

Can *Community Service* Foster *Commitment to Social Responsibility* Among First-year STEM Major Aspirants?

Preliminary Oral Presentation
2025/12/04

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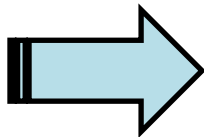
Introduction

Background

- Science and technology (S&T) have brought tremendous changes to human society.
- S & T developments often “benefit some and not others” or “benefit some more than others” (Leydens et al., 2022, p. 3).
- Need for STEM professionals committed to social good and equity.

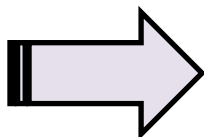
Problem Statement

- STEM education prioritizes economic & national competitiveness over social responsibility.
- Students’ social awareness remains flat during college (Schiff et al., 2025).
- Social justice-oriented students tend to leave STEM fields (McGee & Bentley, 2017).
- Growing policymakers and scholars recognized the importance of social justice and STEM students’ commitment to social responsibility.



Community service activities ~ Commitment to social responsibility (strong positive)

(Einfeld & Collins, 2008, 2008; Garibay, 2015; Myers et al., 2019; Museus & Sifuentez, 2021; Sax, 2004)



Study Purpose: Whether and to what extent community service promotes social responsibility commitment among first-year STEM major aspirants using multi-site longitudinal data and quasi-experimental design.

Research Questions

- **RQ 1:**
 - What **individual** and **contextual** factors predict first-year STEM aspirants' **frequent engagement** in both curriculum-based and co-curricular **community service activities** during their undergraduate studies?
- **RQ 2:**
 - Do first-year STEM aspirants who **frequently participated in community service** during college have significantly **greater** gains in **civic awareness**, **social agency**, and **career concerns for social change** by the end of their senior year compared to demographically and intuitionally similar peers who did not participate in such activities?
- **RQ 3:**
 - Does the effect of **frequent participation in community service** activities on **commitment to social responsibility** vary across **students' social identity characteristics** (gender, race/ethnicity, first-generation status)?
- **RQ 4:**
 - Does the effect of **frequent participation in community service** activities vary across **institutional factors**, such as institutional type, control, and selectivity?

Who and Where

Main Treatment Effect

Student-level
Heterogenous Effect

School-level
Heterogenous Effect

Study Significance



- **Educational Practice and Policy:**
 - Evaluate average treatment effect of community service.
 - Assess heterogenous effect across student-identity and school-context.
 - Provide evidence to inform policy and practice.
- **Theoretical Contribution:**
 - Integrate updated socialization model with Expectancy-Value Theory.
 - Incorporate human agency as essential element.
 - View community service as key socialization process.
- **Methodological Contribution:**
 - Apply potential outcome framework with multilevel modeling.
 - Utilize multi-year multi-institutional data.
 - Several robustness check and sensitivity analyses.

Literature Review



Community Service as a Promising Strategy

- **Types:** Curriculum-based **service-learning** and co-curricular **volunteer and service activities** (Astin et al., 2000; Keen & Hall, 2009; Sax, 2004).
- **Positive associations:** community service participation and **civic values development**, **leadership skills**, and plans for **continued service after college** (Belanger et al., 2017; Botelho et al., 2020; Collins et al., 2020).
- **Participation:** **Women, URM**s, and **first-generations** were more attractive to community service (Collins et al., 2020; Ender et al., 2000; Payton et al., 2015; Saavedra et al., 2022).



Factors Influencing STEM Students' Socially Responsible Outcomes

- **Individual:** **Women, URM**s, and **first-generation** students show higher **social agency** and **community-oriented values** (Allen et al., 2015; Carlone & Johnson, 2007; Garibay, 2018; Martin et al., 2020; McGee & Bentley, 2017).
- **School:** **STEM field**, university **type**, and campus **climate** influence civic development (Dugan & Komives, 2010; Garibay, 2024; Gasparis et al., 2017; Leydens et al., 2022).
- **Higher Education:** racial/cultural awareness workshops, or participating in ethnic/racial student organizations (Batz-Barbarich et al., 2024; Bowman et al., 2016).

Conception Framework

- **Undergraduate Socialization Theory:**
 - How **individual characteristics**, **college experiences**, and **institutional contexts** shape students’ development of **knowledge, dispositions, and skills** (Weidman, 1989, 2020; Weidman & DeAngelo, 2020).
 - **Human agency** as an essential element (Weidman & DeAngelo, 2020).
- **Expectancy-Value Theory:**
 - **Achievement-related choices** are largely determined by students’ **expectations of success** and the **value they assign to the activity** (Eccles & Wigfield, 2023; Wigfield & Eccles, 2000).

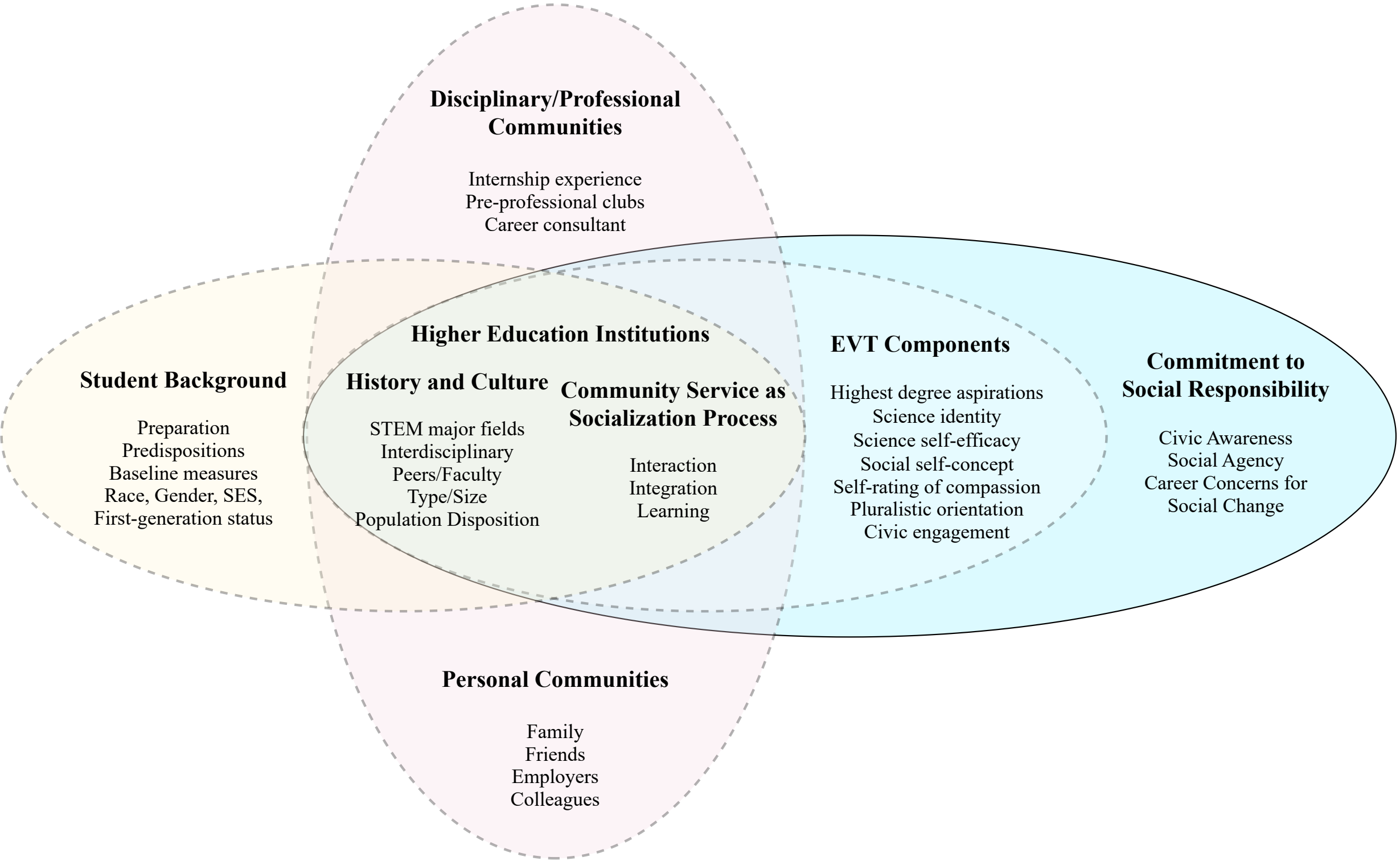


Figure 2.3 Integrated Conceptual Framework

- **Dataset**

- Student-level data: Higher Education Research Institute's ([HERI](#)) 2018-2021 Freshman Survey (TFS) and 2022-2025 College Senior Survey (CSS)
- Institutional-level data: Institutional data from the Integrated Postsecondary Educational Data System ([IPEDS](#))

- Students indicating **STEM major aspiration** on TFS
- Students who **completed both** TFS and CSS
- Institutions with **at least one student** reporting **community service participation** (common support assumption)

COLLEGE

Navigatordiv>

Name of School

ucla

States (use map for more than 1 state)

No PreferenceAlabamaAlaska

Use Map

ZIP Code

Miles from▼

Programs/Majors
0 Items Selected

Browse for Programs

Level of Award ?

☐ Certificate☐ Bachelor's

☐ Associate's☐ Advanced

Institution Type ?

☐ Public☐ Private non-profit☐ Private for-profit

☐ 4-year☐ 2-year☐ < 2-year

+ MORE SEARCH OPTIONS

Show Results

Guide Me | Clear Search

University of California-Los Angeles

405 Hilgard Ave, Los Angeles, California 90095-1405

General information:

(310) 825-4321

Website:

[www.ucla.edu/](#)

Type:

4-year, Public

Awards offered:

Bachelor's degreeMaster's degreePost-master's certificateDoctor's degree - research/scholarshipDoctor's degree - professional practice

Campus setting:

City: Large

Campus housing:

Yes

Student population:

46,678 (33,040 undergraduate)

Student-to-faculty ratio:

18 to 1

Expand AllCollapse All

+ GENERAL INFORMATION

+ TUITION, FEES, AND ESTIMATED STUDENT EXPENSES

+ FINANCIAL AID

+ NET PRICE

+ ENROLLMENT

+ ADMISSIONS

+ RETENTION AND GRADUATION RATES

+ OUTCOME MEASURES

+ PROGRAMS/MAJORS

+ SERVICEMEMBERS AND VETERANS

+ VARSITY ATHLETIC TEAMS

+ ACCREDITATION

+ CAMPUS SECURITY AND SAFETY

+ COHORT DEFAULT RATES

Data

• Variables

– Outcome variables Y_{ij} (CSS)

- civic awareness (HERI Construct)
- social agency score (HERI Construct)
- career concerns for social change

– Treatment variables D_{ij} (CSS)

- 1 = frequently participating community service activities, 0 = otherwise
 - Performed community service as part of a class
 - Performed volunteer or community service work

– Student-level variables X_{ij} (TFS)

- background characteristics (e.g., race, gender, SES, citizenship, major)
- baseline measurements (initial levels of dependent variables)
- pre-treatment socialization processes and EVT (e.g., STEM AP classes, science identity)

– School-level variables W_j (TFS & IPEDS)

- type, control, selectivity, HSI/HBCU status, Carnegie classification, student body composition, and STEM degree production

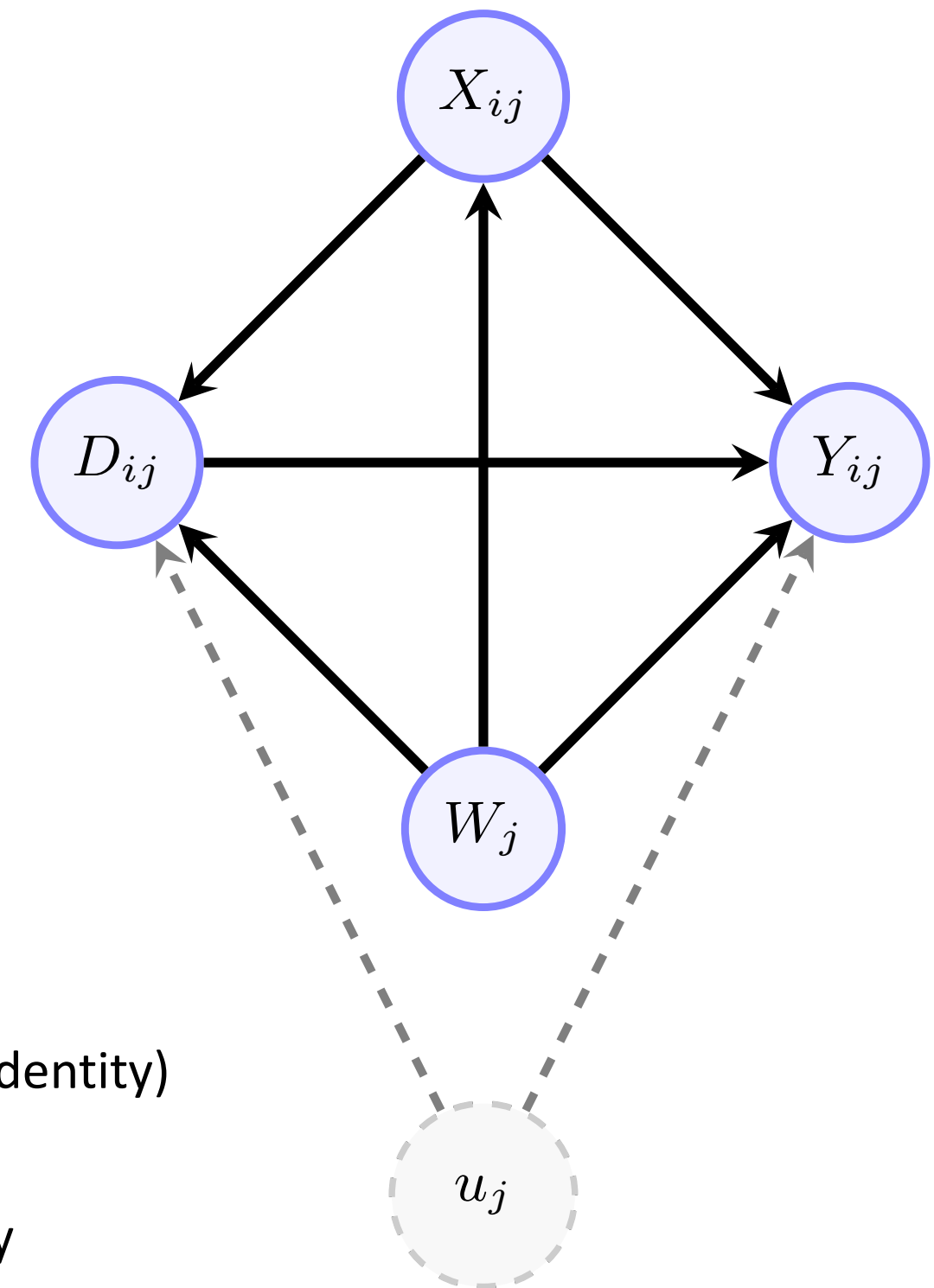


Figure 3.2 Directed Acyclic Graph (DAG) of Study Design

Method

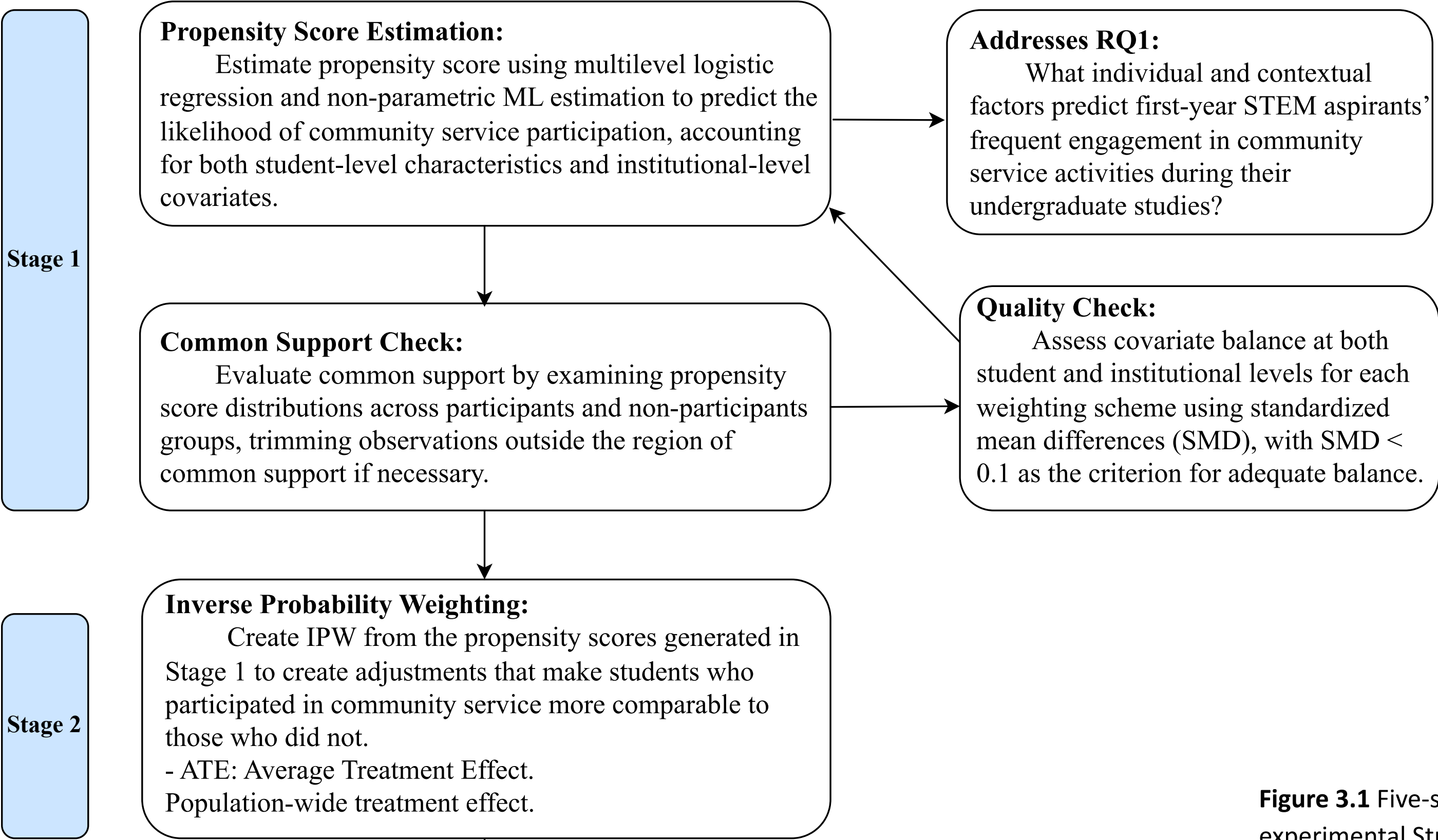
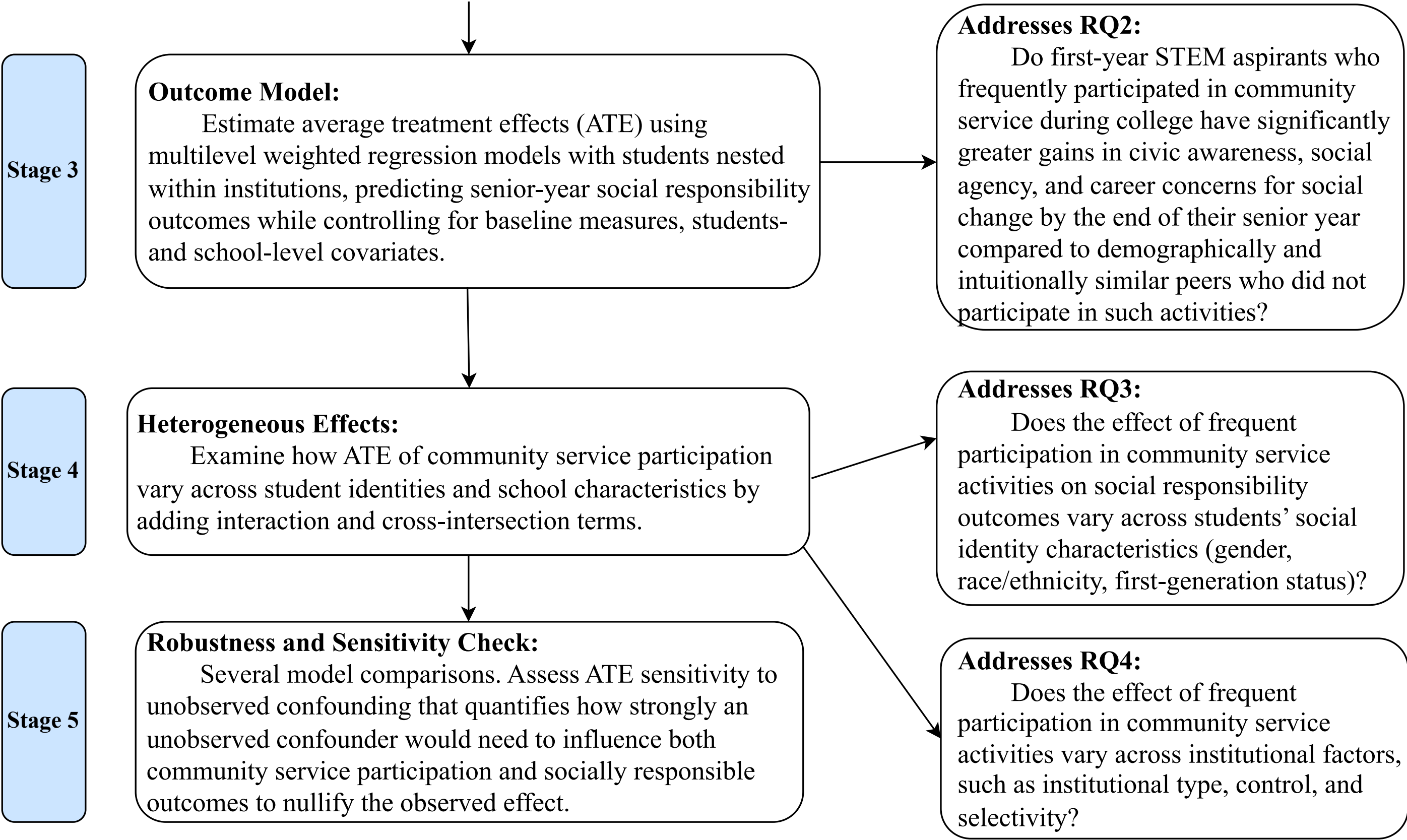


Figure 3.1 Five-stage Quasi-experimental Study Design

Method



Method

- Model Specifications

Propensity Score Model

$$\log \left(\frac{P(D_{ij} = 1 | X_{ij}, W_j)}{P(D_{ij} = 0 | X_{ij}, W_j)} \right) = \alpha_0 + \alpha X_{ij} + \beta W_j + \gamma (X_{ij} \times W_j) + u_j$$

Stage 1
Equation (3)

gender, race/ethnicity, first-generation status

Outcome Model (with interaction terms)

Level 1(student): $Y_{ij} = \beta_{0j} + \delta_j D_{ij} + \beta_{1j} X_{ij} + \beta_{2j} (D_{ij} \times S_{ij}) + e_{ij}, \quad e_{ij} \sim N(0, \sigma^2)$

Level 2 (school): $\beta_{0j} = \gamma_{00} + \gamma_{01} W_j + u_{0j}, \quad u_{0j} \sim N(0, \tau_0)$

$$\delta_j = \gamma_{\delta 0} + \gamma_{\delta 1} W_j + u_{\delta j}, \quad u_{\delta j} \sim N(0, \tau_{\delta})$$

$$\beta_{1j} = \gamma_{10},$$

$$\beta_{2j} = \gamma_{20}$$

Stage 4
Equation (7)

Propensity Score Model

- α : a vector of student-level coefficients
- β : a vector of institutional-level coefficients
- γ : interaction effect of school-level covariates and student-level covariates
- $u_j \sim N(0, \sigma_u)$: institutional random effects

Final Outcome Model (with interaction terms)

- δ_j : ATE of community service within institution j
- γ_{20} : heterogenous ATE across students' social identities
- $\gamma_{\delta 1}$: heterogenous ATE across institutional contexts
- $u_{\delta j} \sim N(0, \tau_{\delta})$: between-institution variability in ATE controlling for W_j

Limitations

Selection Bias and Unmeasured Confounders

- Propensity score methods and sensitivity analyses cannot eliminate all **unobserved confounders**
 - Family values regarding community engagement
 - School financial/resource support for participation
 - Students' intrinsic motivation

SUTVA Assumptions

- Assumes individual outcomes **unaffected** by others' treatment status
- Assume only **one version** of community service participation
 - Peer effects may create spillover effects
 - SUTVA may be more plausible as "local" assumption
 - MLM partially addresses this but cannot fully capture within-institution spillover

Secondary Data Constrains

- Limited by variables and measures in secondary data
- May not capture all theoretically relevant constructs
- TFS lacks direct **baseline measures** of community service participation, civic awareness, and career concerns for social change



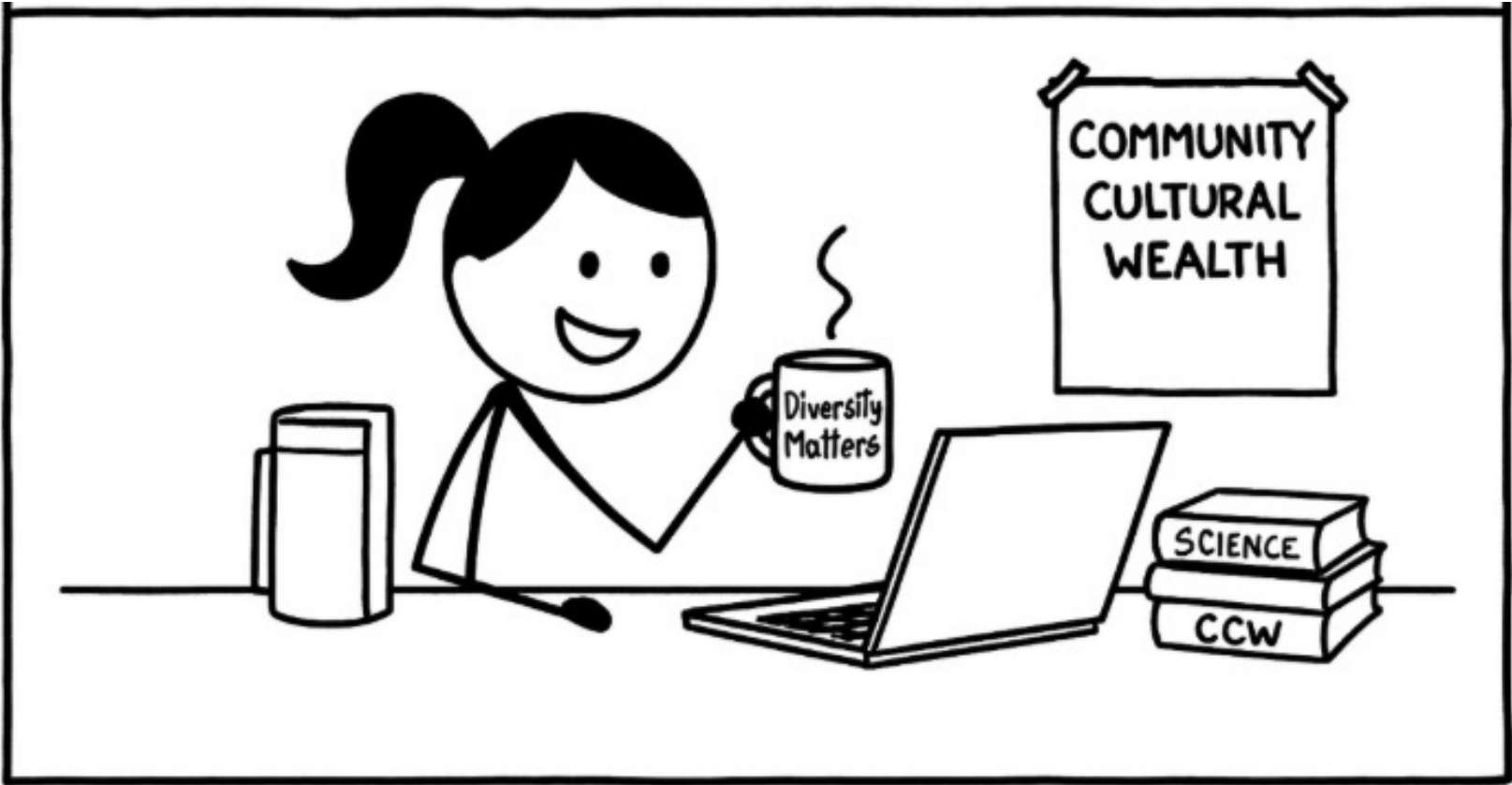
Positionality



Committed to **advancing social justice** through rigorous scholarship that centers the experiences of **underrepresented students** while examining the **institutional context** and **students' agency** in shaping their (our) educational trajectories.



Beyond traditional measures of technical competence, focus on outcomes that reflect students' **sense of self-worth**, **motivation**, and **personal agency**.



Experience firsthand distinction between **STEM** and **non-STEM**. Aim to incorporate **advanced statistical methods** with **higher education research**.

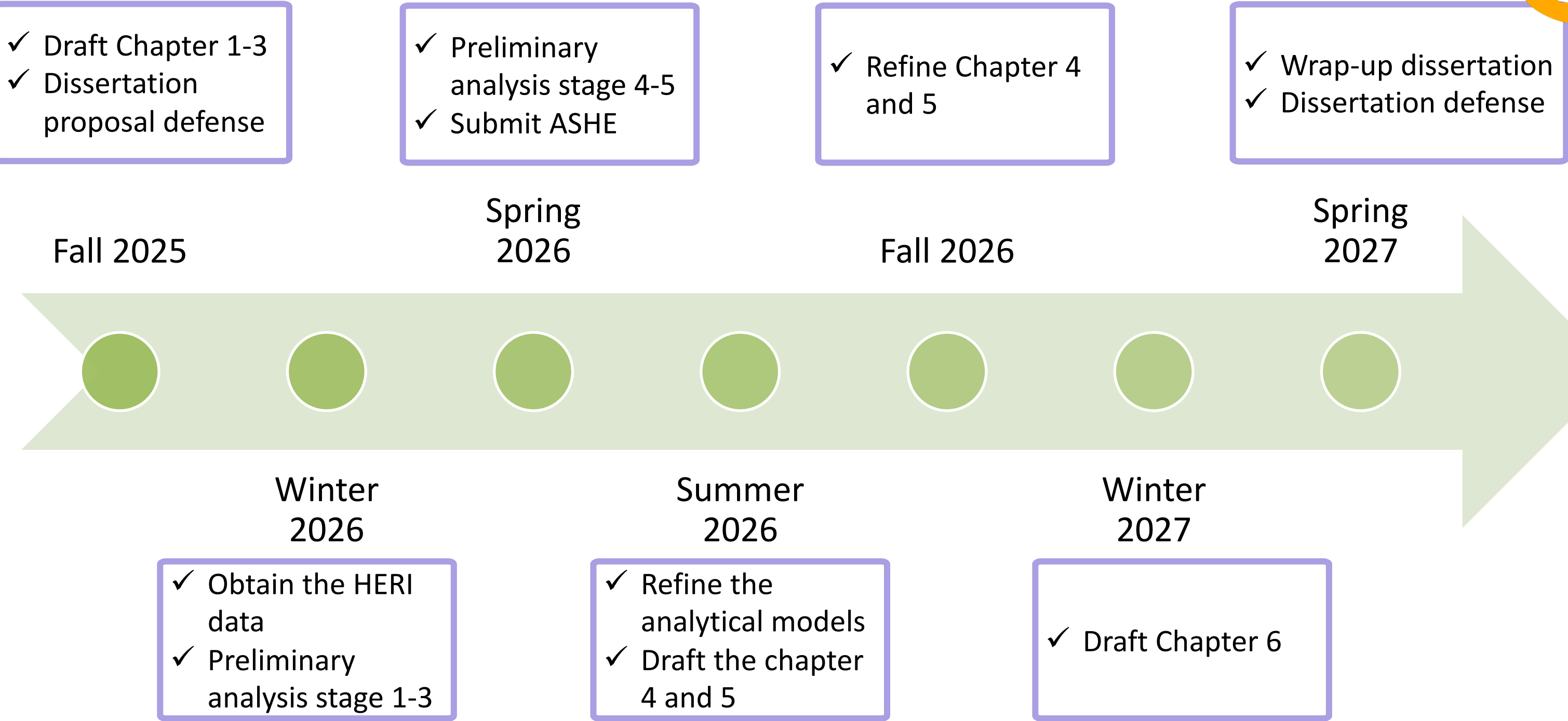


Commitment to **asset-based frameworks** that highlight the **strengths** and **resources** students **bring to** their educational journeys.



Recognize the influence from **historical legacies**, **institutional climate**, and **departmental contexts** in shaping students' higher education experiences, values, and outcomes.

Timeline



Q & A

- Thanks for listening!
- Welcome questions and constructive feedback.

