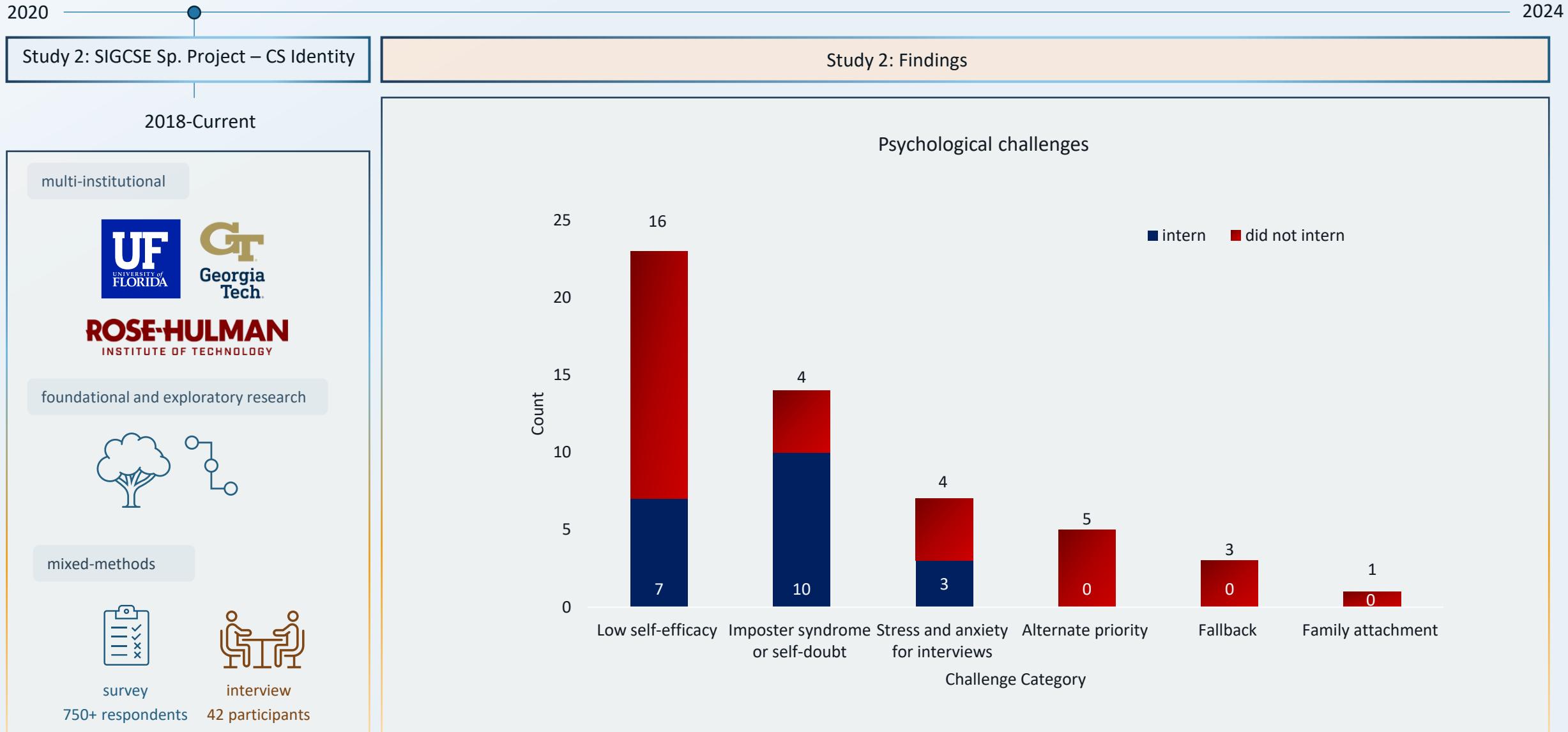
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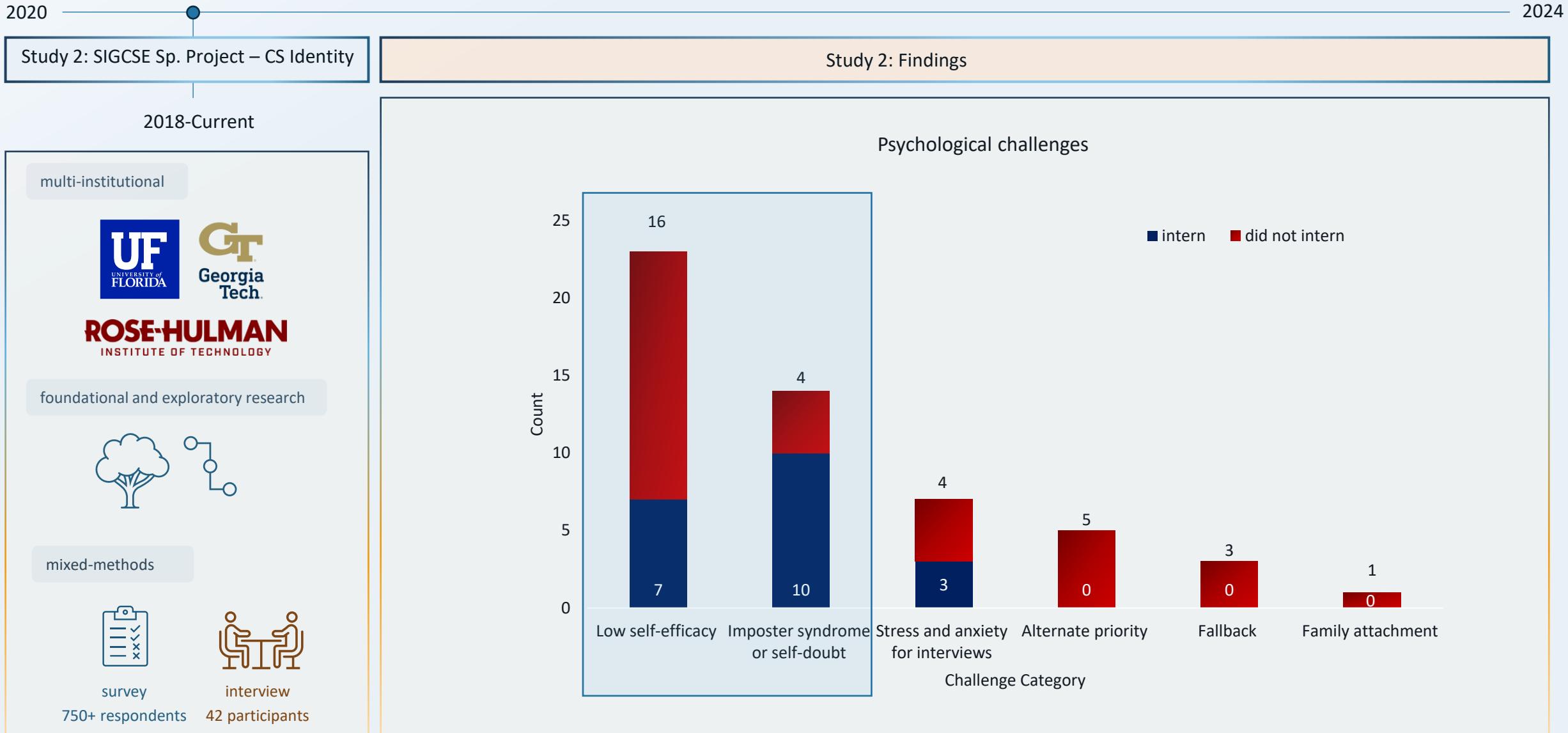
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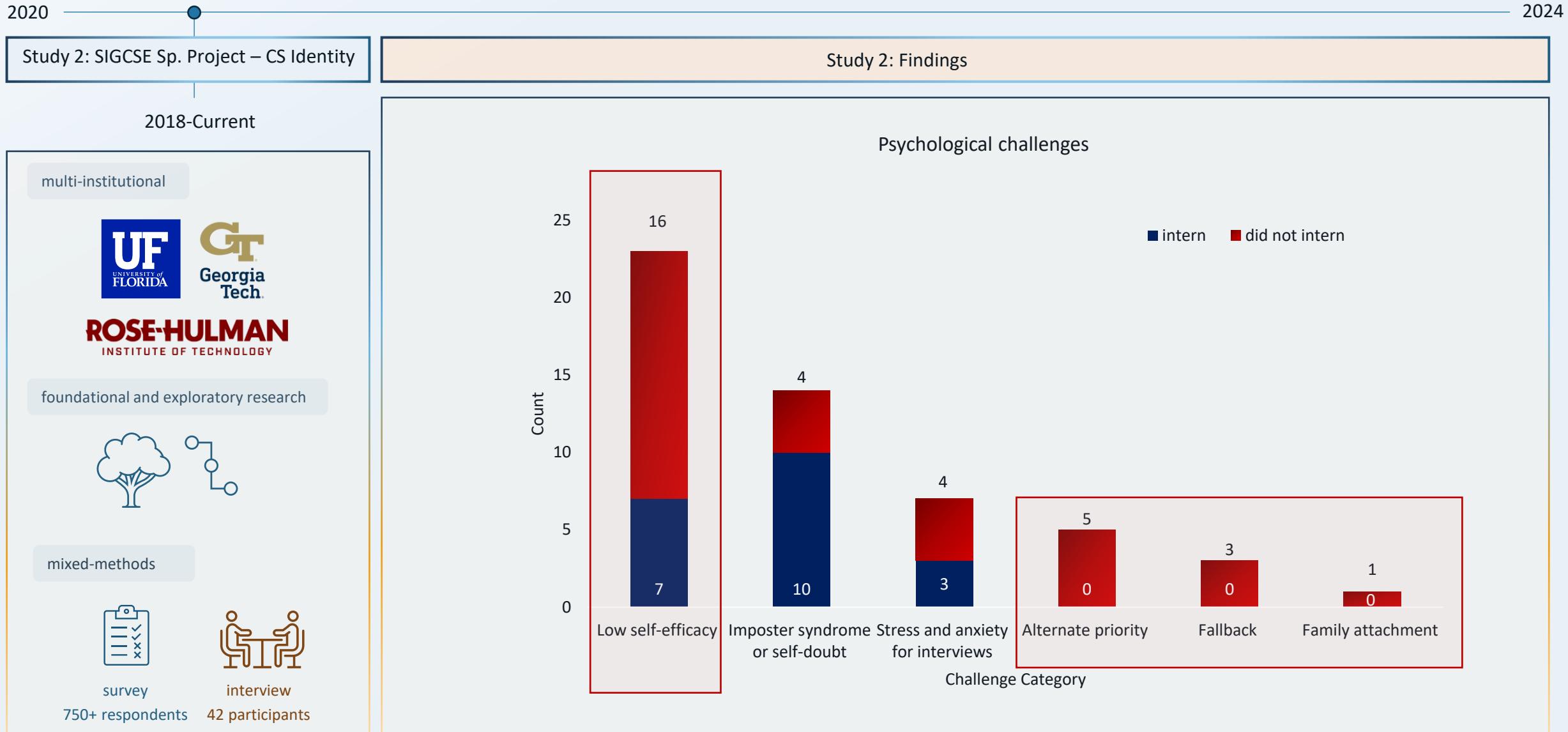
# Developing Personas: Fitting in altogether



# Developing Personas: Fitting in altogether



# Developing Personas: Fitting in altogether



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survey



interview

750+ respondents

42 participants

## Low Self-Efficacy

I think it's [failing technical interviews at small companies where he interviewed] because I didn't have that much experience with the technical coding, because I was still relatively new to coding at the time. And just my approach to coding, I'm not the most proficient. [...] I would say [I am] mildly confident in coding skills]. Because I'm still learning and still, even though it's been almost two years of being in the computer science program, I feel like I'm not as proficient, as I would like, so I'm not as confident.



P674

Male, Super-senior year, Transfer student



Did Not Intern

## Imposter Syndrome

A lot of the people that I hang out with I guess are super smart. Several of them had jobs after their freshman year [...]. I'm not an exceptional student. I'm very much like a B, C student. [...] I feel like it's one of those things where nobody blasts their insecurities and shares those. They always try to pretend like they have everything together. [...] So it's comparing yourself to other people, especially when you're at a school like Rose which is very, very hard. And I guess to some extent, I regret having chosen Rose only for this, since I feel like I'm a very small fish in a big pond. [...] It very much feels like imposter syndrome because you look around and you feel like everybody else is like so successful and you're like, God, what am I doing with my life? Because I feel like average.



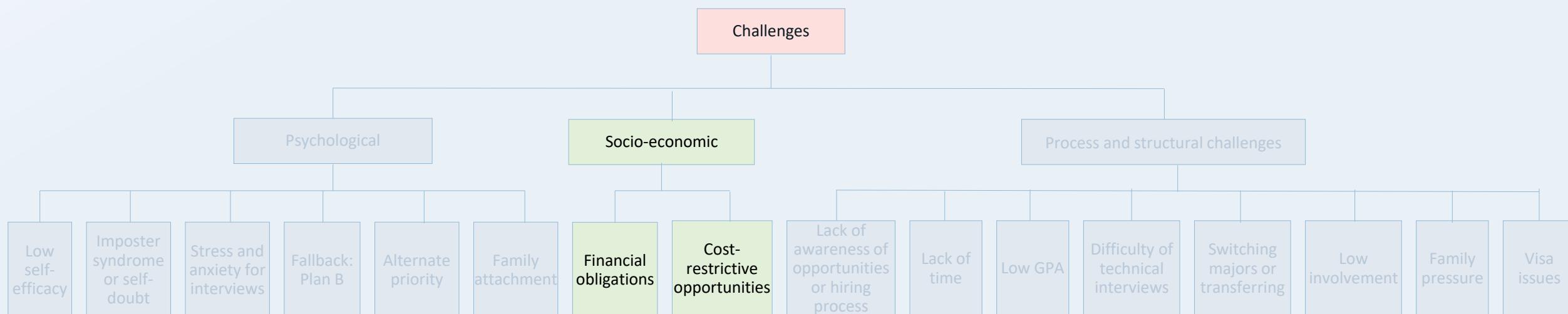
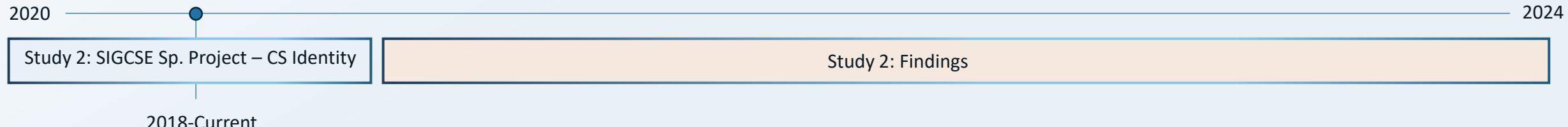
Y89

Female, Junior Year

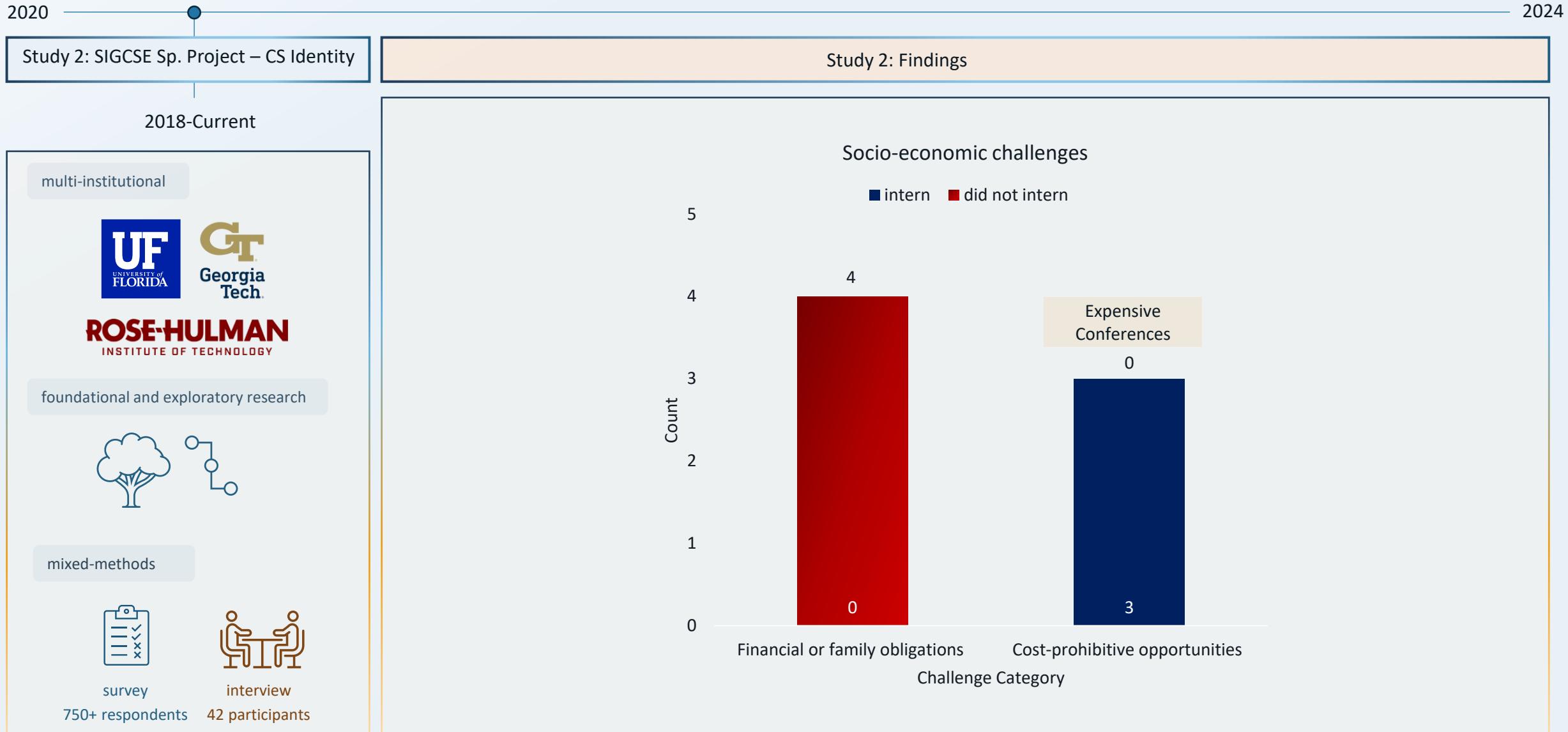


2 Internships

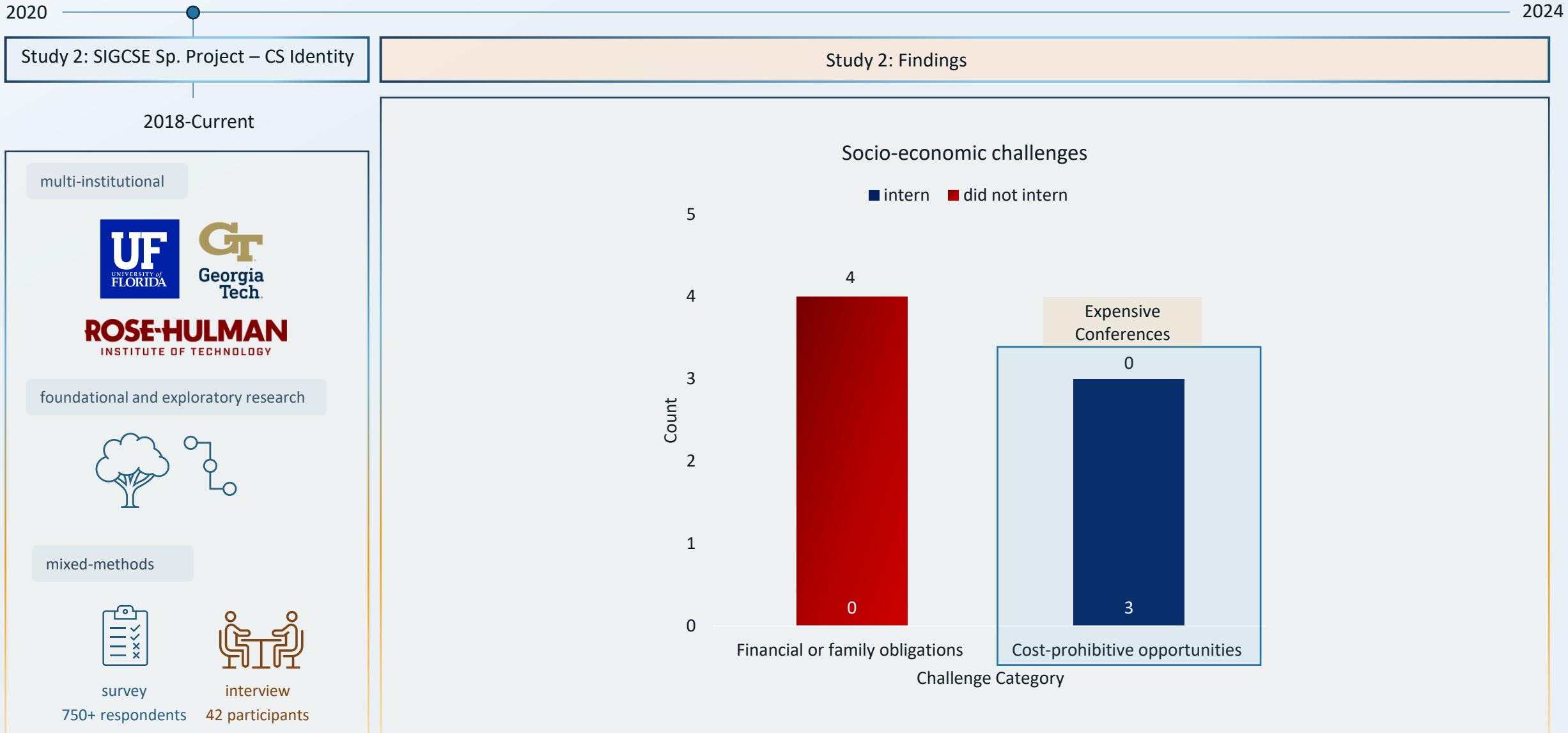
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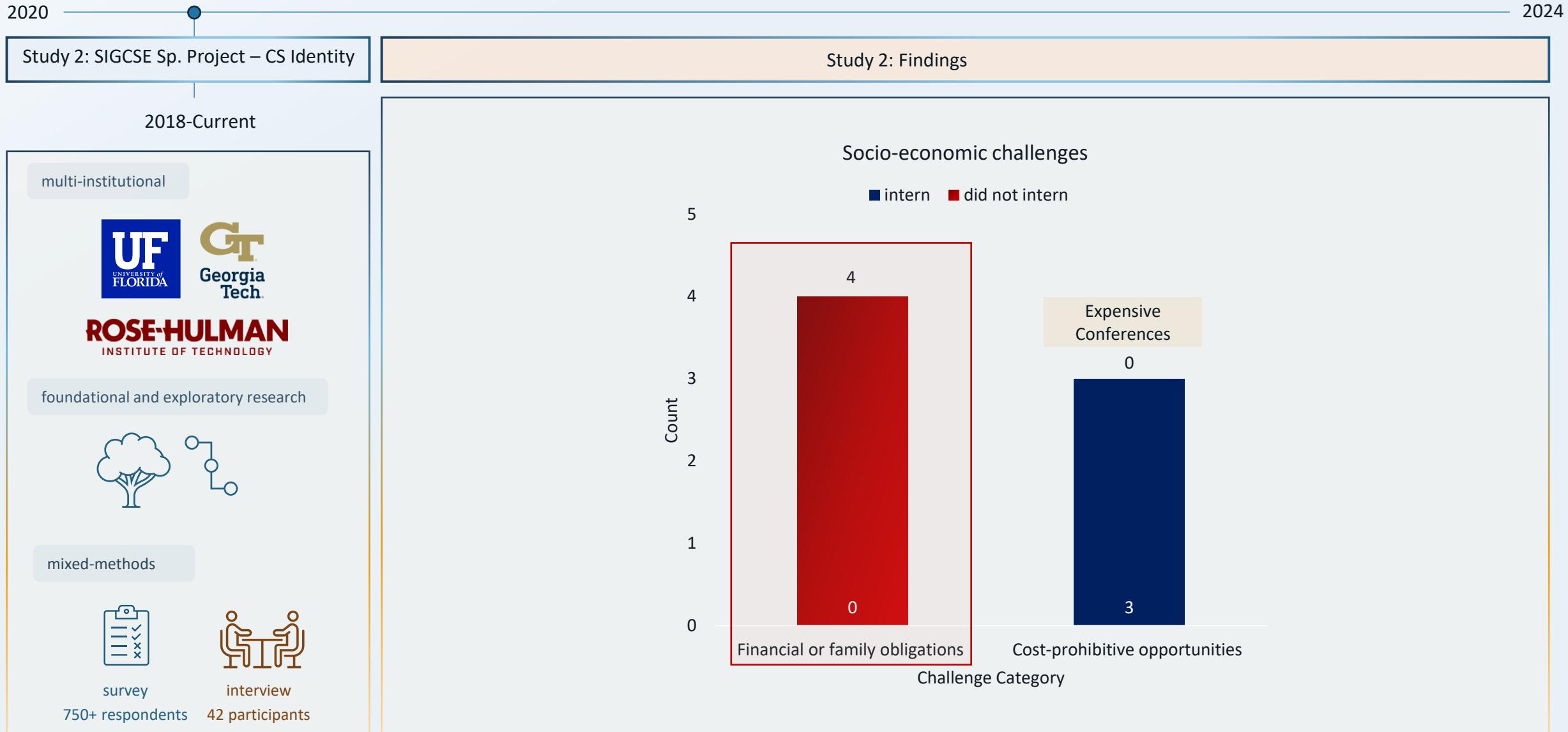
# Developing Personas: Fitting in altogether



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# Developing Personas: Fitting in altogether



# Developing Personas: Fitting in altogether

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survey

750+ respondents



interview

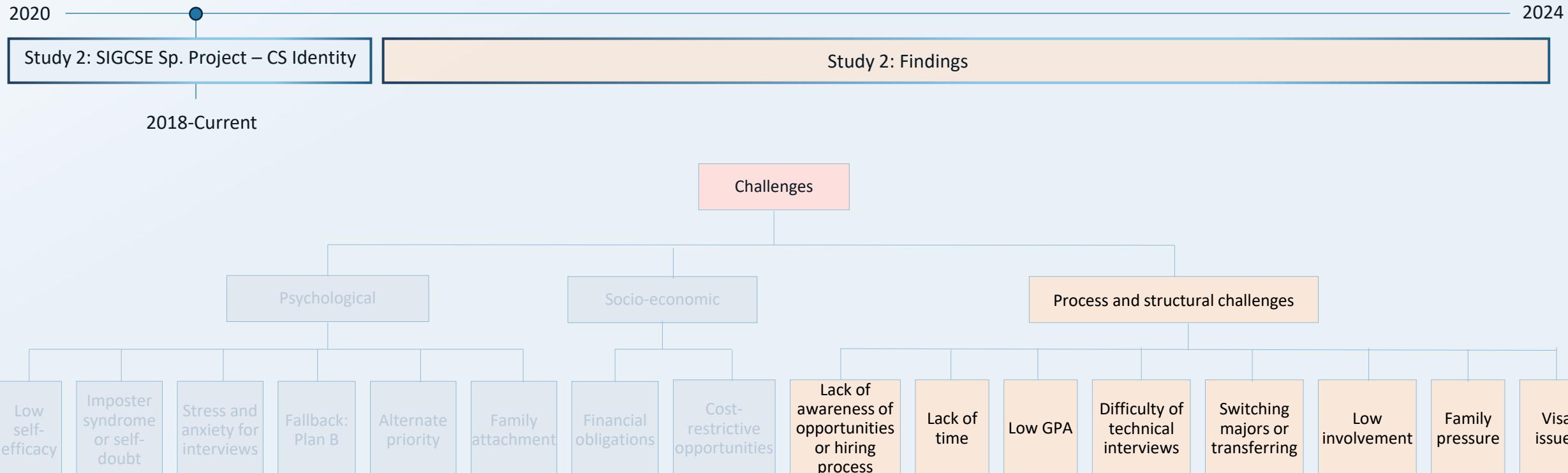
42 participants

## Financial Obligations

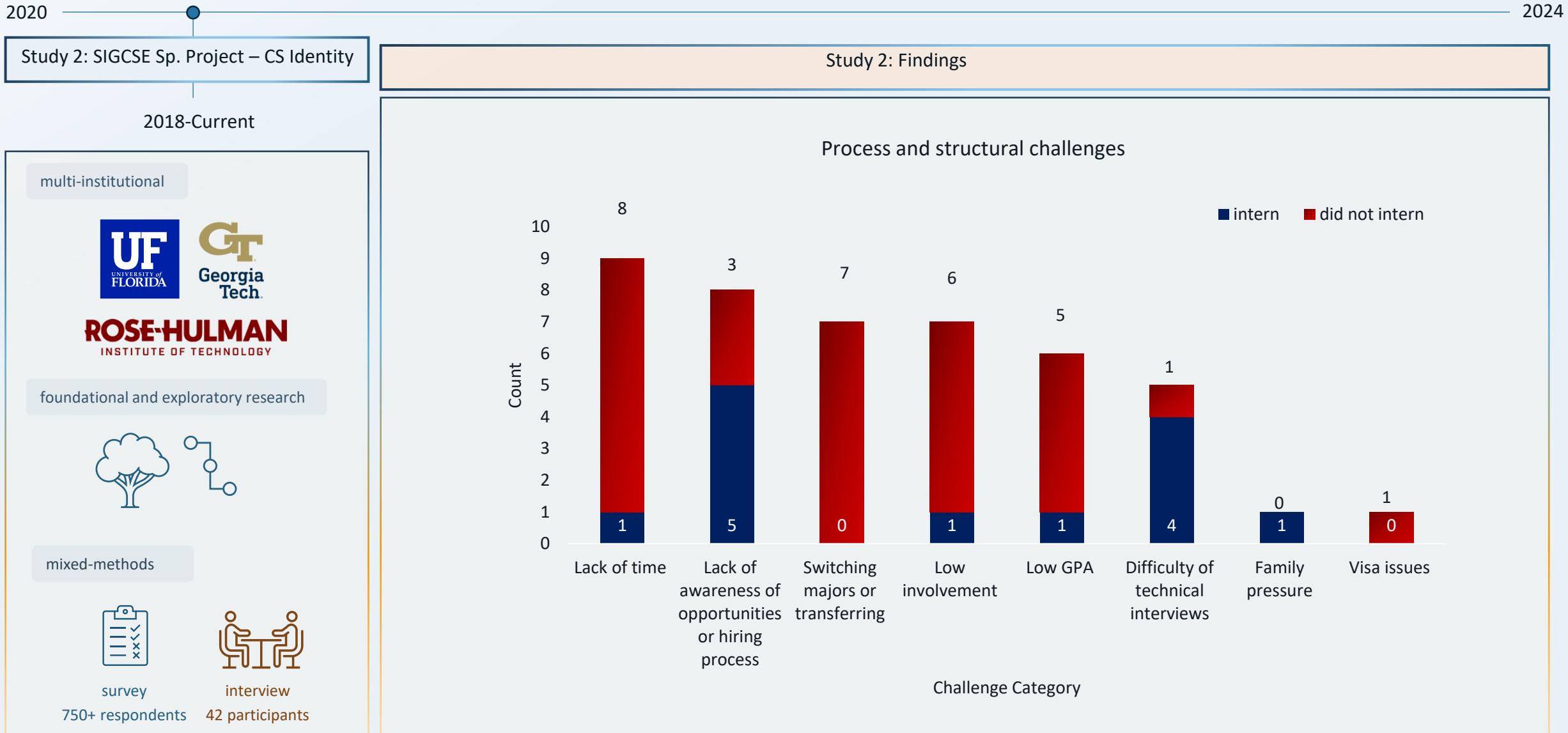
I've been **working since I basically started school**. So, I **don't have that much time left to work on projects or do anything much. Or do much else outside of my coursework.** [...] First my financial situation, just having to work a lot of hours a week to help maintain myself during college. That has taken a **toll on me, physically and mentally**, since I can't really work as much as I would like in my studies. But, also just the long hours that I have to work, both school and work, it's tiring.

👉💻 P315  
🎓 Male, Senior year  
🚫 Did Not Intern

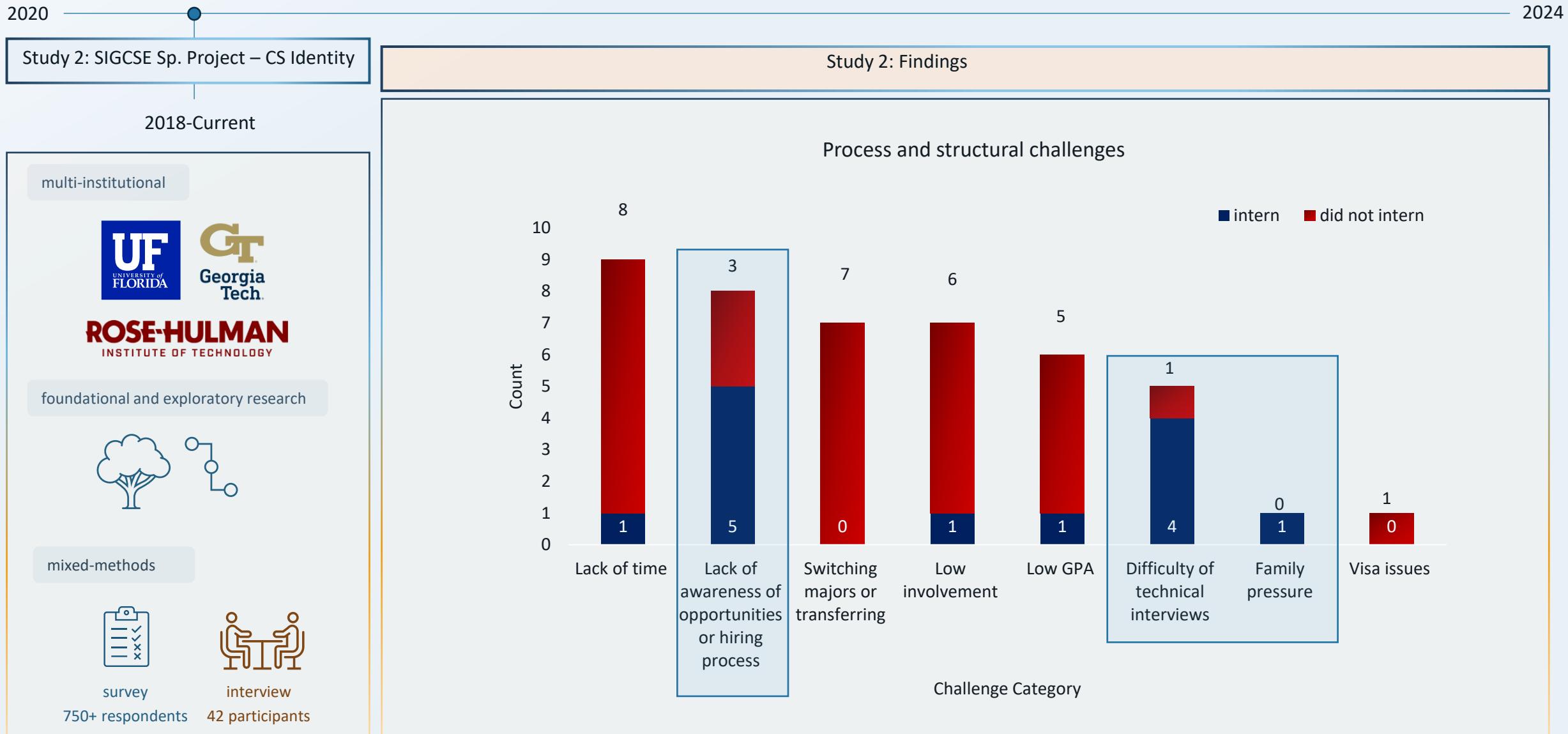
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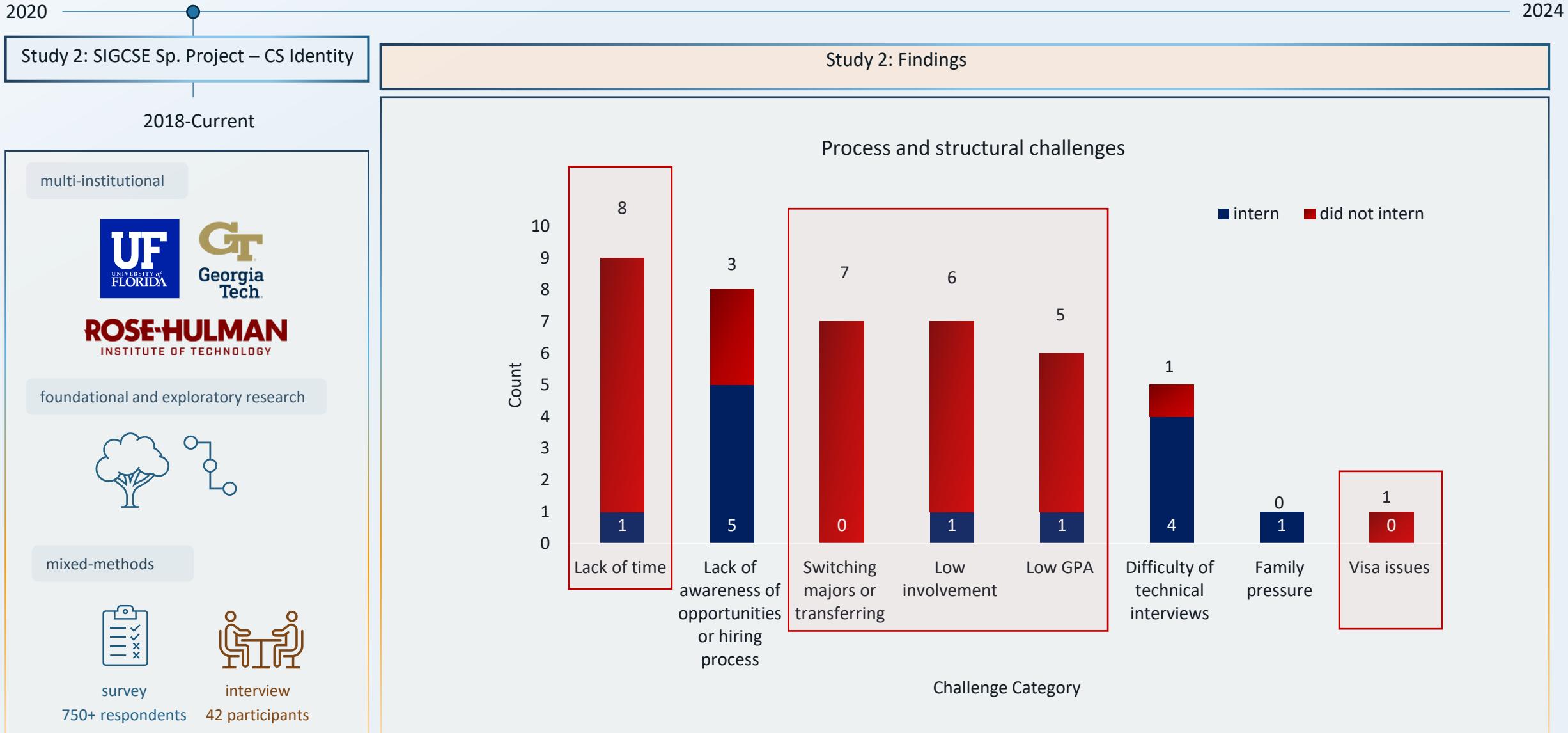
# Developing Personas: Fitting in altogether



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survey



interview

750+ respondents

42 participants

## Summary of Challenges



### Participants who interned



**Psychological Challenges** – Low confidence and imposter syndrome



**Interview Struggles** – Found technical interviews particularly challenging



**Lack of Awareness** – Uncertainty about hiring process and expectations



**Time Constraints** – Juggling internship with other responsibilities



### Participants who did not intern



**Psychological Challenges** – Low self-efficacy and reliance on fallback plans (Plan B)



**Socio-Economic Barriers** – Financial/family obligations, visa restrictions



**Time Constraints** – Prioritized hobbies, studying abroad, or other pursuits



**Structural Barriers** – Challenges related to community college transfer, low GPA, low extracurricular involvement

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Study 2: Data analysis

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survey

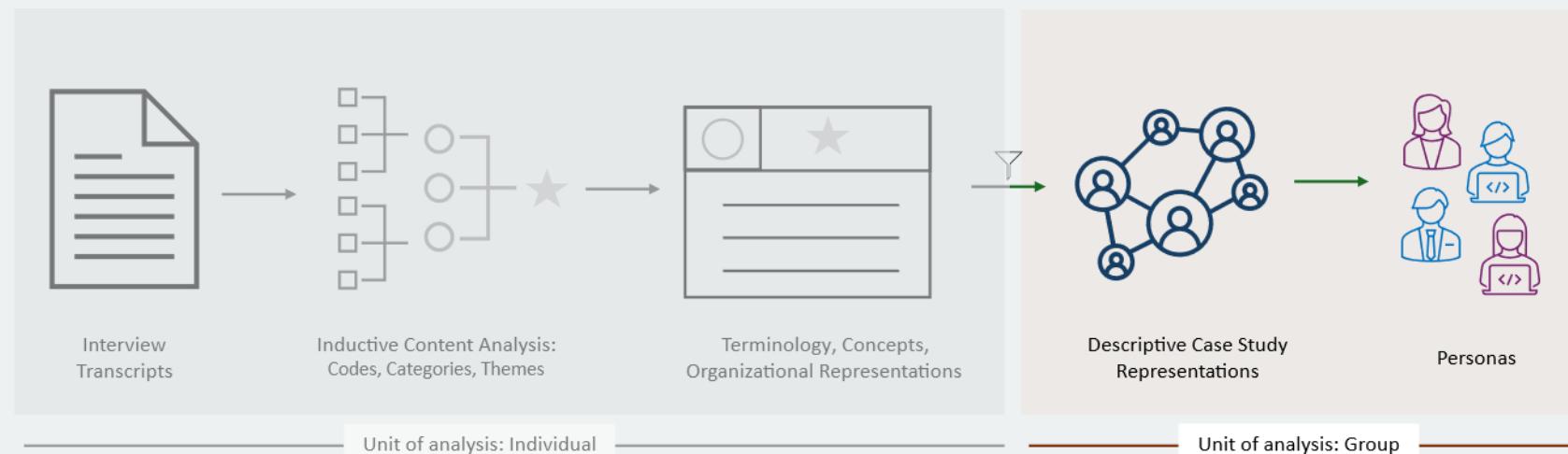


interview

750+ respondents

42 participants

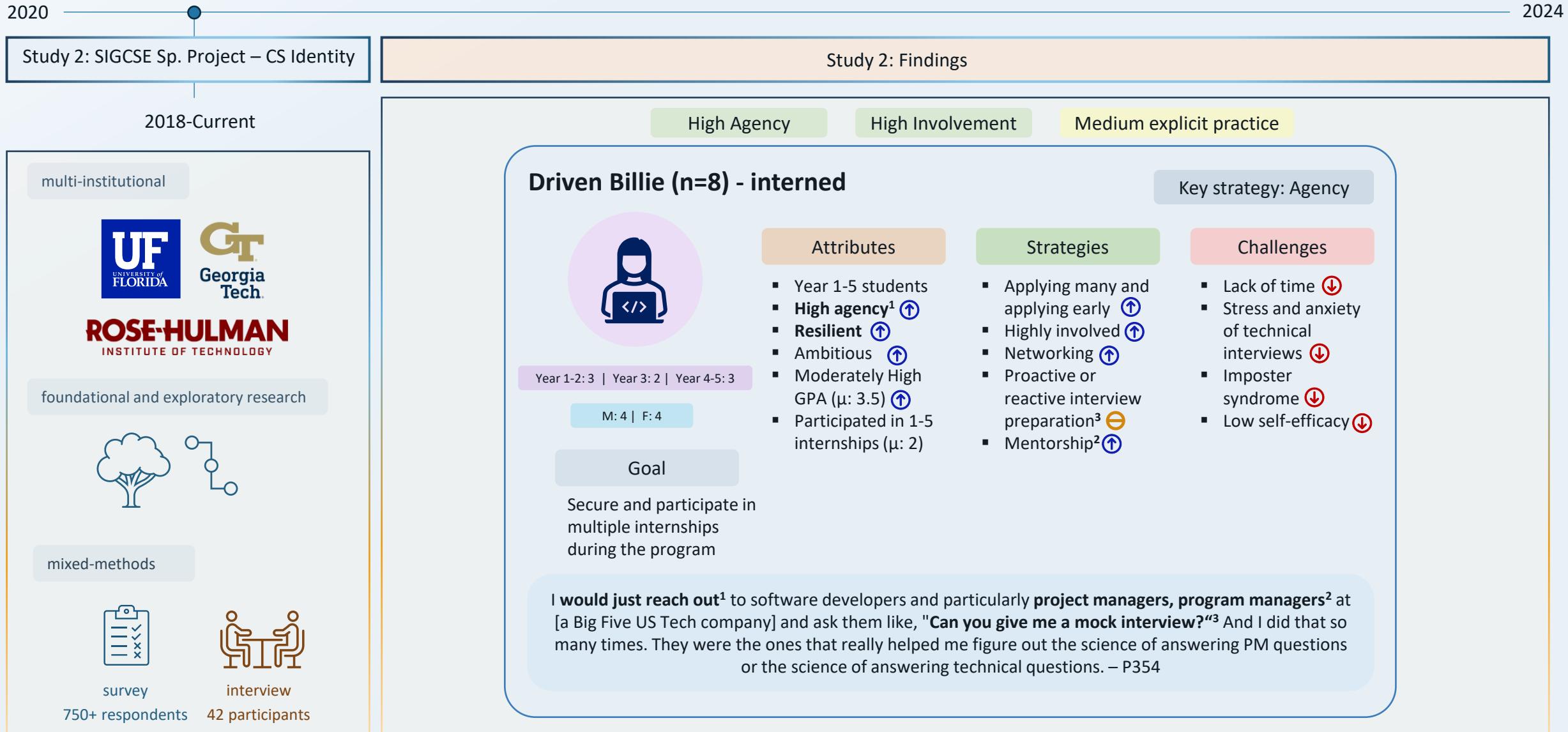
## Data analysis



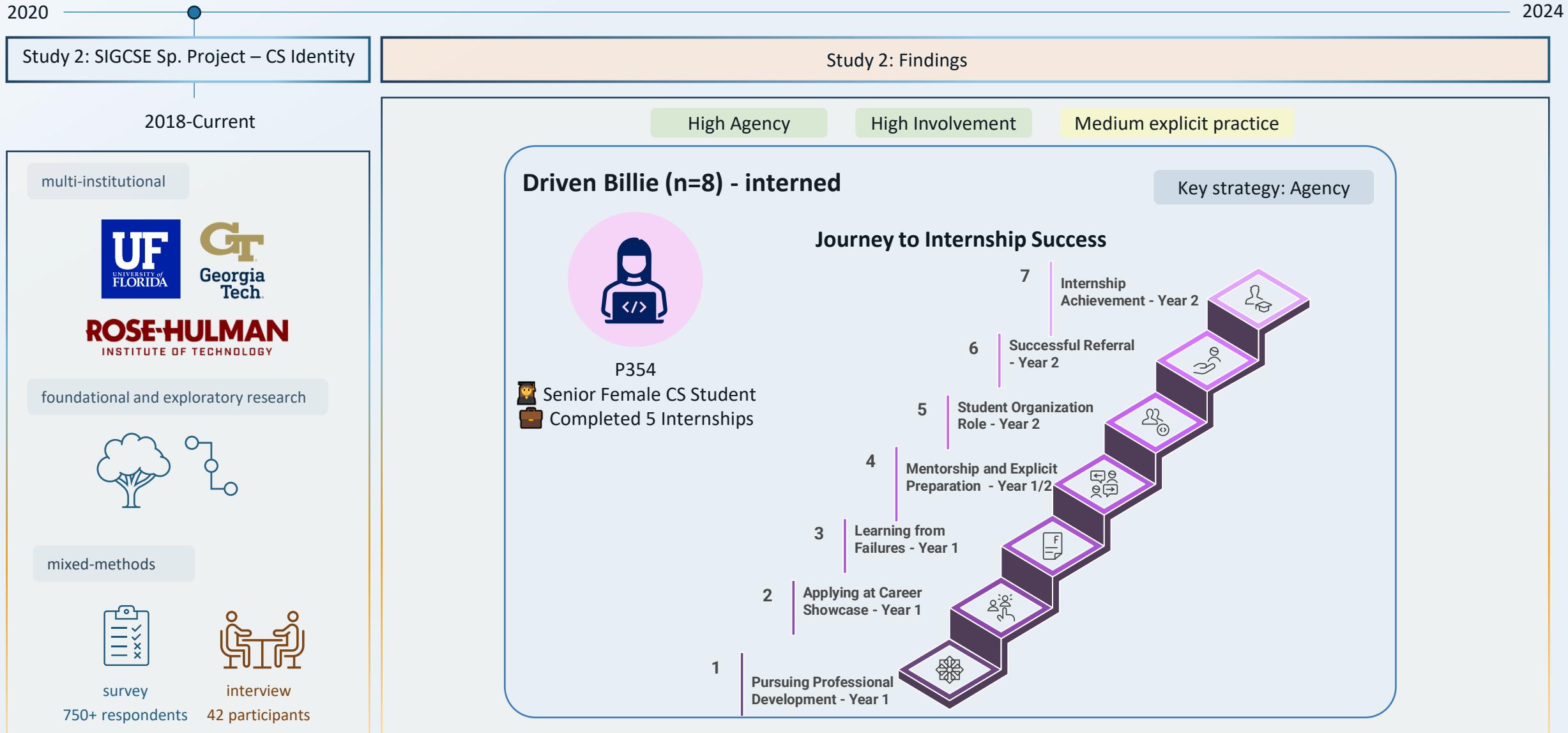
### Personas emphasize students':

- salient student **attributes** who participate and do not participate in internships
- **strategies** for securing internships,
- **challenges** encountered when securing internships,

# Developing Personas: Fitting in altogether



# Developing Personas: Fitting in altogether



# Developing Personas: Fitting in altogether

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survey



interview

750+ respondents

42 participants

High Agency

High Involvement

Medium explicit practice

## Driven Billie (n=8) - interned

The first one I ever got. It wasn't the first interview I did. I've definitely failed a lot of interviews. I think it started my freshman year. So as soon as I got to college, I immediately started pursuing professional development opportunities. So, working on my leadership skills, working on my resume, working on leading things. I remember I heard of career showcase because I took a tour from the engineering ambassadors full circle. And they were like, "Go to career showcase even if you're a freshman, even if you feel like you don't have anything, just try it and learn."

So then next year came [...] and I was prepping and I did interviews. I did interview with [large industrial company], but I didn't get it that freshman year. So it was like really pushing to learn, like get interviews, resume, etc., learn and get mentors. Mentors is a big thing. I had a lot of mentors in different organizations, whether it was alumni mentors or career mentors.

Key strategy: Agency  
And then sophomore year came around, same time of your career showcase. And at the time I joined [a student organization teaching coding] essentials and I met this lady or this girl who's the president or something [...] and they needed a social media chair and I was like, "Hey, I'll do it". And then I guess [the president], I don't know what she saw in me, but she was like, "Hey I worked at [Big five US tech company], do you want a referral?" And I was like, "Yes." So she gave me a referral, which then I guess put my... resume up to be seen. [...]

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survey



interview

750+ respondents

42 participants

Some Agency      Some Involvement      Low explicit practice

## Resourceful Alex (n=6) - interned



Year 3: 3 | Year 4: 3

M: 3 | F: 3

### Goal

Secure in an internship strategically

### Attributes

- Year 3-4 students
- **Low to High agency**
- High resilience
- Securing internships via behavioral interviews at conferences<sup>3</sup>
- 5 of the 6 students identified racial/gender identities as underrepresented

### Strategies

- Applying many and applying early
- Reactive or no interview prep
- Prioritizing coursework
- Networking
- **Conferences<sup>1</sup>**
- **Referrals**
- Parent connections
- Some involvement

Key strategy: Conferences

### Challenges

- Lack of time
- Costly conferences<sup>2</sup>
- Stressful interviews
- Low self-efficacy

One of my **closest friends** is in NSBE and he saw that I was struggling to get internships. I got a couple interviews from career showcase, but it didn't pan out. And he said, "**Come to NSBE<sup>1</sup>** because they hand out those things left and right." And I was like, "Yeah, sure." It was a **little expensive<sup>2</sup>**, but I flew out to the NSBE conference in spring. [...] So being what they consider a good GPA and from a really good school and being able to pass basic questions<sup>3</sup>, they really don't even look beyond what's on your resume. They check a couple things. **Going to NSBE beforehand, I had never gotten a single offer. Coming out of NSBE I had six internship and coop offers.** – P665

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survey



interview

750+ respondents

42 participants

Study 2: Findings

High Agency

High Involvement

High explicit practice

## All-in Haku (n=3) - interned



Year 3: 1 | Year 4: 2

M: 3

### Goal

Secure an internship in  
Top 5 technology  
companies in the USA

### Attributes

- Year 3-4 students
- High agency<sup>2</sup> ↑
- High self- ↑ regulation skills<sup>3</sup>
- High ambition ↑
- Working at Big 5 Technology companies in USA
- Participated in 1-3 internships ( $\mu$ : 2)

### Strategies

- Applying many and applying early ↑
- Proactive and ↑ regulated interview prep<sup>1</sup> ↑
- Networking ↑
- Highly involvement ↑
- Collaborative preparation<sup>4</sup> ↑

### Challenges

- Imposter ↓ syndrome
- Difficulty of technical ↓ interviews

Key strategy: Explicit preparation

I asked a couple of people in some of my classes and some of my other friend - "What are you guys doing for your technical prep right now?" And everyone is kind of doing the same thing that I was before [individual practice]<sup>1</sup> and I was like, "It kind of works, but we kind of need to take it to the next level now." And so we told each other that we wanted to hold each other accountable<sup>2</sup>. And what we ended up creating is a huge Excel omni grid<sup>3</sup> and in that grid, we had a bunch of questions that we knew we had to target for a specific company that we already had interviews to. We had columns for me and my other two buddies. And what we ended up doing is we had mock interview sessions<sup>4</sup>. - P440

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survey



interview

750+ respondents

42 participants

Study 2: Findings

High Agency

Some Involvement

Low explicit practice

## Unconventional Morgan (n=2) - interned



Year 3: 1 | Year 4: 1

M: 1 | F: 1

### Goal

Become an entrepreneur  
and get an internship  
without explicit preparation

### Attributes

- High agency ↑
- High confidence ↑
- High ambition ↑
- High self- regulation ↑

### Strategies

- Applying for few companies and ↓ applying late
- Reactive or no interview prep<sup>1</sup> ↓
- Prioritizing ↓ coursework
- Relying on institution for internships ↓
- Somewhat involved ⊕

### Challenges

- Lack of time ↓

Key strategy: Opportunity from institution

No [I didn't prepare for interviews]<sup>1</sup>, but the thing is also is that a lot of these interview questions that they give you in computer science are very textbook-y, very discrete math type of thinking, and if you really understand algorithms, you understand turning machines and state machines and graph theory and stuff, you can pretty much derive most of these algorithms right off the top of your head. You don't really need to study at all. – P219

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survey



interview

750+ respondents

42 participants

Study 2: Findings

Low Agency

Some Involvement

Low explicit practice

**Tardy Taylor (n=1) - interned**



Year 5: 1

F: 1

Goal

Secure an internship  
before graduation or  
look for a full-time if not.

Attributes

- Low agency ⚡
- Low self-regulation skills ⚡
- Low Ambition ⚡

Strategies

- Not applying for ⚡ internships till late<sup>1</sup>
- Applying too few companies ⚡
- Reactive or no interview prep ⚡
- Prioritizing coursework ⚡
- Somewhat involved<sup>3</sup> ⊕

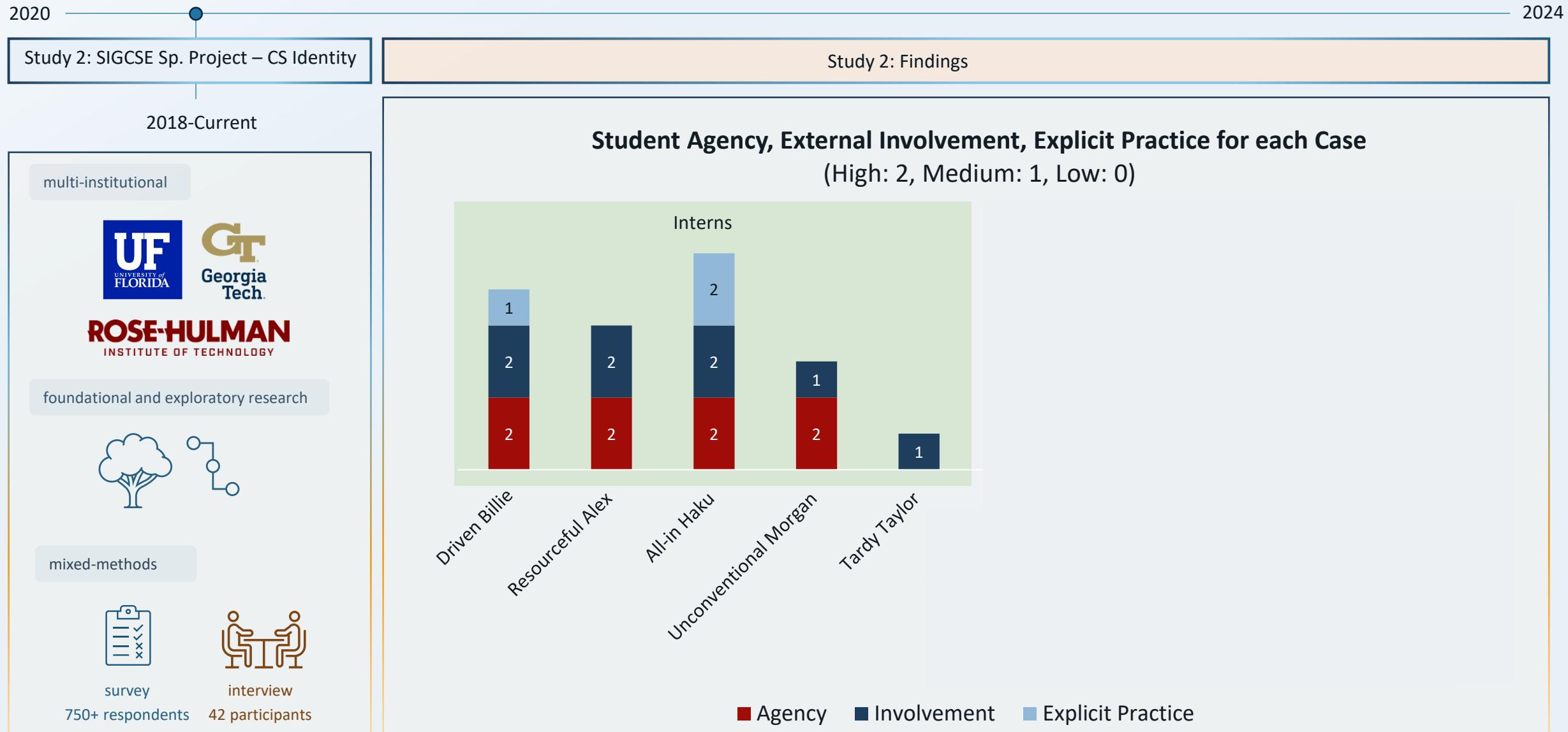
Challenges

- Low GPA<sup>2</sup> ⚡
- Difficulty of technical interviews ⚡
- Transfer challenges ⚡

Key strategy: Part-time experiences

No, I didn't even apply<sup>1</sup>[in Years 1-4 of degree program] because of my GPA<sup>2</sup>, but at this point, I was like, "Okay. Well, it's better to do it even if you don't make it. Just try." [...] I'm slightly below a 3.0. GPA and how I'll be graduating soon is a wake-up call, so that's been pushing me a lot to actually start on [personal] projects<sup>3</sup> and learn things. – P401

# Developing Personas: Fitting in altogether



# Developing Personas: Fitting in altogether

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survey



interview

750+ respondents

42 participants

High Agency

High Involvement

Low explicit practice

## Upskilling Veda (n=8) – did not intern



Year 1: 6 | Year 2: 2

M: 3 | F: 4 | DNS: 1

### Goal

Secure an internship  
in the future

#### Attributes

- Year 1 or 2 students
- High agency ↑
- High self-regulation skills ↑
- Low ambition ↓

#### Strategies

- Not applying<sup>1</sup> but ↓ developing skills sought by employers to apply in the future
- Involvement in ↑ activities outside of coursework
- Reactive interview ↓ preparation or no preparation<sup>3</sup>

#### Challenges

- Lack of time ↓
- Low self-efficacy<sup>2</sup> ↓

Key challenge: Low self-efficacy

**"I've never applied for anything<sup>1</sup> [any internship]. I feel like I need to get more skills overall<sup>2</sup>, to secure an internship. Like more technical skills, and I also need to practice interviewing skills<sup>3</sup> and those types of things to get better."** – P578

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survey



interview

750+ respondents

42 participants

Study 2: Findings

Low Agency

Some Involvement

Low explicit practice

## Delayed and Preoccupied Sage (n=7) – did not intern

Key challenge: Low GPA



Year 3: 2 | Year 4: 4 | Year 5: 1

M: 2 | F: 5

### Goal

Secure an internship before graduation or apply for full-time

### Attributes

- Year 3-5 students
- Transfer students or switched majors late
- Low ambition ↓
- Low agency due to alternate priorities of coursework and part-time work ↓

### Strategies

- Applying very late ↓ due to low awareness
- Some external ☰ involvement
- Reactive or no ↓ interview prep
- Prioritizing ↓ coursework

### Challenges

- Low self-efficacy<sup>1</sup> ↓
- Lack of awareness of expectations of the recruitment process ↓
- Lack of time ↓
- Perception of Low GPA ↓
- Low involvement<sup>2</sup> ↓
- Financial ↓ challenges

"I think [I didn't secure an internship] because I lack the skills<sup>1</sup> and personal projects<sup>2</sup> to compete with much more experienced students<sup>1</sup>. My GPA isn't the best<sup>4</sup> either, as most engineering students GPA average to a 3.0." – P382

# Developing Personas: Fitting in altogether

2020



Study 2: SIGCSE Sp. Project – CS Identity

2024

Study 2: Findings

2018-Current

multi-institutional



**ROSE-HULMAN**  
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foundational and exploratory research



mixed-methods



survey



interview

750+ respondents

42 participants

Low Agency

Some Involvement

Low explicit practice

**Delayed and Preoccupied Sage (n=7) – did not intern**

Key challenge: Low GPA



P382  
\_super-Senior Female  
CE Student  
🚫💼 Unable to intern

Low GPA

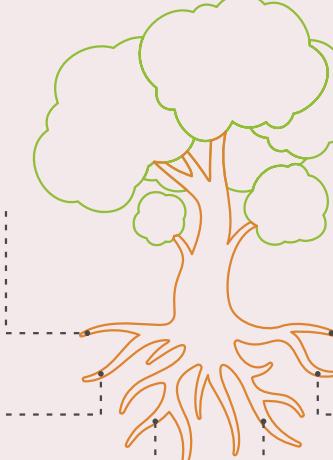
Hinders competitiveness for internships

Late Engagement in Activities

Missed opportunities for experience

Limited Personal Projects

Reduces appeal to employers



Lack of Confidence

Limits application to suitable roles

Misconception about Job Readiness

Underestimated need for practical skills

Cultural Transition Challenges

Affects confidence and adaptation to university life

# Developing Personas: Fitting in altogether

2020

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## Delayed and Preoccupied Sage (n=7) – did not intern

Key challenge: Low GPA

I transferred from a university that weren't up to par as UF. And so seeing these people who started at UF as freshmen, and they know so much more than I do. So, that was kind of discouraging. [...] I finally passed [Digital Logic] spring, that was my third time taking it. When I failed at a second time, I was like, Oh my God, I needed to get out of this career. Maybe I can get into like computer science.

I had the misconception that once I get a degree then I'll get a job. But I realized that in senior year or at my year now that you needs more experience than what the school has taught you. And nobody was there to tell me that like, what you learn at school isn't enough to get you a job unless you have a good GPA.

I was denied to every paid internship and had begun to apply to unpaid internships for the next summer. [...] I don't have any personal projects done, but I am working on it. And at my year now, I should probably have like two, or three personal projects done. I mean I have all my resume, like I put down things that I've done for class, but I kind of like said that add personal projects so that I have some sort of leverage in getting an internship.

# Developing Personas: Fitting in altogether

2020



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mixed-methods



survey



interview

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42 participants

Low Agency      Low Involvement      Low explicit practice

## Hesitant Cameron (n=3) – did not intern

Key challenge: Plan B



Year 2: 1 | Year 4: 1 | Year 5: 1

M: 3

### Attributes

- Year 2-5 students
- Low agency ↓
- Lack of ambition ↓ or complacent
- Low resilience<sup>3</sup> ↓

### Strategies

- Applying late ↓
- Applying too few companies<sup>1</sup> ↓
- Reactive or no ↓ interview prep

### Challenges

- Low self-efficacy<sup>4</sup> ↓
- Lack of ↓ awareness of expectations of jobs and process
- Low involvement ↓
- Fallback(Plan B)<sup>2</sup> ↓

### Goal

Explore options after graduation and if none are available, go with Plan B

I've applied to a couple<sup>1</sup> [of internships ...]. Sometimes, I think that the fact I am interested in something else like Taekwondo<sup>2</sup> will set me aside from other people, but I know that it also hinders me because I don't have as much technical skills as other do [...] as] I haven't been fully committed to developing my technical skills. [...] I did get a little bit disheartened<sup>3</sup> even though it was only a few. I thought if I couldn't even get this one, what makes me a good applicant for others<sup>4</sup>. – P591

# Developing Personas: Fitting in altogether

2020

Study 2: SIGCSE Sp. Project – CS Identity

2024

2018-Current

multi-institutional



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mixed-methods



survey



interview

750+ respondents

42 participants

Study 2: Findings

High Agency

High Involvement

Low explicit practice

## Obligated Jollie (n=2) – did not intern



Year 3: 1 | Year 4: 1

M: 1 | F: 1

### Attributes

- Year 3-4 students
- High ambition ↑
- High agency ↑
- High self-regulation skills ↑
- High GPA ↑
- Confident ↑

### Strategies

- Applying, securing but declining ↘
- High external involvement ↑
- Reactive or no interview prep ↓

### Challenges

- Financial challenges ↓<sup>1</sup>
- Alternate priorities<sup>2</sup>

### Goal

Finding an internship that meets their needs

I am a non-traditional student with a family and **cannot afford to take an internship<sup>1</sup>** when I instead need long-term employment. I wanted to focus on my school and graduate quickly so that I could **support my family<sup>2</sup>**. I actually interviewed for and was accepted for a Summer 2019 internship, but I could not afford to travel to Tampa and support my family with the offered compensation. – P600

# Developing Personas: Fitting in altogether

2020

Study 2: SIGCSE Sp. Project – CS Identity

2024

Study 2: Findings

2018-Current

multi-institutional



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mixed-methods



survey



interview

750+ respondents

42 participants

High Agency

Low Involvement

Low explicit practice

## Uninterested Jing (n=2) – did not intern



Year 4: 1 | Year 5: 1

M: 1 | F: 1

### Goal

Graduate with multiple majors or pursue full-time job directly

#### Attributes

- Year 4-5 students
- **High agency ↑**
- High self-regulation skills ↑
- **Goal misalignment:** full-time job or start graduate school

#### Strategies

- Not applying for ↘ internships
- Reactive or no ↘ interview prep
- Prioritizing ↘ coursework<sup>1</sup>

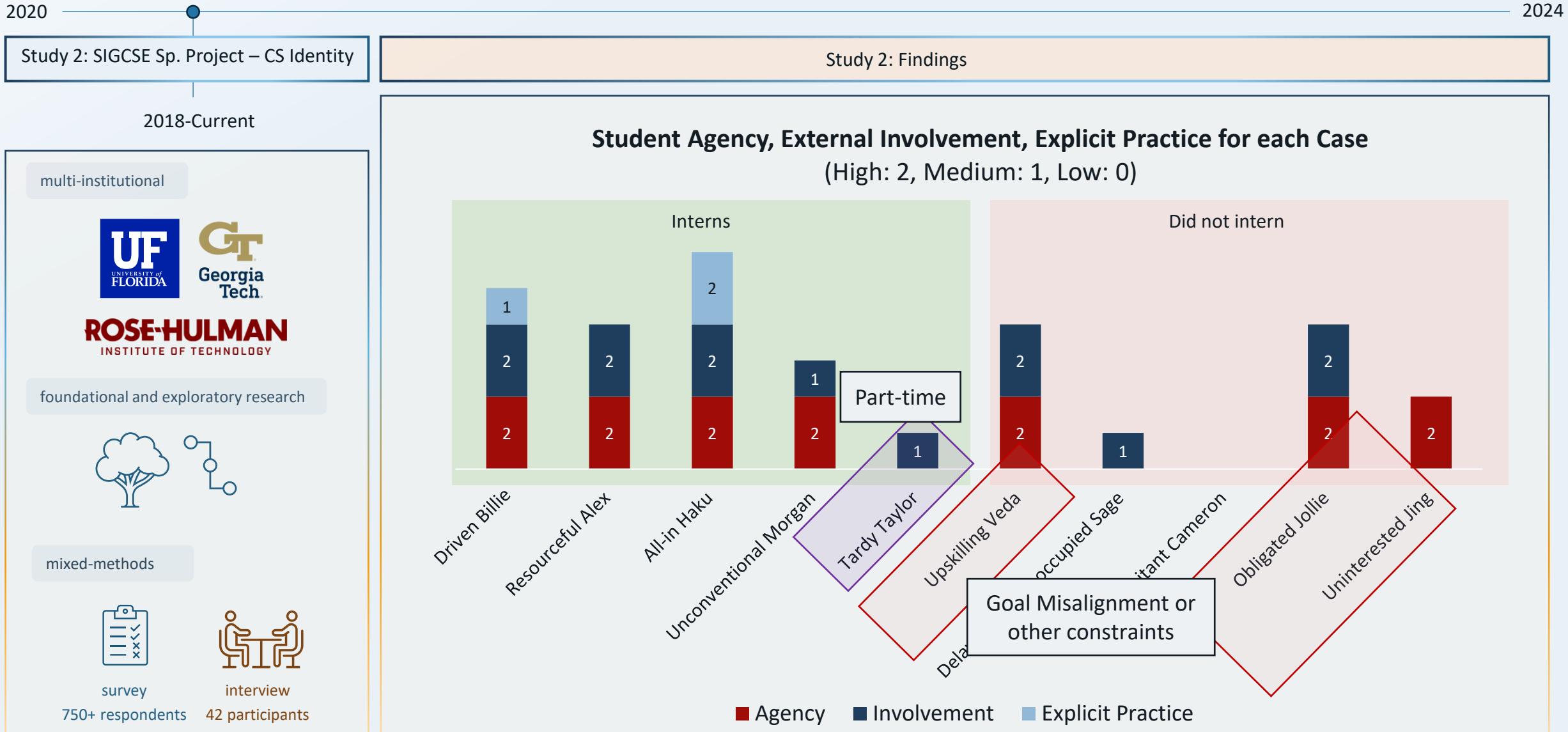
#### Challenges

- Lack of time ↘
- Low involvement ↘

Key challenge: Goal Misalignment

I guess I haven't pursued it at all because I thought I'd **focus more on summer classes<sup>1</sup>** and getting the right classes that I can triple degree. – Y81

# Developing Personas: Fitting in altogether



# Developing Personas: Fitting in altogether

2020



Study 2: SIGCSE Sp. Project – CS Identity

2024

Study 2: Discussion

2018-Current

multi-institutional



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mixed-methods



survey

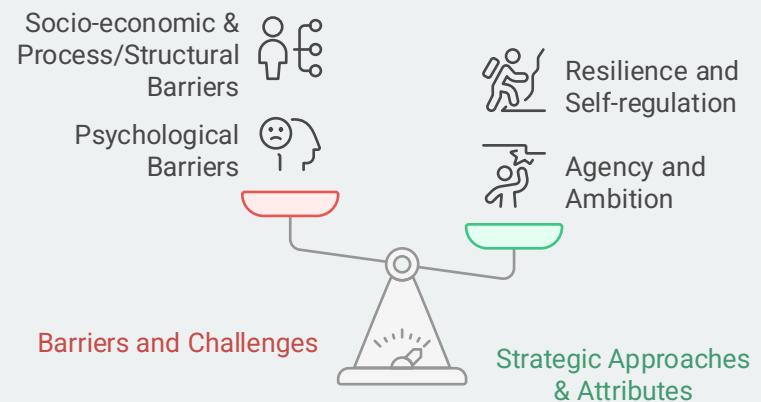
750+ respondents



interview

42 participants

## Discussion

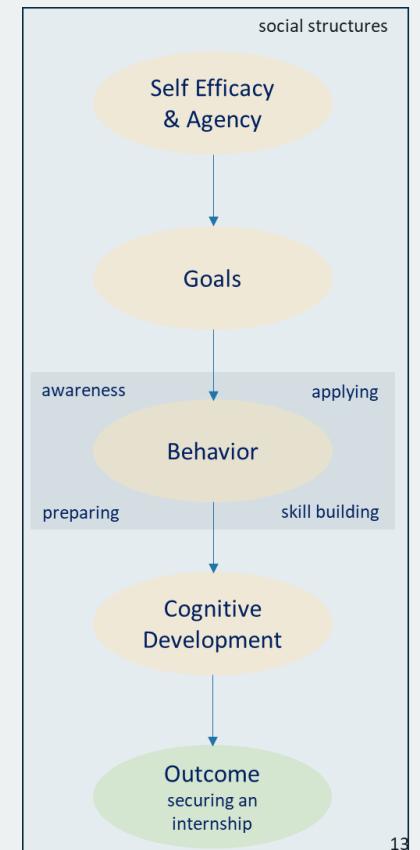


### Internship Participation



- Secure an Internship =
- Goal to secure an internship
  - Actually applying
  - Extracurricular involvement
  - Interview Preparation

What is the role of curriculum and advising in securing an internship? 😢



13

# Developing Personas: Fitting in altogether

2020



Study 2: SIGCSE Sp. Project – CS Identity

2024

Study 2: Discussion

2018-Current

multi-institutional



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mixed-methods



survey



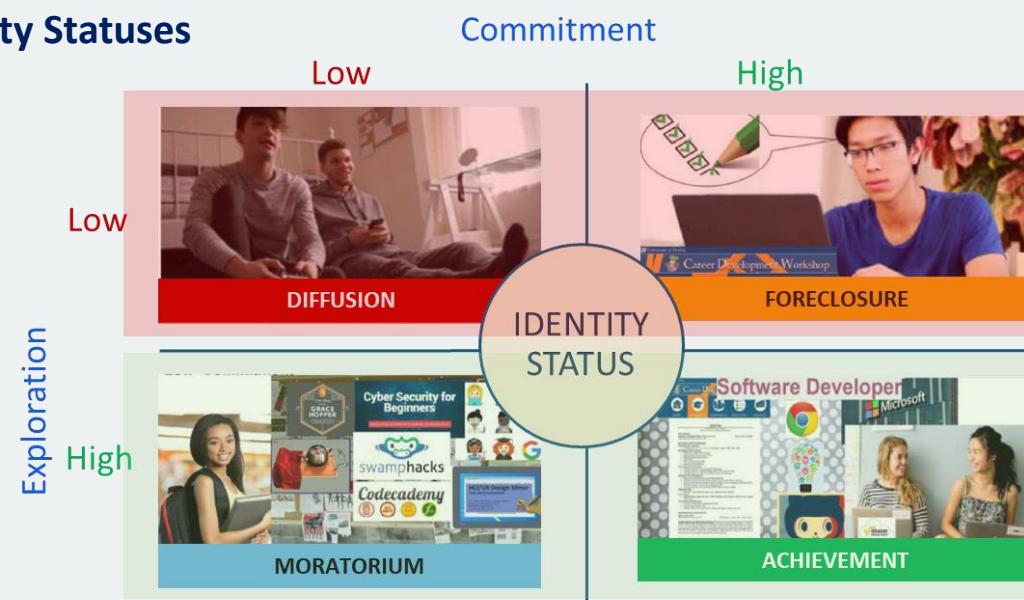
interview

750+ respondents

42 participants

## Discussion

- Most students (interns or unsuccessful interns) fell under **Moratorium** or **Achieved Identity Statuses**



- Most identity statuses except diffusion status **do not predict** internship participation (Wolf et al., 2023)

Source

Marcia (1966). Development and validation of ego-identity status

# Developing Personas: Fitting in altogether

2020



Study 2: SIGCSE Sp. Project – CS Identity

2024

Study 2: Limitations

2018-Current

multi-institutional



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mixed-methods



survey



interview

750+ respondents

42 participants

## Recommendations

- 📣 Increase awareness of the importance of internships, the recruitment process, and available opportunities
- 🕒 Encourage students to apply early and to multiple companies
- 👉 Emphasize involvement in activities outside the curriculum and support for funding these initiatives
- 🎙 Recommend interview preparation and offer courses or interventions to ensure readiness
- 🛠 Promote conferences and provide financial support for attendance
- 📚 Instructors adjust coursework during peak recruiting periods

# Developing Personas: Fitting in altogether

2020



2024

Study 2: SIGCSE Sp. Project – CS Identity

Study 2: Limitations

2018-Current

multi-institutional



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foundational and exploratory research



mixed-methods



survey



interview

750+ respondents

42 participants

## Limitations

- sample consists of students across institutions in the United States (US)
- personas are based on generalized characteristics which may not represent diverse students
  - purposefully recruited students in our sample
  - developing multiple personas beyond the dichotomy of successful vs unsuccessful student personas
- risk of creating personas that reinforce stereotypes
  - transparency
  - quotes
  - empirical data backed by frequency analysis
  - positionality

# Agenda

- **Part I: Overview**
  - Introduction
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  - ✓ Study 1: Why are internships important?
  - ✓ Study 2: Who is participating in internships and how?
  - Developing Personas: Fitting in altogether
- **Part III: Intervention & Evaluation**
  - ✓ Study 3: How can we improve our curriculum so that more students intern?
  - Study 4: How effective is our pedagogical intervention in preparing students for securing internships?
- **Part IV: Contributions & Conclusions**

# Study 3: How can we improve our curriculum so that more students intern?

2020

2024

Study 3: Hire Thy Gator (HTG) Activities

Context and Outcomes for Hire Thy Gator (HTG) Activities

2020-2024

single-institutional



design and development research



mixed-methods & pedagogical intervention



survey

363 respondents



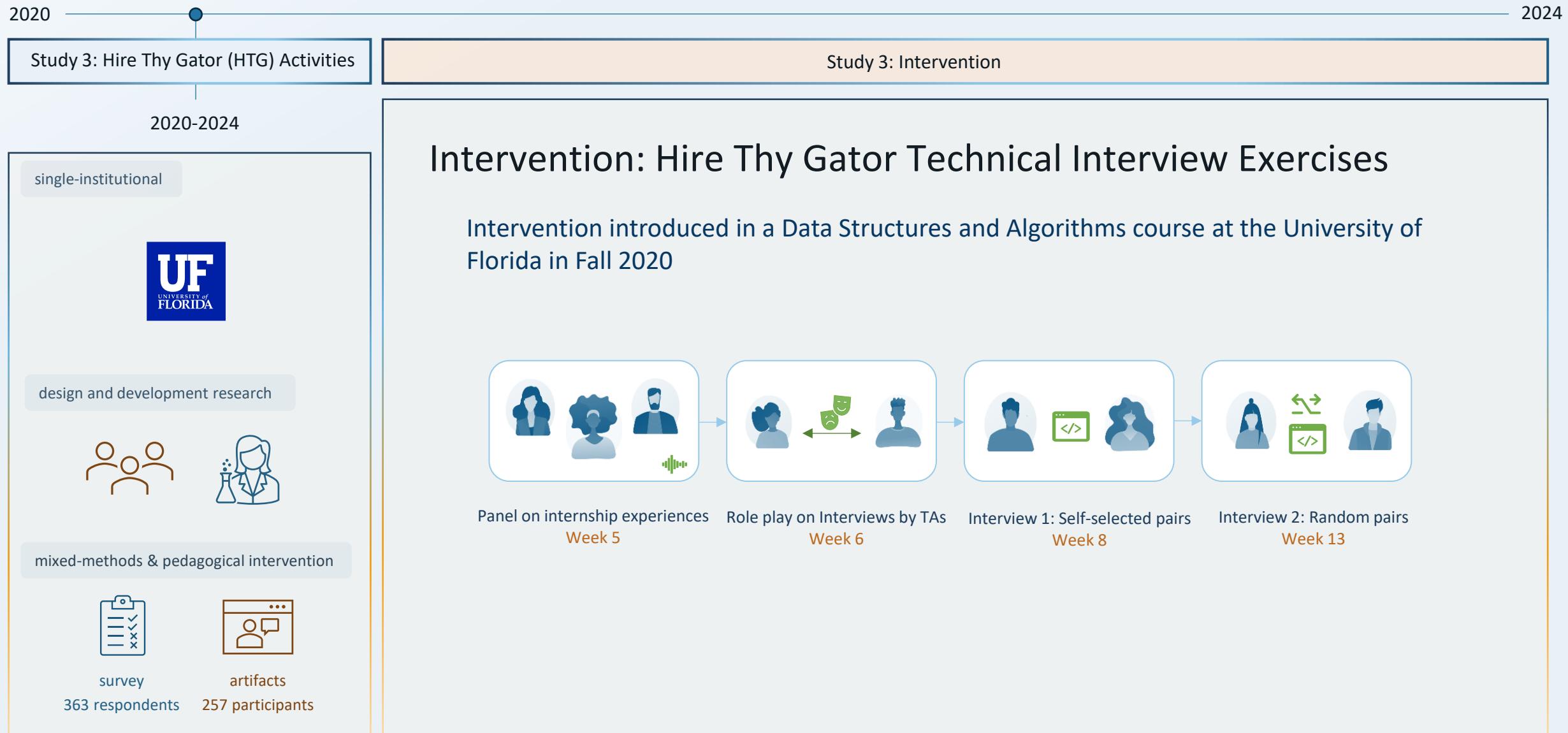
artifacts

257 participants

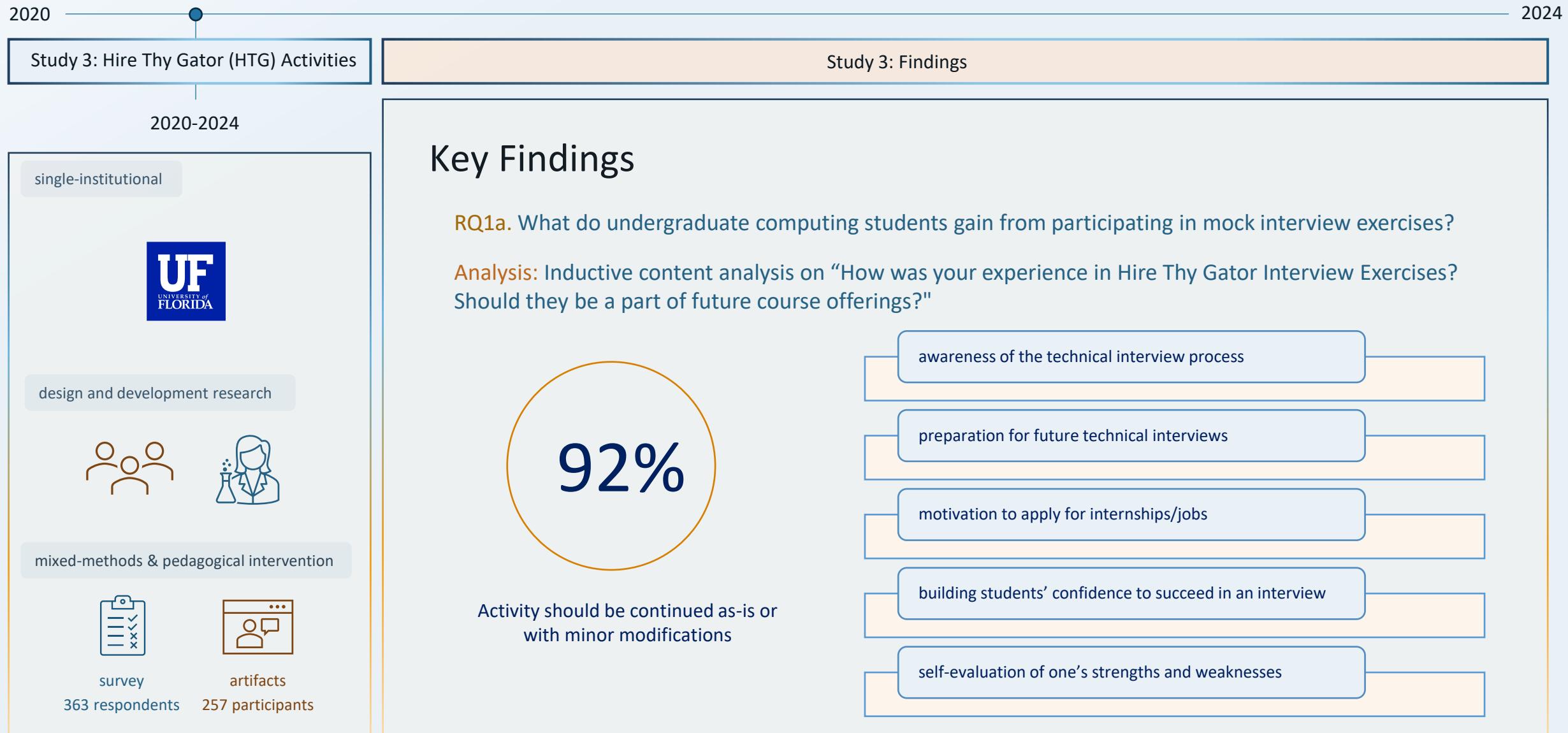
## Context and Outcomes for Hire Thy Gator (HTG) Activities

- Goal of the study: **introduce an intervention to prepare students for securing internships**
- Study 3 was designed during Summer 2020 and data was collected starting Fall 2020
- Data analysis and outcomes:
  - **Papers**
    - ✓ *Introducing a Technical Interview Preparation Activity in a Data Structures and Algorithms Course* (ITiCSE 2021)
    - ✓ *Implementation and Evaluation of Technical Interview Preparation Activities in a Data Structures and Algorithms Course* (SIGCSE 2023, undergraduate student second author, Sajani Panchal)
  - **Others**
    - ✓ [Invited Talk]: *Introducing a Technical Interview Preparation Activity in a Data Structures and Algorithms Course* (ACM Compute 2021)
    - ✓ [Creative Assessment Repository]: *Hire thy Gator Interview Exercises* (Center for Teaching Excellence, UF, 2022)
    - ✓ [Course Transformation Grant]: *Preparing Computing Students for Technical Interviews through Open Educational Resources*, (Center for Teaching Excellence & George A. Smathers Libraries, UF, 2022)

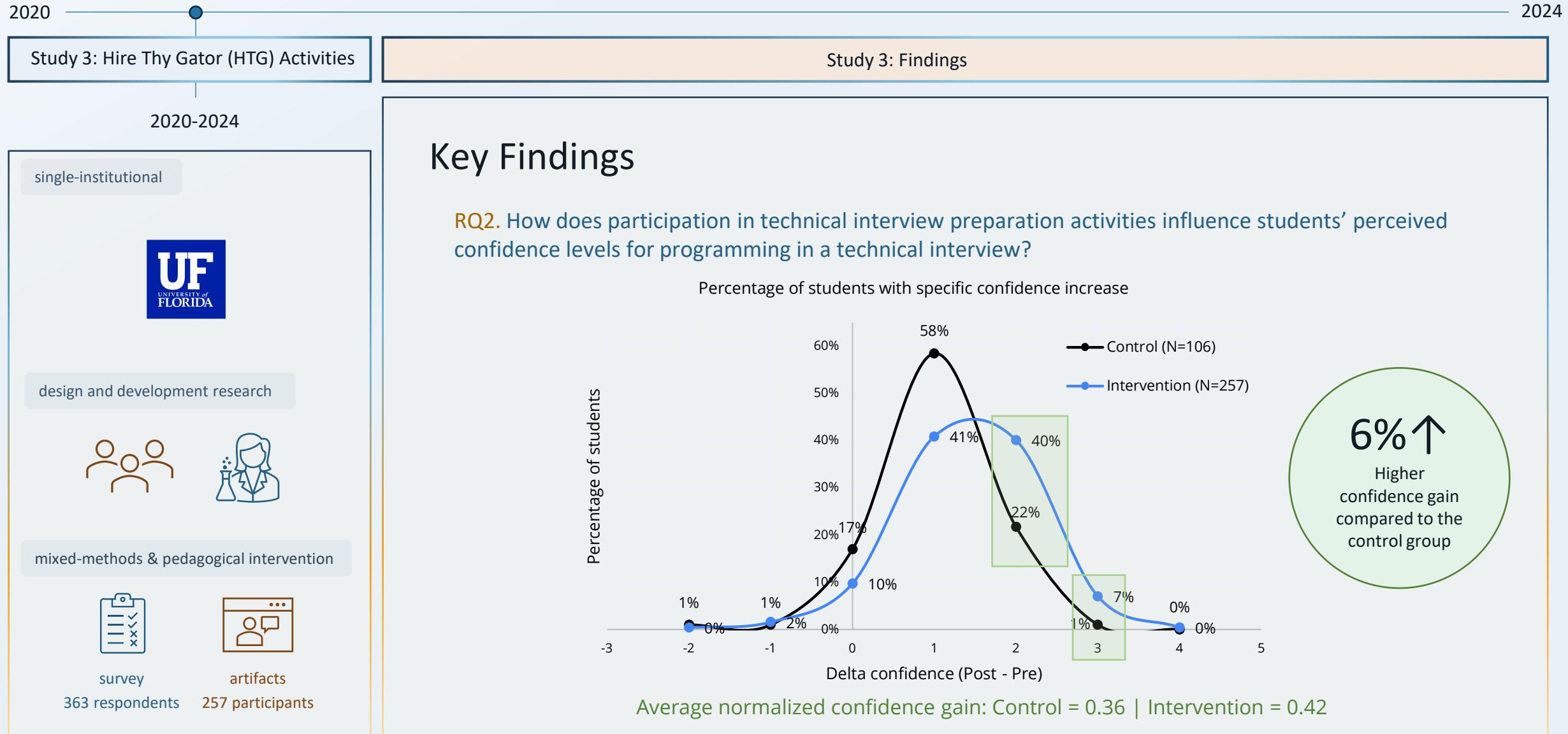
# Study 3: How can we improve our curriculum so that more students intern?



# Study 3: How can we improve our curriculum so that more students intern?



# Study 3: How can we improve our curriculum so that more students intern?



# Agenda

- **Part I: Overview**
  - Introduction
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- **Part II: Internship Participation**
  - ✓ Study 1: Why are internships important?
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  - Developing Personas: Fitting in altogether
- **Part III: Intervention & Evaluation**
  - ✓ Study 3: How can we improve our curriculum so that more students intern?
  - Study 4: How effective is our pedagogical intervention in preparing students for securing internships?
- **Part IV: Contributions & Conclusions**

# Study 4: How effective is our pedagogical intervention in preparing students for securing internships?

2020

2024

Study 4: Retrospective efficacy of HTG

Study 4: Study Design

2024 (Proposed work)

single-institutional



efficacy research



survey-based (retrospective)



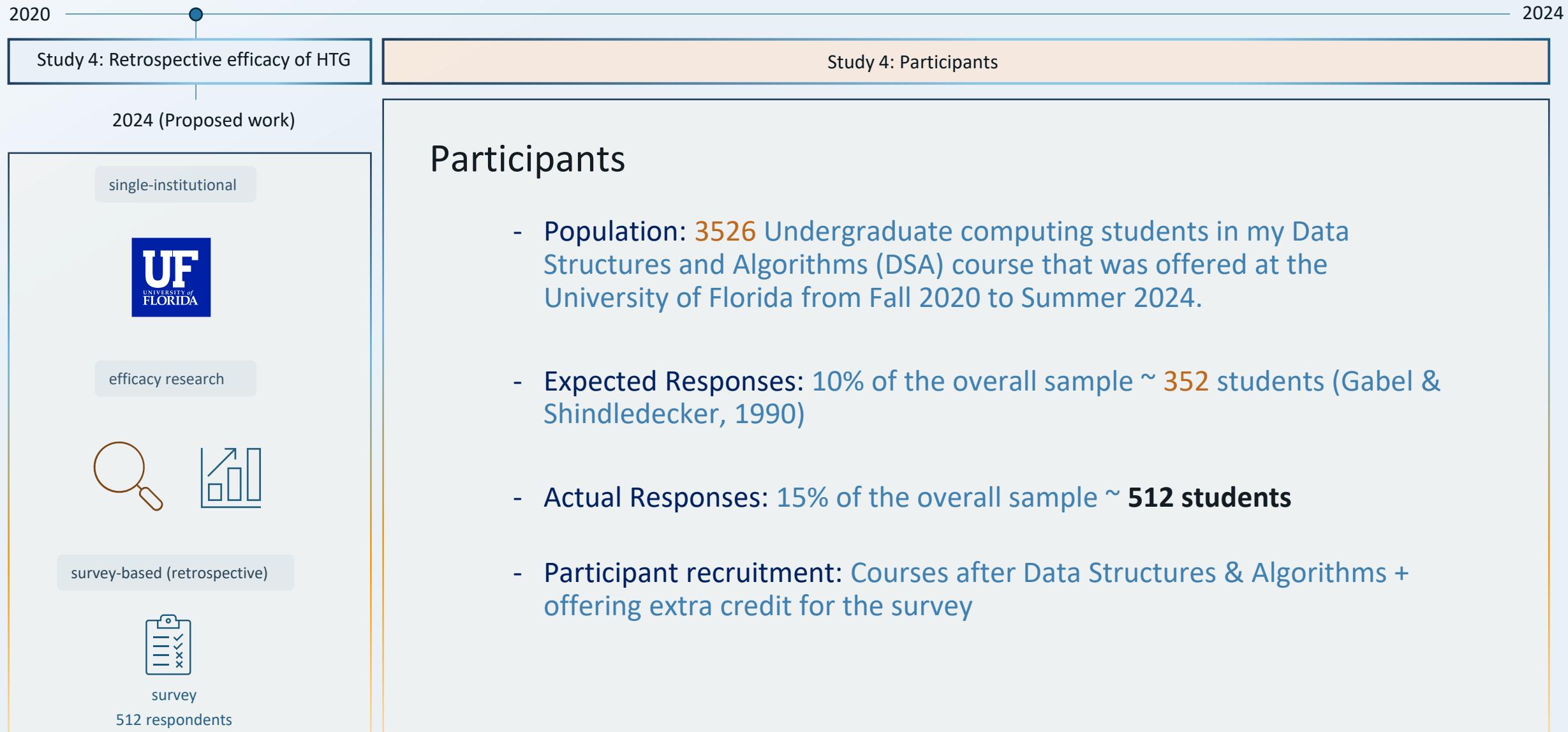
survey

512 respondents

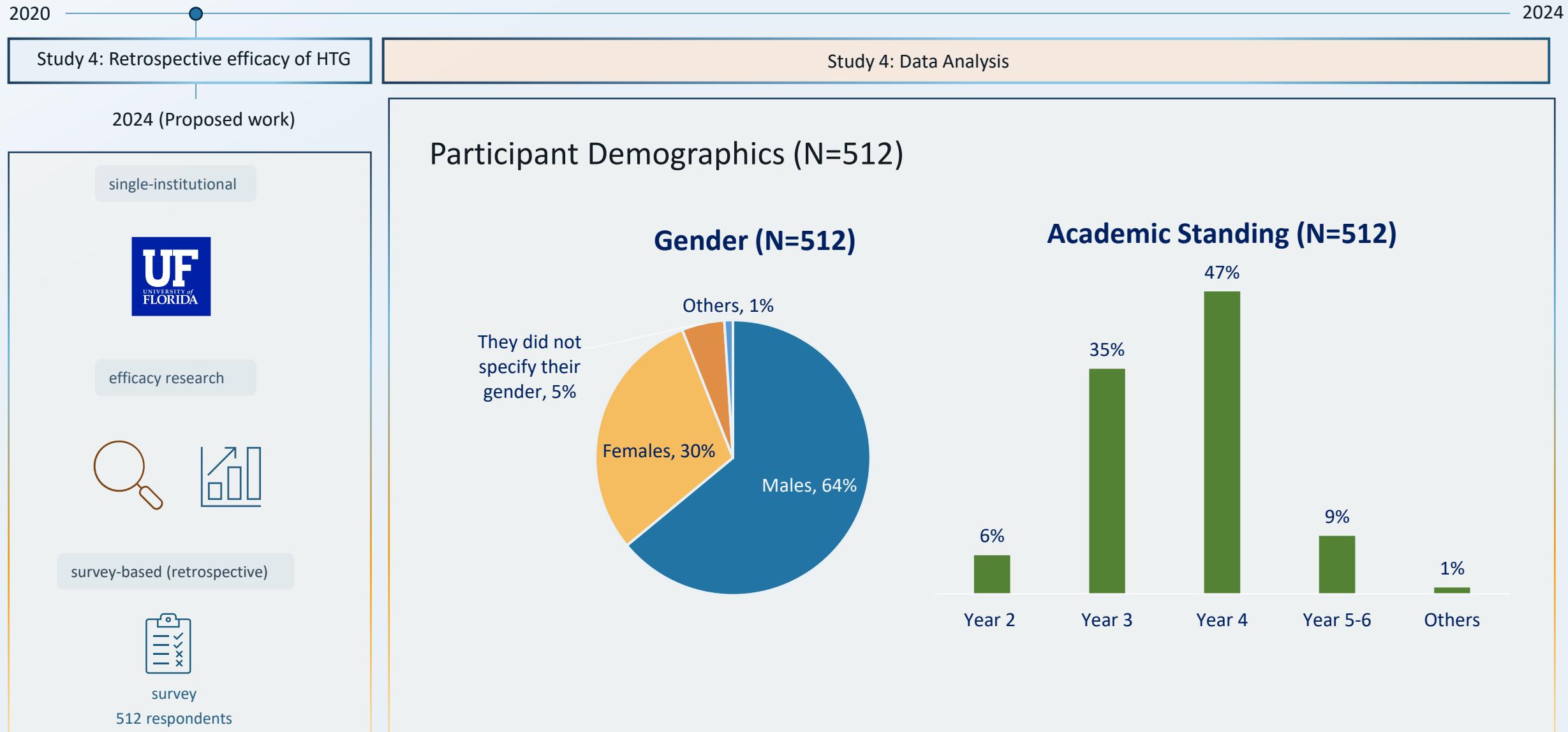
## Study Design

- Research Question: How effective are Hire Thy Gator Technical Interview Exercises in preparing computing undergraduate students for securing industry internships?
- Goal: Evaluate the effectiveness of Hire Thy Gator exercises on:
  - future technical interview preparation
  - securing an internship or job
- Study Type: Longitudinal panel survey study in Fall 2024 at UF
- Status: Work is accepted and will be published to ACM ITiCSE 2025 Conference

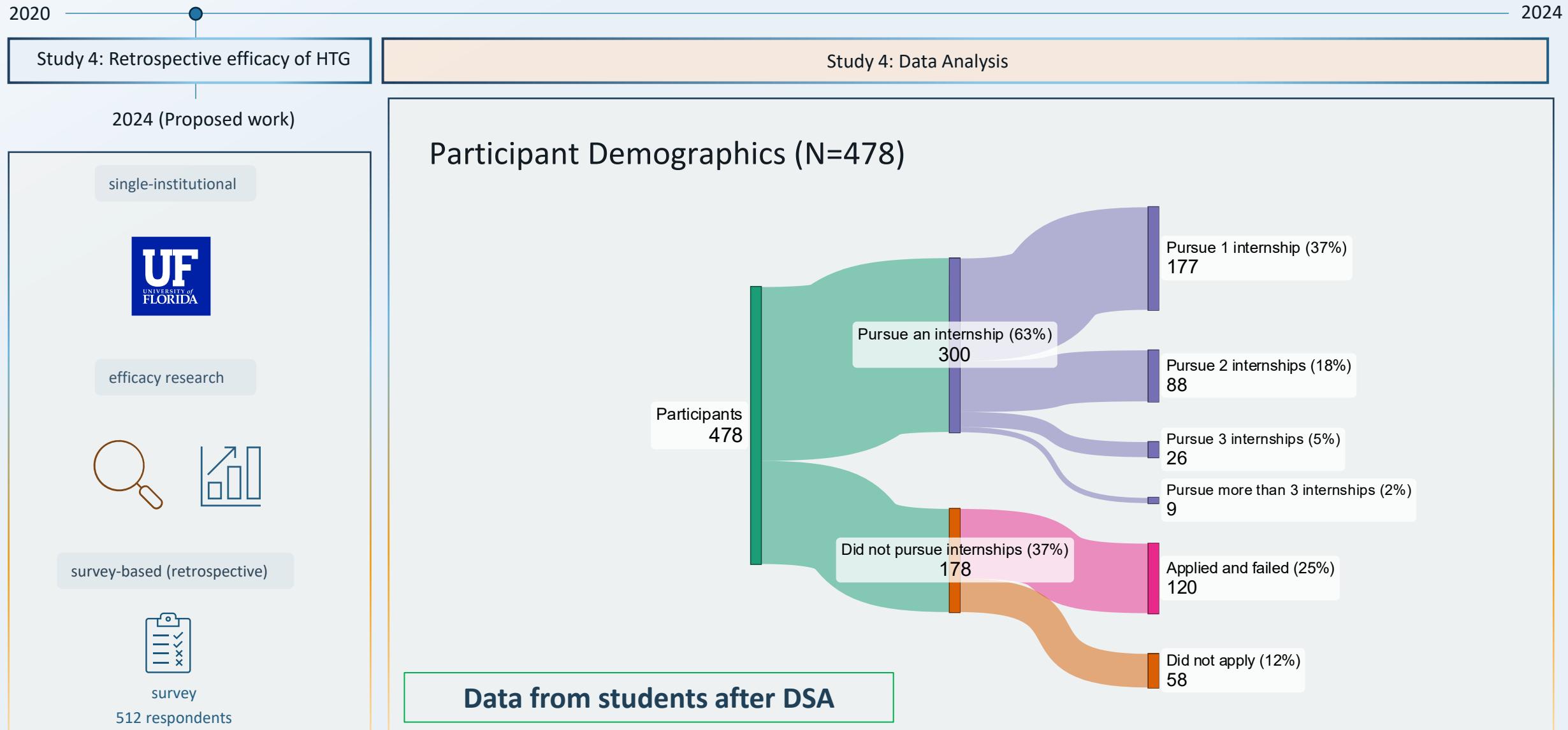
# Study 4: How effective is our pedagogical intervention in preparing students for securing internships?



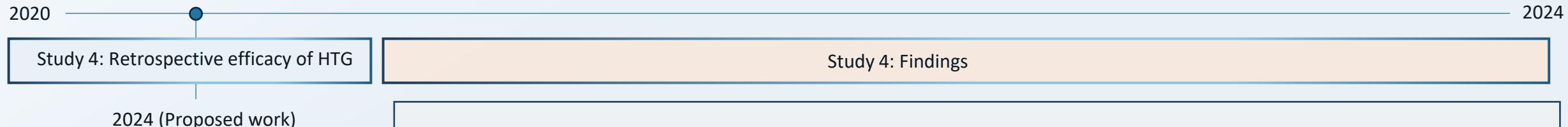
# Study 4: How effective is our pedagogical intervention in preparing students for securing internships?



# Study 4: How effective is our pedagogical intervention in preparing students for securing internships?



# Study 4: How effective is our pedagogical intervention in preparing students for securing internships?



single-institutional



efficacy research



survey-based (retrospective)

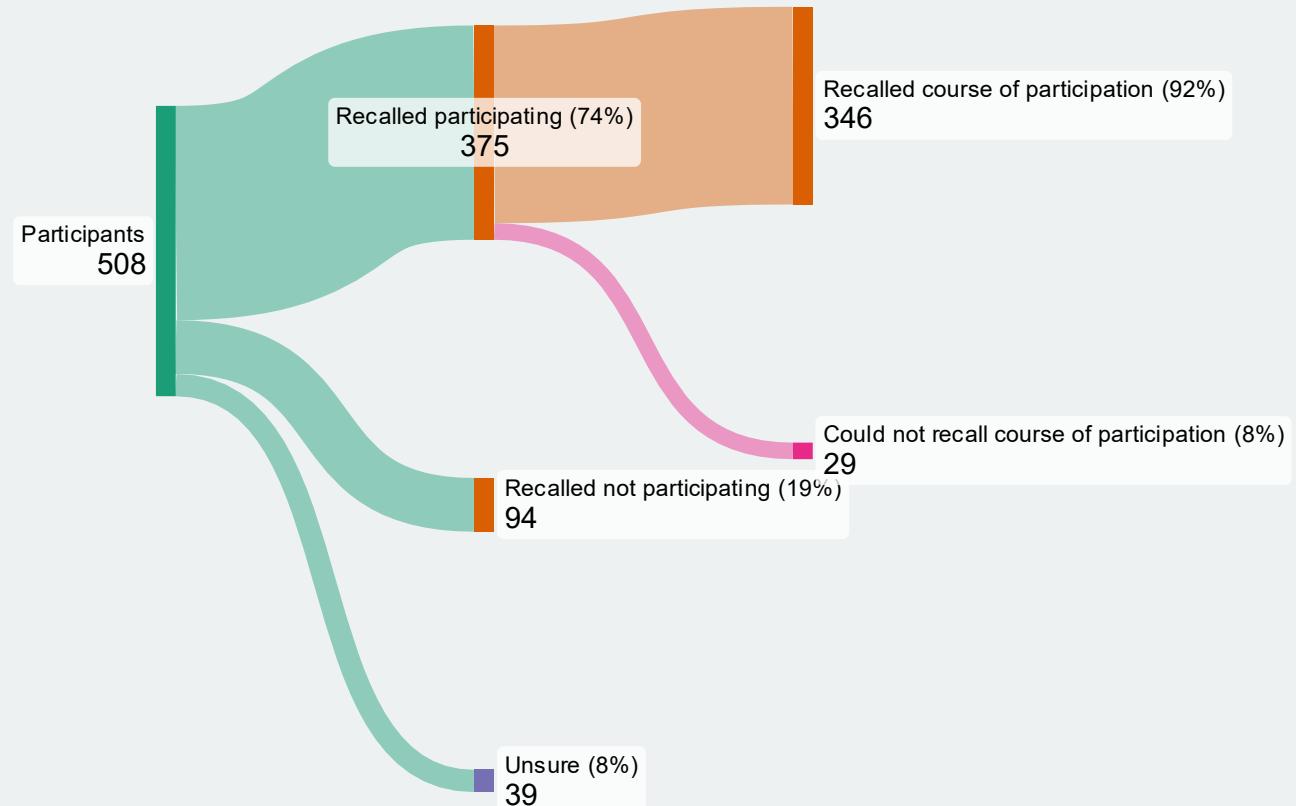


survey

512 respondents

RQ1. Recall: Are students able to recall participating in our activities?

**74%  
Recalled**



# Study 4: How effective is our pedagogical intervention in preparing students for securing internships?

2020



2024

Study 4: Retrospective efficacy of HTG

Study 4: Findings

2024 (Proposed work)

single-institutional



efficacy research



survey-based (retrospective)



survey

512 respondents

RQ2. *What are student opinions on the effectiveness of our activities, n-semesters after their participation?*

RQ	Metric	Likert Scale - (5- Strongly agree)				
		5	4	3	2	1
RQ.2	increased my familiarity with the technical interview	45%	47%	4%	2%	1%
	allowed me to understand my weaknesses and strengths	40%	41%	10%	6%	3%
	increased my self-confidence to succeed in a technical interview	23%	38%	23%	11%	5%
	are a useful activity that is beneficial for me to succeed in an interview	45%	42%	9%	3%	1%

RQ2. Metric	Likert Scale (0-4): 4 is Strongly Agree		
	Right After (N=256)	N-semesters After (N=363)	Delta ( $\delta$ )
familiarity	3.46	3.33	-0.13
self-evaluation	3.34	3.09	-0.25
confidence	3.09	2.63	-0.46
usefulness	3.42	3.25	-0.17

# Study 4: How effective is our pedagogical intervention in preparing students for securing internships?

2020



2024

Study 4: Retrospective efficacy of HTG

Study 4: Findings

2024 (Proposed work)

single-institutional



efficacy research



survey-based (retrospective)



survey

512 respondents

RQ3. *Did our activities **motivate and prepare** students for subsequent interview preparation after our course as well as **foster their agency** to apply for internships/jobs?*

RQ	Metric	Likert Scale - (5- Strongly agree)				
		5	4	3	2	1
RQ.3	prepared me to - participate in subsequent mock interviews	26%	38%	28%	5%	3%
	prepared me to - participate in subsequent individual programming	33%	46%	16%	3%	2%
	prepared me to - apply for actual internships or jobs related to computing	26%	38%	26%	6%	3%
	motivated me to - participate in subsequent mock interviews	21%	33%	29%	13%	5%
	motivated me to - participate in subsequent individual programming	38%	40%	13%	7%	2%
	motivated me to - apply for actual internships or jobs related to computing	30%	34%	23%	9%	4%

After the activities,

- 82% students practiced solving technical interview questions (e.g., Leetcode style) **independently**
- 19% students practiced solving technical interview questions **collaboratively**
- 18% students practiced **mock interviews** with a friend, peer, etc.
- 16% students **did not participate in any subsequent preparation activities** after our intervention

# Study 4: How effective is our pedagogical intervention in preparing students for securing internships?

2020



2024

Study 4: Retrospective efficacy of HTG

Study 4: Findings

2024 (Proposed work)

single-institutional



efficacy research



survey-based (retrospective)



survey

512 respondents

RQ4. *What role did our activities play in helping students secure an internship or job post their participation?*

RQ	Metric	Likert Scale - (5- Strongly agree)				
		5	4	3	2	1
RQ.4	helped me in securing an internship/full-time job	6%	27%	49%	9%	9%

# Study 4: How effective is our pedagogical intervention in preparing students for securing internships?

2020

2024

Study 4: Retrospective efficacy of HTG

Study 4: Findings

2024 (Proposed work)

single-institutional



efficacy research



survey-based (retrospective)



survey

512 respondents

RQ4. *What role did our activities play in helping students secure an internship or job post their participation?*

**Qualitative analysis (N=347):** What role did mock interviews play in helping you to secure an internship or a full-time job?

- ↓ 456 codes
- ↓ 29 unique codes
- ↓ 3 themes

# Study 4: How effective is our pedagogical intervention in preparing students for securing internships?

2020



Study 4: Retrospective efficacy of HTG

2024

2024 (Proposed work)

single-institutional



efficacy research



survey-based (retrospective)



survey

512 respondents

Study 4: Findings

RQ4. *What role did our activities play in helping students secure an internship or job post their participation?*

📌 **Theme 1: Derived value (71%, 248 of 347 students)**

✓ **Positive impact:** Activities were useful for preparing students for the recruitment process

✗ **No direct attribution:** Students did not explicitly state that the activities helped them secure a job

◆ **Prominent Codes:**

- Promoting awareness of the process – 155 students
- Practicing technical interviews – 42 students
- Building self-confidence – 33 students
- Fostering self-evaluation – 21 students

# Study 4: How effective is our pedagogical intervention in preparing students for securing internships?

2020

2024

Study 4: Retrospective efficacy of HTG

Study 4: Findings

2024 (Proposed work)

single-institutional



efficacy research



survey-based (retrospective)



survey

512 respondents

RQ4. *What role did our activities play in helping students secure an internship or job post their participation?*

## 📌 Theme 1: Derived value (71%, 248 of 347 students)

I have **not technically secured an internship** as of today, but the HTG activities provided **strong hands-on experience of the process**. It certainly made me **gain** a substantial amount of **confidence** for my future technical interviews.

– S396, Fall 2023

confidence

The exercise helped **open my eyes to how much I need to prepare**. It's one thing doing problem on your own and another thing doing them in an interview setting.

– S27, Fall 2023

awareness

**At the time I hated it, but looking back it was essential** as that was my first introduction into how interviews for computing jobs work and **what is expected in a technical interview**.

– S182, Fall 2022

awareness

# Study 4: How effective is our pedagogical intervention in preparing students for securing internships?

2020



Study 4: Retrospective efficacy of HTG

2024

2024 (Proposed work)

single-institutional



efficacy research



survey-based (retrospective)



survey

512 respondents

Study 4: Findings

RQ4. *What role did our activities play in helping students secure an internship or job post their participation?*

📌 **Theme 2: Limited, unclear, or no role** (39%, 139 of 347 students)

❓ **No or unclear impact:** Activities played a limited role or had no role in them securing an internship

◆ **Prominent Codes:**

- Not securing an internship – 34 students
- Applying to non-technical or computing roles without coding interviews – 13 students
- Not having applied for internships – 8 students
- Poor experience due to an unprepared interviewer – 5 students

# Study 4: How effective is our pedagogical intervention in preparing students for securing internships?

2020

2024

Study 4: Retrospective efficacy of HTG

Study 4: Findings

2024 (Proposed work)

single-institutional



efficacy research



survey-based (retrospective)



survey

512 respondents

RQ4. *What role did our activities play in helping students secure an internship or job post their participation?*



## Theme 2: Limited, unclear, or no role (39%, 139 of 347 students)

I have yet to participate in a technical interview for this hiring season, so I am unsure. It was valuable to learn what to expect, however.

– S283, Fall 2023

It didn't but that's because I think much more preparation is needed in addition to mock interviews, which I did AFTER the DSA one and then in Enterprise SWE I did the interview after preparing on my own and securing an internship

– S146, Fall 2023

None, I am going to work in the Networking/Cybersecurity Engineering field and my past interviews did not include coding as they were not strictly programming roles where I interviewed.

– S284, Fall 2021

# Study 4: How effective is our pedagogical intervention in preparing students for securing internships?

2020

2024

Study 4: Retrospective efficacy of HTG

Study 4: Findings

2024 (Proposed work)

single-institutional



efficacy research



survey-based (retrospective)



survey

512 respondents

RQ4. *What role did our activities play in helping students secure an internship or job post their participation?*

## 📌 Theme 3: Positive outcome (2%, 7 of 347 students)

✓ **Direct attribution:** Students explicitly stated that the activities helped them secure an internship or clear an interview

### ◆ Prominent Codes:

- clear technical interviews (n=2)
- secure an internship (n=5)

# Study 4: How effective is our pedagogical intervention in preparing students for securing internships?

2020

2024

Study 4: Retrospective efficacy of HTG

Study 4: Findings

2024 (Proposed work)

single-institutional



efficacy research



survey-based (retrospective)



survey

512 respondents

RQ4. *What role did our activities play in helping students secure an internship or job post their participation?*

## 📌 Theme 3: Positive outcome (2%, 7 of 347 students)

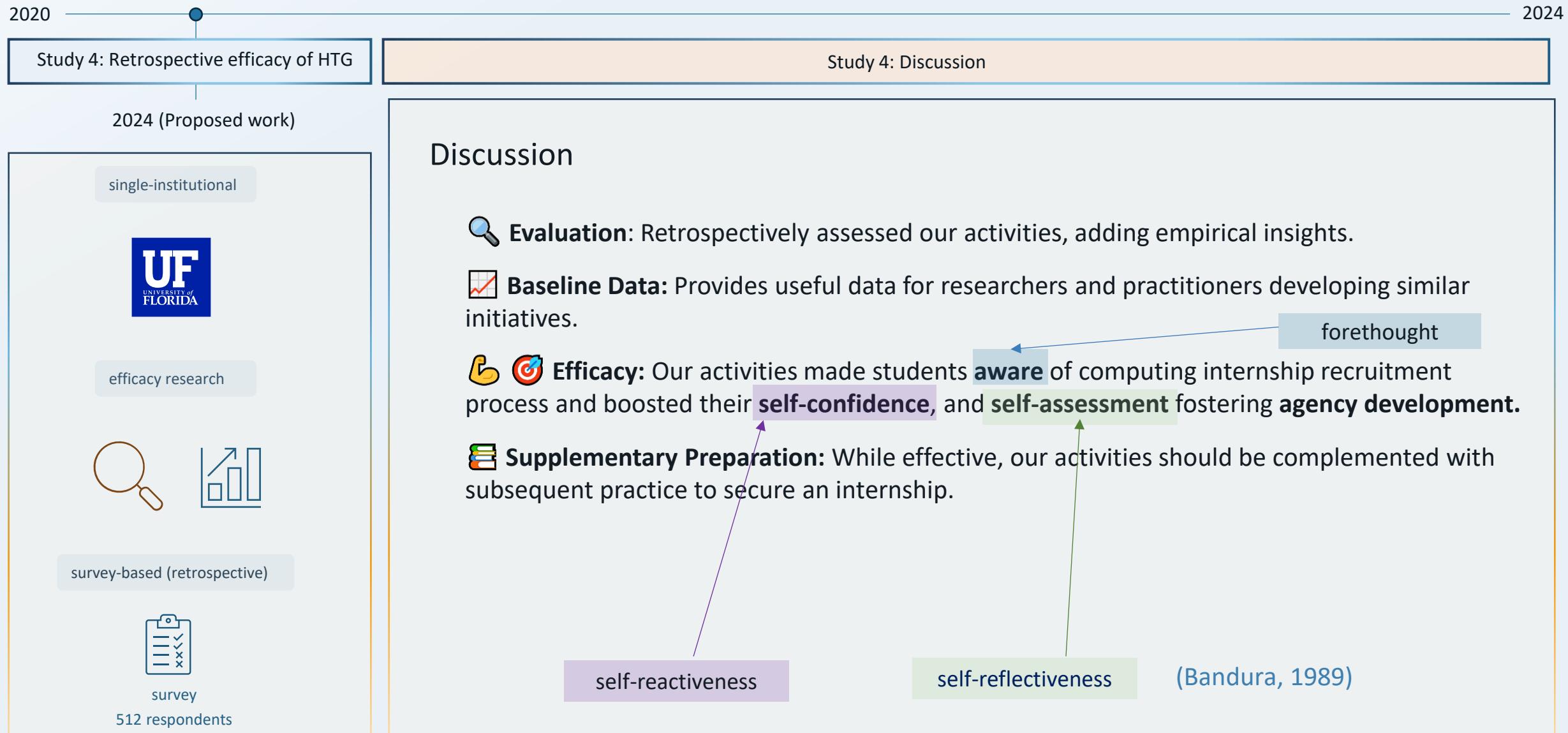
Helped me practice talking out loud while solving coding problem. Get to know my strengths and areas that needed improvement before a technical interview. **Helped me secure a software engineering internship with JP Morgan Chase**

– S166, Fall 2023

HTG helped me prepare for career fair and the Grace Hopper conference in which I had to interview with recruiters, and ultimately ended up receiving an internship offer.

– S23, Fall 2023

# Study 4: How effective is our pedagogical intervention in preparing students for securing internships?



# Study 4: How effective is our pedagogical intervention in preparing students for securing internships?

2020



2024

Study 4: Retrospective efficacy of HTG

Study 4: Limitations

2024 (Proposed work)

single-institutional



efficacy research



survey-based (retrospective)



survey

512 respondents

## Limitations

- Locating students in longitudinal panel studies can be challenging especially graduating students
- Maturation effect
  - additional checks in our instrument such as recalling the course for the HTG activities and explicitly asking its attribution to securing a job
- Validity of qualitative analysis
  - transparency of research process
  - using participants' quotes
  - revealing the researchers' positionality

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# CONTRIBUTIONS

## ■ Empirical contributions in Computing Education Research Literature

- Value students receive from participation (SIGCSE 2019a)
- Attributes of students' who participate in internships (SIGCSE 2020, SIGCSE 2023a)
- Student preparation for securing internships (SIGCSE 2019a, SIGCSE 2019b, SIGCSE 2020)
- A qualitative categorization model describing barriers to participation (ACE 2020)
- A statistical model for identifying internship participation (SIGCSE 2023a)

foundational research

Study 1

Study 2

## ■ Theoretical contribution

- Personas of successful vs unsuccessful students with emphasis on:
  - student goals, attributes, strategies and challenges
  - processes for participation and preparation
  - stakeholders involved in these processes
  - participation in formal, non-formal, and informal education

foundational research

Study 1

Study 2

## ■ Curriculum and Pedagogical Contributions

- Integration of Technical Interview Exercises within Curriculum and Instructor Resources (ITiCSE 2021)
- Effectiveness of our intervention (SIGCSE 2023b, ITiCSE 2025)

design and development research

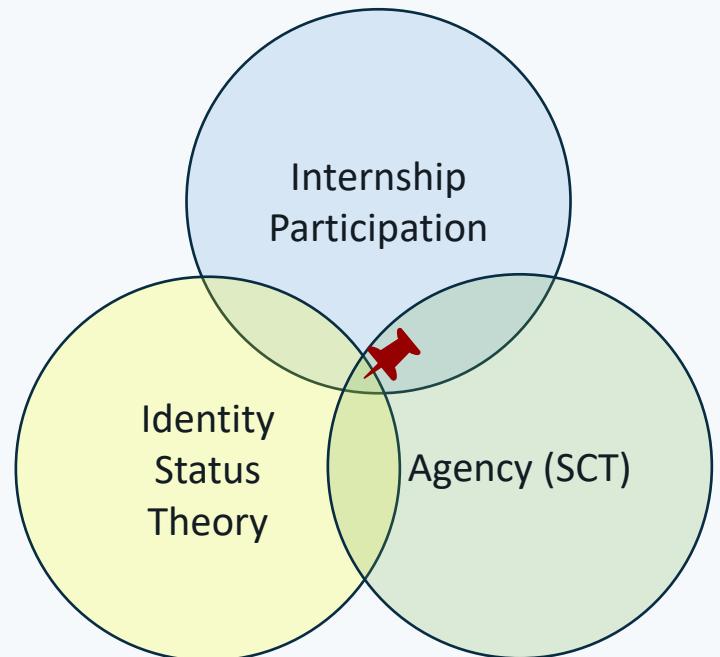
efficacy research

Study 3

Study 4

# CONCLUSIONS

🎓 Research Focus: Computing students' participation in internships



## Sources

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Alvarado and Spring (2018). Successfully Engaging Early Undergraduates in CS Research. SIGCSE '18

Dean, Lynch, and Ramnath (2011). Student perspectives on learning through developing software for the real world. FIE '11

Fryling, Egan, Flatland, Vandenberg, and Small (2018). Catch 'em Early: Internship and Assistantship CS Mentoring Programs for Underclassmen. SIGCSE '18

Parker (2018). Developing Software Engineers: A study of professionalization in a CS Senior Capstone. SIGCSE '18

Marcia (1966). Development and validation of ego-identity status.

# CONCLUSIONS

 **Research Focus:** Computing students' participation in internships

 **Key Insights:**

-  Successful interns: High agency, ambition, self-regulation, external involvement & proactive prep
-  Students who did not intern: Relied on coursework, lower self-efficacy, lack of structured prep

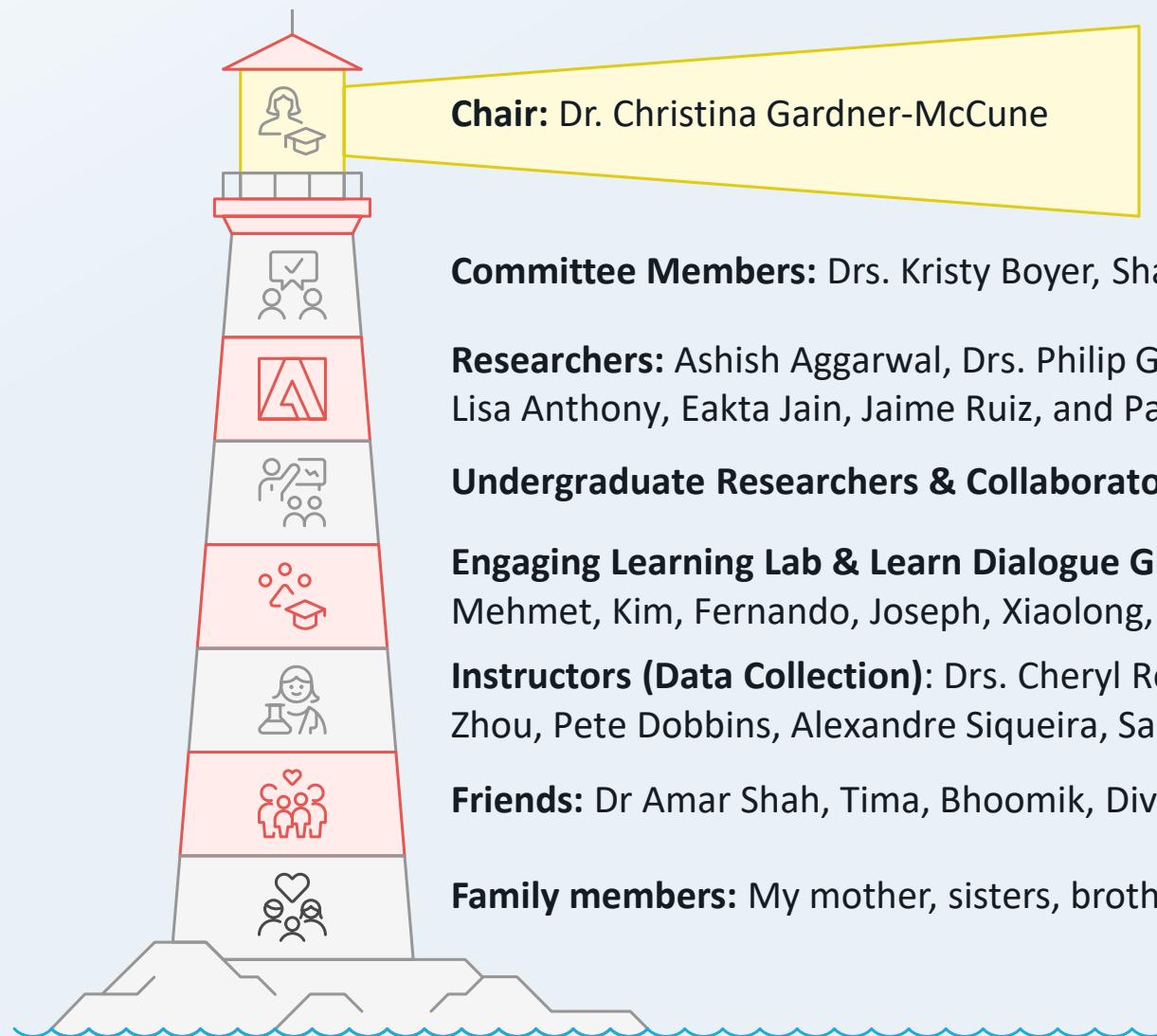
 **Intervention:** *Hire Thy Gator* – Technical interview exercises

-  Increased awareness & confidence in recruitment process
-  Helped preparation but required continued practice

 **Future Directions:**

-  Study student transitions between personas
-  Build predictive models to identify at-risk students
-  Examine internship trends post-COVID across contexts

# ACKNOWLEDGMENTS



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**Family members:** My mother, sisters, brothers-in-law and nephews.

# QUESTIONS



Questions?

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What's next?



— Edugator

AI assisted preparation for Internships



Grasshopper Lab aims to advance collective understanding of human **agency** and **accelerate** its development **among key stakeholders in computing education**.