

Science interest and science identity in racial and ethnic minority urban undergraduate and high school geoscience students

Dr. Rondi Davies (1,2) Jessica Wolk-Stanley (2,3) Victoria Yuan (2,4)
Julie Contino (2)

1. Department of Biological Sciences and Geology, Queensborough Community College, City University of New York
2. Richard Gilder Graduate School, American Museum of Natural History, New York
3. Landmark High School, New York,
4. Franklin D. Roosevelt High School, New York

Minority groups and STEM

- Minority groups
 - Racial and ethnic minorities
 - Migrants
 - Lower income households
- Underrepresented in science, technology, engineering, and mathematics (STEM) fields in higher education and the workforce.
- The greatest underrepresentation is found in the geosciences
→ almost 90% of doctoral degrees are awarded to white people.

Initiatives to improve representation in STEM:

Science Interest:

- Knowledge and information seeking behaviors, find value and enjoyment.

Science Identity:

- View oneself as a science person as well as gaining recognition from others.
- Sense of belonging.

Goals

- Apply pedagogical strategies that provide equitable ways of learning and demonstrating knowledge to develop:
 - a. Content knowledge and skills
 - b. Science interest
 - c. Science identity
- Pedagogical strategies included:
 - a. Place-based learning
 - b. Active learning
 - c. Analyzing and interpreting data

Methods: Science Interest:

- The science interest survey (SIS) developed by Lamb et al. (2012)
- 19 questions scored using a Likert scale
- 5 subscales
 - Family encouragement
 - Peer attitudes
 - Teacher influence
 - Informal learning experiences
 - Science classroom experiences

Methods: Science Interest:

MEASURING SCIENCE INTEREST: RASCH VALIDATION OF THE SCIENCE INTEREST SURVEY

TABLE 1
Item and subscale assignments

<i>Number</i>	<i>Item</i>	<i>Subscale</i>
1	My family has encouraged me to study science.	F
7 (reversed)	People in my family are not interested in science.	F
10	My family is enthusiastic about a science career for me.	F
13	My family is interested in the science courses I take.	F
2 (reversed)	My friends do not like science.	P
9	My friends view science as nerdy.	P
12 (reversed)	My friends do not like to watch science programs on TV.	P
18 ^a	My friends perform science experiments outside of school.	P
3	My teachers encourage me to do my best.	T
8	My science teachers have encouraged me to learn about science.	T
15	My science teachers make science interesting.	T
20	My science teachers are enthusiastic about science.	T
4 (reversed)	I do not enjoy visiting science museums and science centers.	I
6	Visiting science museums and exhibits makes me consider a career in science.	I
11	Visiting science museums and exhibits makes me want to learn more about a science topic.	I
14 ^a	I prefer science class to visiting science museums and centers.	I
5	The topics taught in my science class are important in the real world.	S
16	The topics taught in my science class are boring.	S
17	My science classroom has interesting equipment.	S
19 (reversed)	We do not use most of the equipment in our science classroom.	S

^aIndicate items were dropped from the measure

Methods: Science Identity

- Science Identity Survey
(Pugh et al., 2010)

Motivation, Learning, and Transformative Experience: A Study of Deep Engagement in Science

KEVIN J. PUGH

University of Northern Colorado, Greeley, CO 80639, USA

LISA LINNENBRINK-GARCIA

Duke University, Durham, NC 27708, USA

KRISTIN L. K. KOSKEY. VICTORIA C. STEWART. CHRISTINE MANZEY

Science Identity Items

I can imagine myself being involved in a science related career.

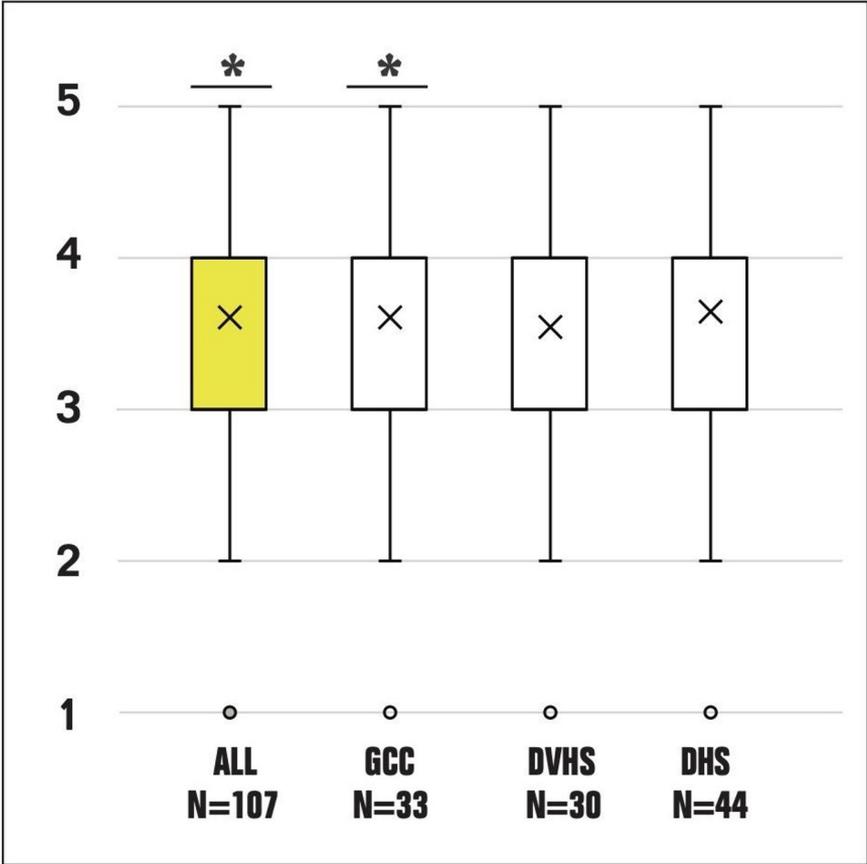
Being involved in science is a key part of who I am.

I consider myself a science person.

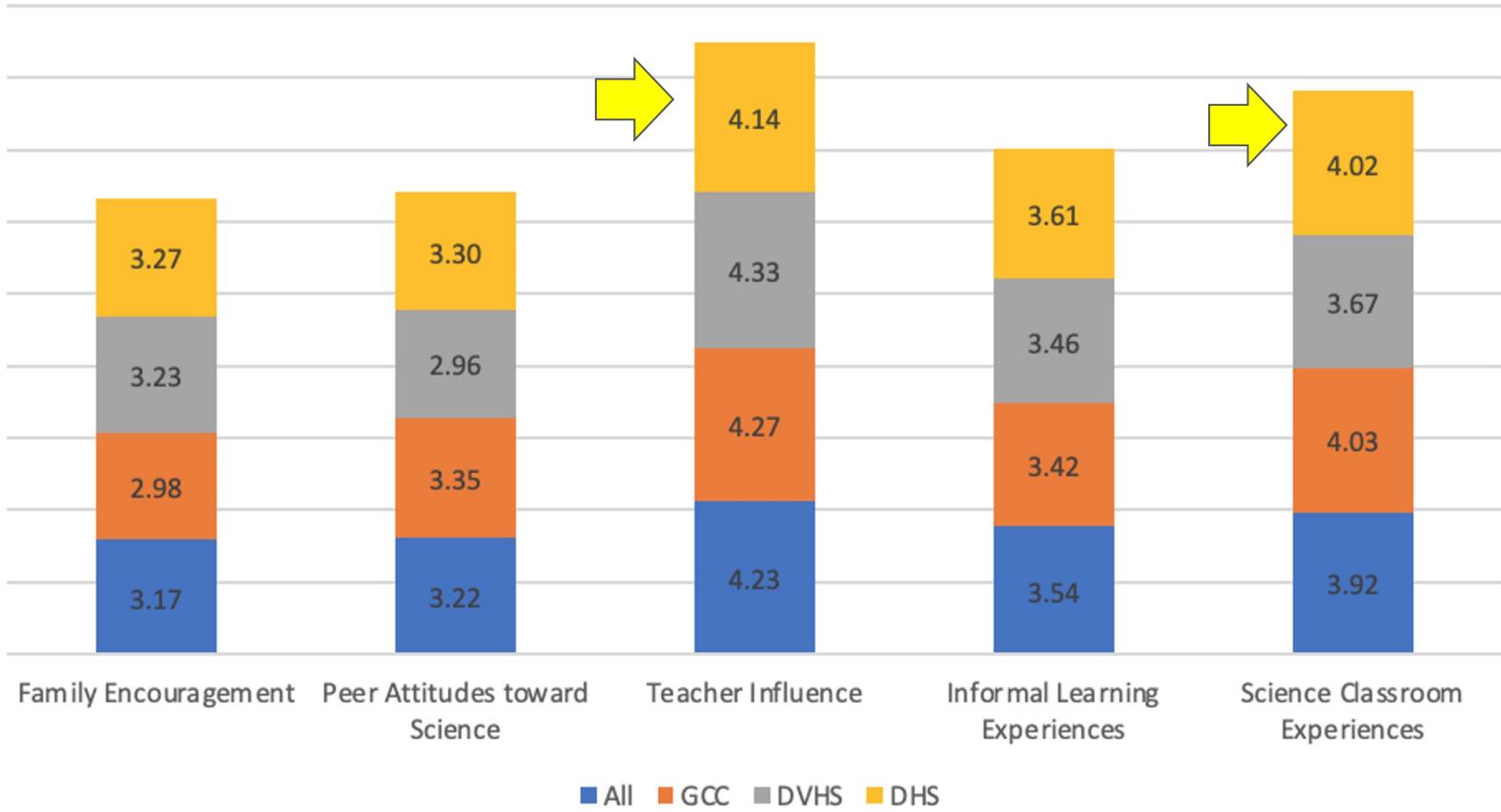
I can see myself doing science in the future.

The students	n=107 students	Combined (%)
	Hispanic/Latinx	39.6
	Asian	23.8
	Black	14.5
	White	26.2
	Non-resident	>1.8
	Female	47.8
	Male	53.1
	ELL	> 13.3
	Disabilities	>11.3
	Receive financial aid/ economically disadvantaged	74.7

Results: Science Interest

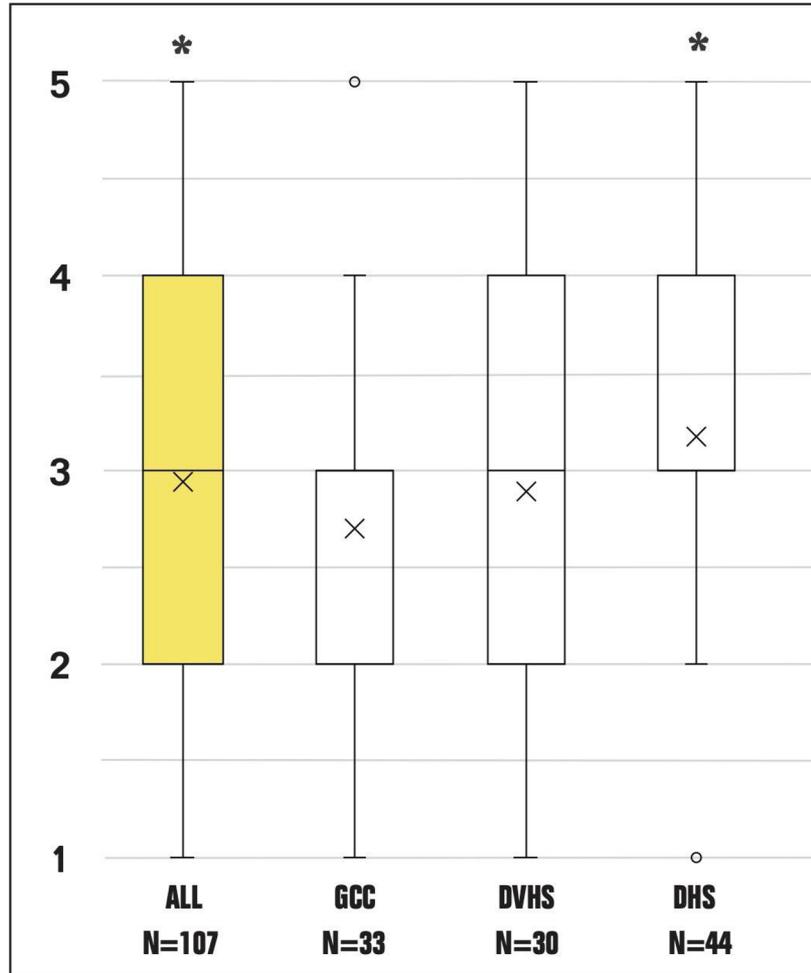


Results: Science Interest Subscales

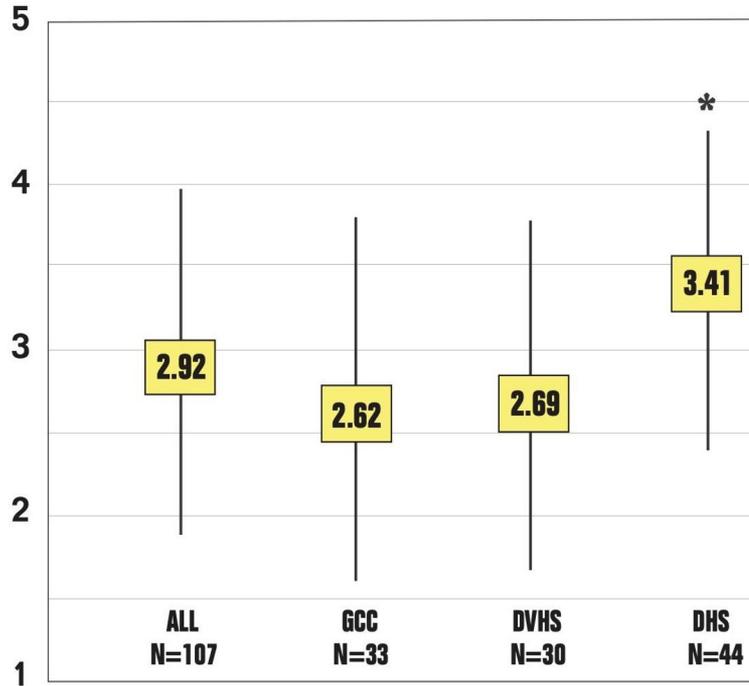


n=107

Results: Science Identity

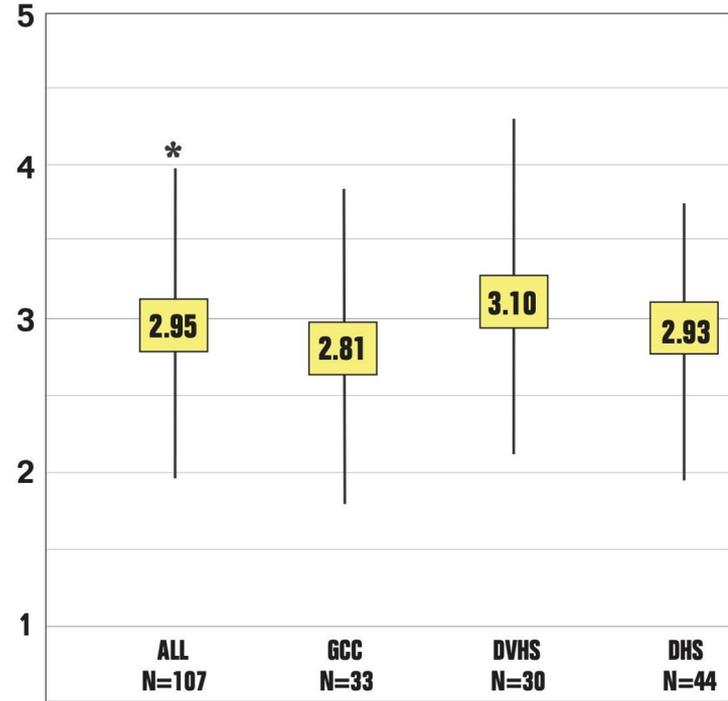


Results: Science Identity



Present

*I see myself as a science person;
being involved in science is a key part of who I am*



Future

*I can see myself doing science in the future;
I can imagine myself being involved in a science related career*

Discussion

Science Interest: students have a strong interest in science, they value and enjoy doing science.

Science identity: average scores were below 3 on a 5 point scale and were a highly variable within and across groups. This indicates work needs to be done to build science identity in order to attract these students to higher education and careers in science.

Students aspire to being involved in science in the future showing they place value on science.

There was no correlation between science interest and identity indicating having an interest does not translate to viewing oneself as a scientist.

Next steps

- Build science identities in our students to encourage careers in STEM.
- Harness their inherent interest in science to do this.

Strategies to build science identities:

- Showcase examples of scientists who do not fit common stereotypes
 - Diverse, more than one-dimensional characters
- Give students opportunities to practice doing and talking about science.
- Highlight content topics that are relevant to students' lives.
- Create cohorts and have student mentors.

References

- Davies, R.M., Wolk-Stanley, J., Yuan, V., Contino, J. (accepted). Building science knowledge, identity, and interest using place-based learning with underrepresented minority urban undergraduate and high school students. *Journal Geoscience Education*
- Lamb, R. L., Annetta, L., Meldrum, J., & Vallett, D. (2012). Measuring science interest: Rasch validation of the science interest survey. *International Journal of Science and Mathematics Education*, 10(3), 643-668.
- Pugh, K. J., Linnenbrink-Garcia, L., Koskey, K. L., Stewart, V. C., & Manzey, C. (2010). Motivation, learning, and transformative experience: A study of deep engagement in science. *Science Education*, 94(1), 1-28.

Contact

Dr. Rondi Davies, Queensborough Community College, CUNY

rdavies@qcc.cuny.edu