

# ITEST as a Career Development Research Context

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# The Crossroad: Stagnation vs. Inclusiveness

- We are at a crossroads wherein our world is changing rapidly.
- We have multiple options here:





# The Crossroad:

- We all know the story about the critical importance of STEM education.
- What can career development research add to the conversation?
  - We can ask some of the hard questions about the meaning of interventions designed to influence interest formation and expression.
  - We can identify best practices.
  - We can generate new ideas to facilitate STEM interests and skills.



# Goals for this Presentation

- Ask the hard questions
- Review theory-building research at Boston College
- Identify future directions for career development research



# The Hard Questions

- To what extent can we foster greater appreciation of STEM courses and careers?
- To what extent is this a good thing for students?
- How can we manage the achievement gap and knowledge gap that is manifested so profoundly in the STEM pipeline?



# The Hard Questions

- What we do know....
  - Students may be considering STEM options; we can enhance their exploration by...
    - Improving competence
    - Enhancing relevance
    - Providing viable exploration options
    - Reducing the impact of gender and race-based socialization

# The Hard Questions

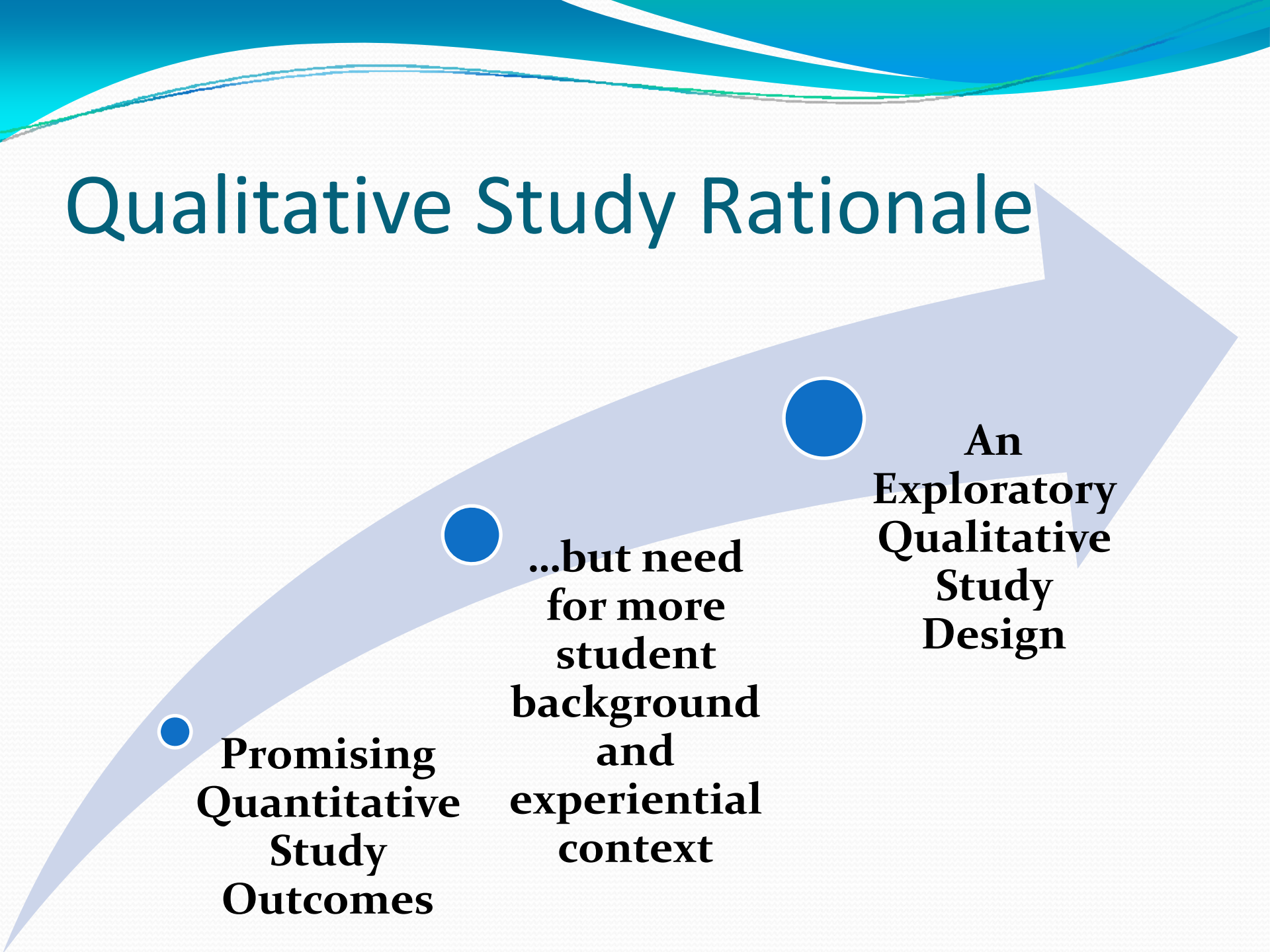
- To what extent can we shape interest formation?
  - Answer is both yes or no
- We can bring students to the STEM world of ideas and curiosity.
- We can help them understand the importance of 21<sup>st</sup> century skills for the competitive labor market.
- We can help them internalize the connections among STEM skills, school engagement, and career planning.
- However, we still do not fully understand why some people move into STEM careers and others do not, even after the best practices of ITEST programs.



# The Hard Questions

- The Boston College contribution
- Collaborative research with interdisciplinary teams
  - The Boston College model
- Methodological diversity
  - Theory testing research
  - Theory-building research
- Clear acknowledgement of values

# Qualitative Study Rationale



**Promising  
Quantitative  
Study  
Outcomes**

**...but need  
for more  
student  
background  
and  
experiential  
context**

**An  
Exploratory  
Qualitative  
Study  
Design**

# Qualitative Research Question

Overarching Project Question: How can we move from helping students explore STEM fields to having them actually consider STEM fields as viable career aspirations?

Specific Research Question for the Qualitative Study:

**How do the students' backgrounds and experiences help explain their outcomes in the program?**

# Program Structure

- An intensive 2-week immersive scientific inquiry experience.
- Curriculum of the program
  - Investigation of environmental issues
    - Projects: urban street trees; bird bioacoustics; biodiversity
  - Local city environment
  - Field studies
  - Geospatial technology
  - Computer modeling software
- Learning Goals emphasize **scientific inquiry** and collaboration with others on investigating problems using similar (and the same tools) as professional scientists.



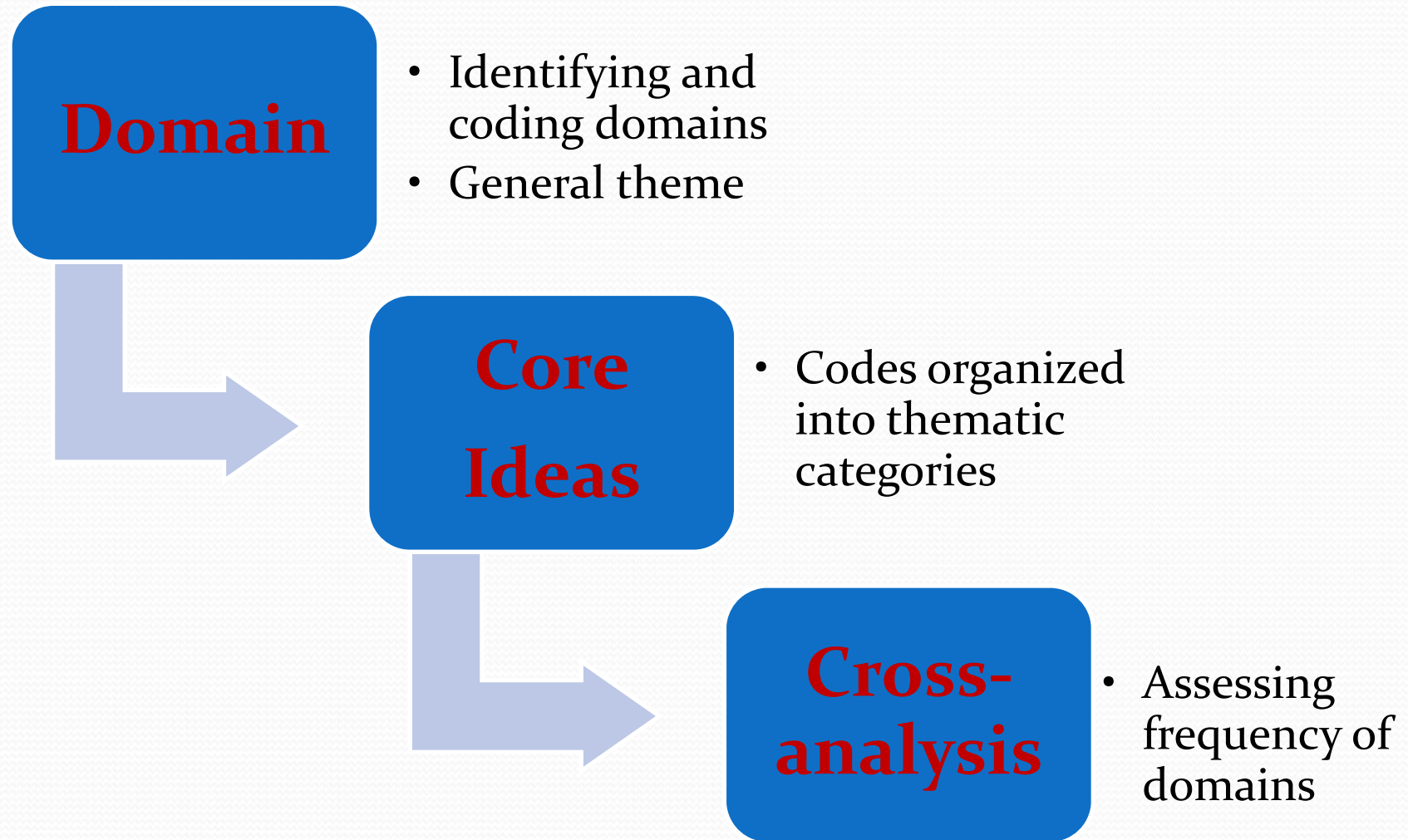
# Methods: Interview Protocol

- Targets included:
  - Educational & career interests;
  - Social supports & barriers;
  - Reflections on the ITEST program.

# Qualitative Methodology

- Consensual Qualitative Research (CQR; Hill, Knox, Thompson, Williams, Hess, & Ladany, 2005)
  - Open-ended, semi-structured interviews
  - Several judges conduct coding of domains and core ideas
    - ➔ Multiple perspectives
  - Validity of findings/perspectives on the data sets
    - ➔ Multiple coders
    - ➔ External auditor

# Data Analysis



# Participants

**Total Program  
Enrollment: 62  
students**

**Interviewees at  
Time 1: 57 GPA:  
2.66 Female:  
42%**

**Interviewees  
at Time 2: 9  
GPA: 2.96  
Female: 56%**

# Qualitative findings

# Summary of Findings

- Increased program-specific content knowledge
- **Positive experiences with the hands-on, interactive science learning experiences and supportive social relationships**
- Program participation encouraged STEM career exploration
- **Friends were resources & barriers. The students were resources to themselves**



# Summary of Findings

- **Teachers & Guidance Counselors were limited resources in STEM career exploration**
- **Students held optimistic, ambitious, hopeful and realistic attitudes for their futures**
- **Parents as role models for working might be a root of students' career aspirations**

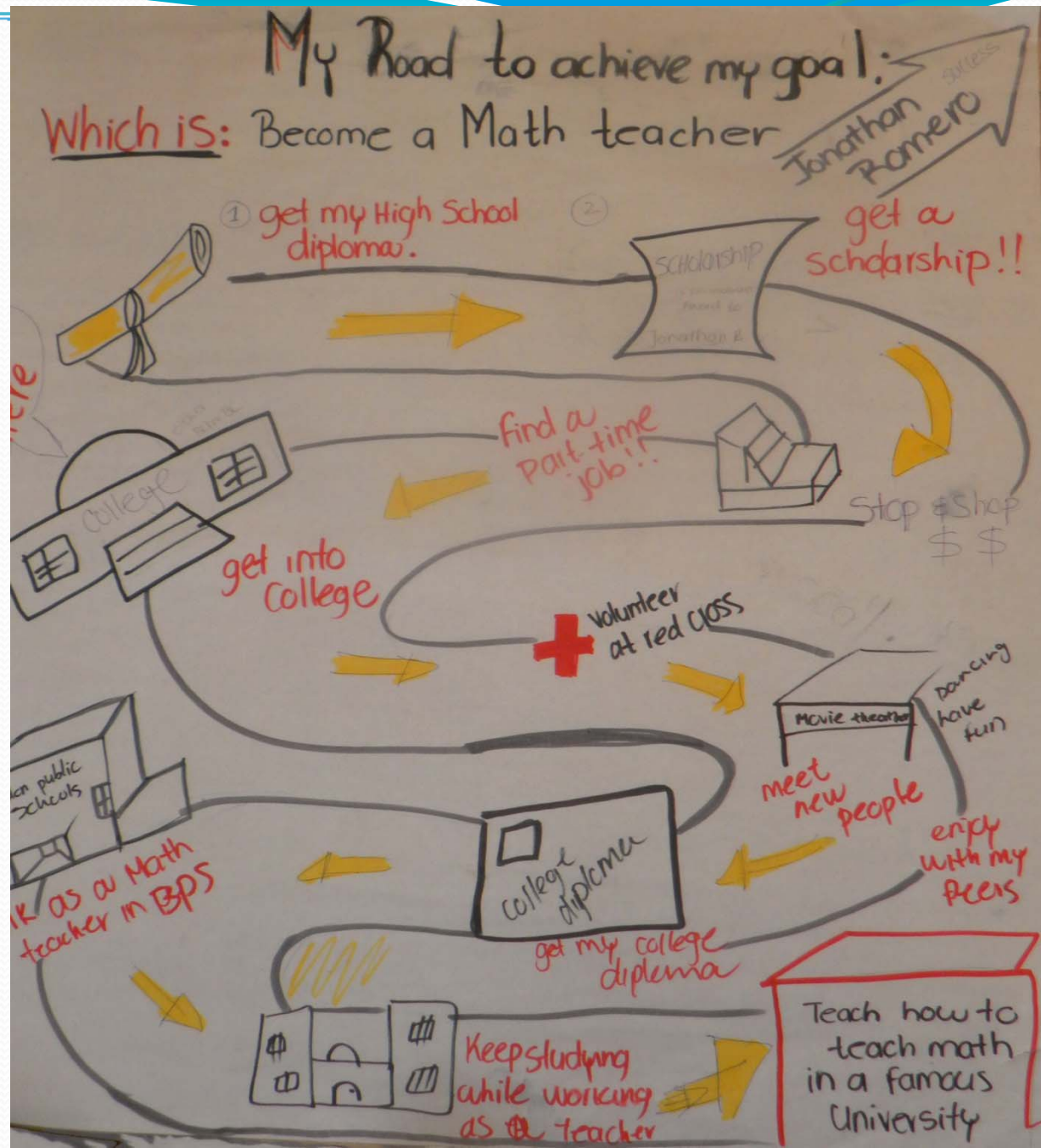
# Program participation encouraged STEM career exploration

Student 1: For a minute, when I was in the summer program, I was like...**I never really liked science, but this is really fun. It made me think of kind of becoming a doctor,** but in the back of my mind I always have that goal of being a lawyer. So I don't know.

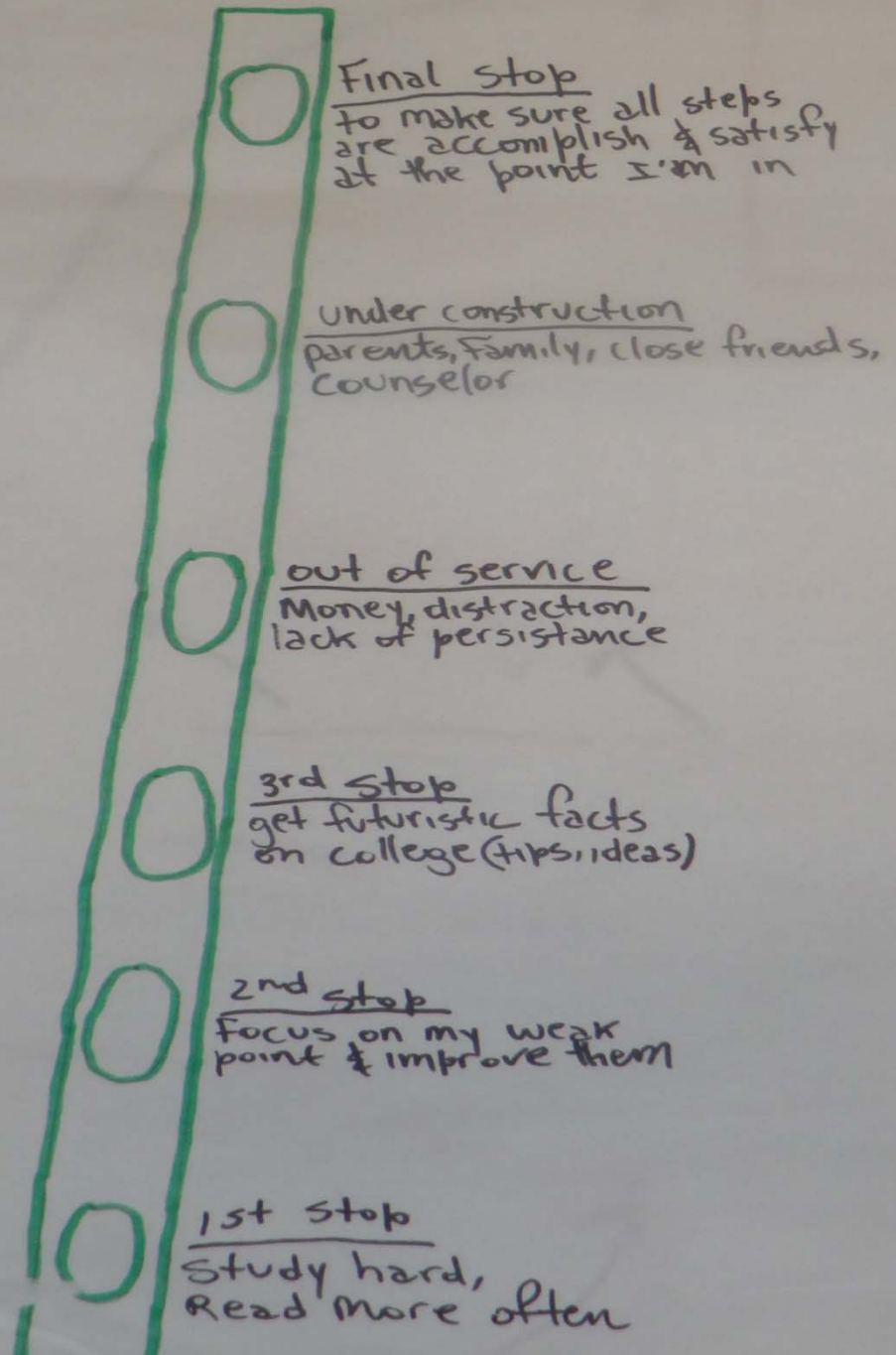
# Parents as role models for working might be a root of students' career aspirations

Student 1: **[My parents] work hard.** They have to get up in the morning even though they don't want to... like, **if you really want a good job and like not kill yourself and work so hard, you have to go to college and get a good job and get paid well.**

# Student Career Planning: Road to a Math Teacher



# Student Career Planning: Green Line to Success



# **Friends were resources & barriers. The students were resources to themselves, as well**

**Student 1: All the friends I have are... into science and math careers. Two... both want to be eye doctors. My other friend... wants to do aerospace.... Everybody else is thinking about medicine or like science. They want to like be a chemist or like a doctor...**

**Student 2: That was a big like maturing step for me like freshman and sophomore year. I was always like the guy who was like just chilling, trying to be a jock... But then, I realized... what the real world was about. And then I changed my whole cluster of friends, and I guess they called them geeks but they're not geeks to me.**

## **Teachers & Guidance Counselors were limited resources in STEM career exploration**

Student 1: I'm taking AP Chemistry now. I'm planning on taking AP biology. I was hoping that they would have AP physics because I like physics and I like the teacher that I had. He made it fun for me. But [the school doesn't offer it]... I only had one teacher that actually ever talked to me about [STEM careers]. That was my freshman physics teacher. He taught me some stuff about bioacoustics on bird sounds and he told me about it. And that's how it all started because he talked to us about it and decided we should do it.

**Students held optimistic, ambitious, hopeful and realistic attitudes for their futures**

**Student 1: At the end of next year, I want to go to college, of course, not sure where exactly, but maybe UPenn or BC, and study [obstetrics]... I think future opportunities to become an obstetrician are very, very difficult just because I mean I am not the only one striving to get that type of job and there's plenty of competition, and with the economy. You have to know the right people you know, it's just, it's going to be hard.**



# Implications

Contribution to knowledge base on best practices and program design for STEM career development.

Culturally-relevant science curriculum can enhance ethnic minority students' science career interests.

Strong racial & ethnic identities might contribute to student resilience and perseverance in an academic area in which they are marginalized.

# Implications

A positively impactful and organized STEM career development program would include, provide or strengthen:

- relational support,
- active and engaged teachers,
- a strong racial and gender-based identity component,
- competence in STEM courses, and
- systematic career exploration opportunities
- needs programmatic duration... short doses over time can be quite effective