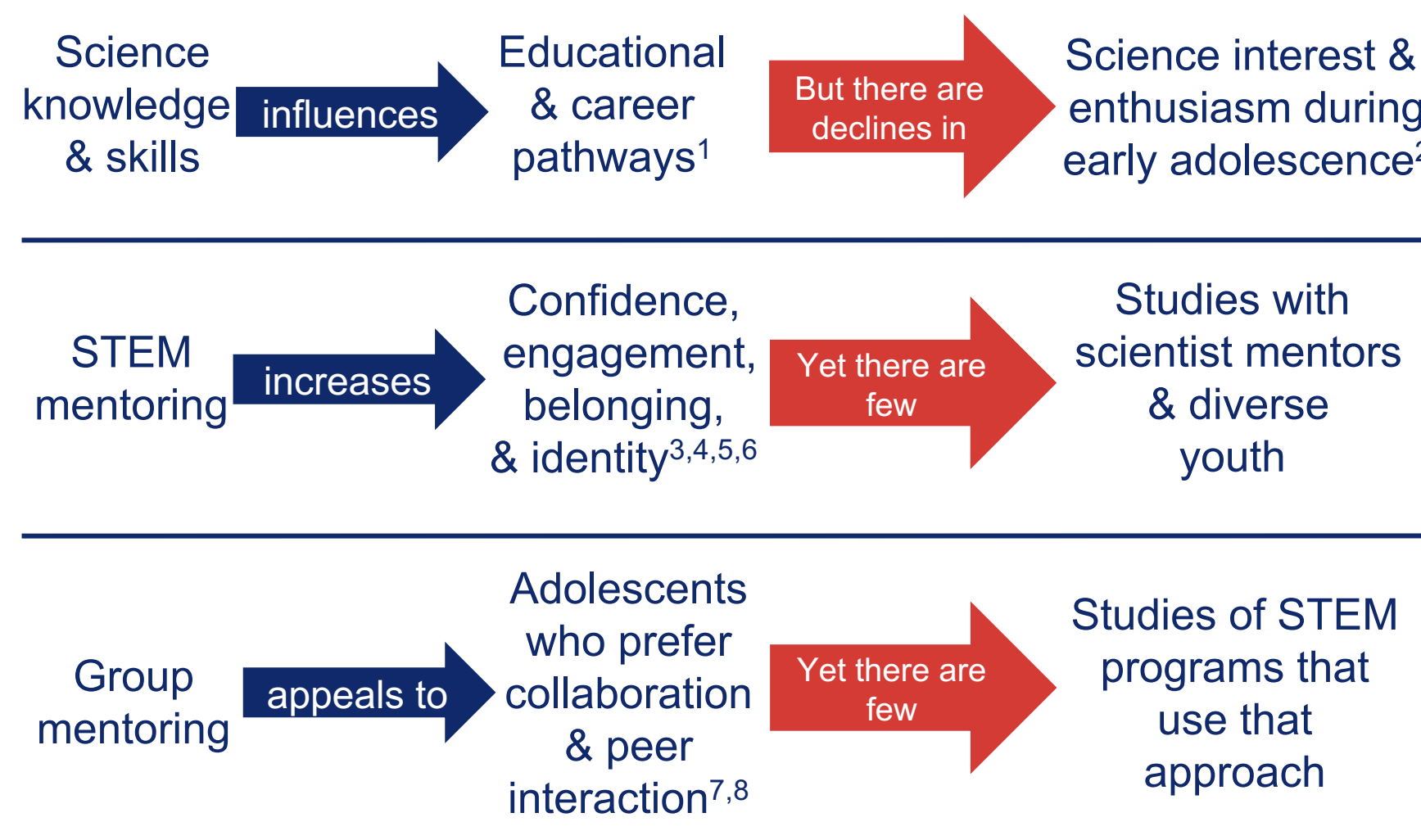




Being a “Science Kind of Person”: Exploring the Influences of Group Mentoring on Middle School Students’ Science Engagement



BACKGROUND & PURPOSE



RESEARCH QUESTION:

What are the group mentoring dynamics and characteristics that take place in an out-of-school-time science program with early adolescents of color and scientist mentors?

METHOD

CONTEXT: Science Club is a weekly group mentoring program with hands-on, curriculum-based science activities.

PARTICIPANTS:



Club A had fifth grade ($n=6$), sixth grade ($n=6$), seventh grade ($n=7$), and eighth grade students ($n=2$).

Club B had fourth grade ($n=1$), fifth grade ($n=8$), sixth grade ($n=8$), and eighth grade students ($n=1$).

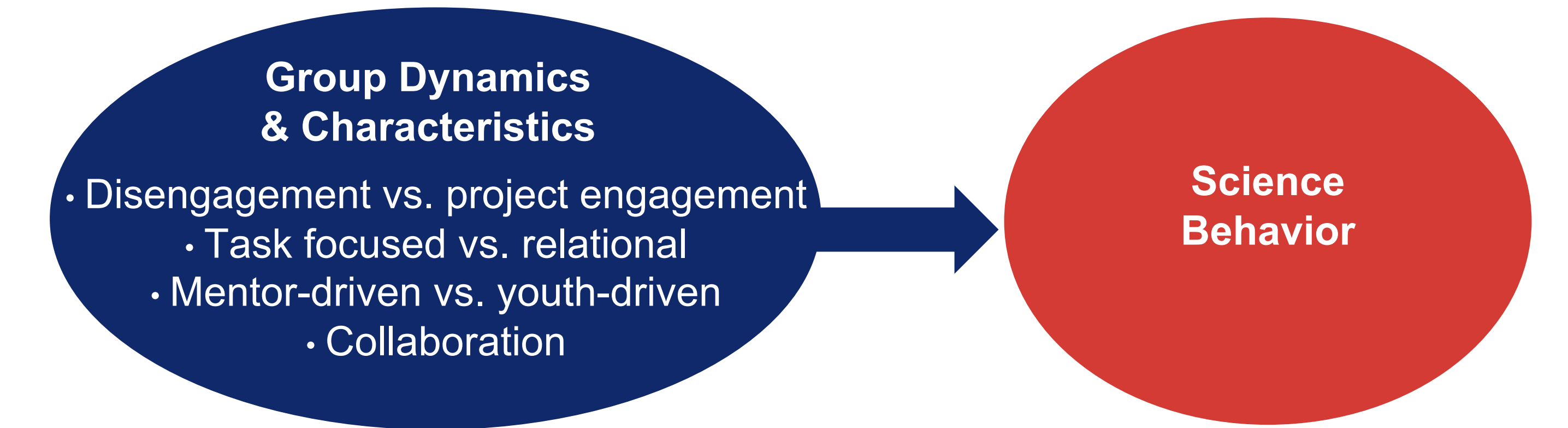
Demographics	Club A		Club B	
	Youth ($n=21$)	Mentor ($n=11$)	Youth ($n=18$)	Mentor ($n=11$)
Girls/Women	12 (57.1%)	8 (72.7%)	8 (44.4%)	7 (63.6%)
Boys/Men	8 (38.1%)	3 (27.3%)	6 (33.3%)	3 (27.3%)
Non-binary	0 (0%)	0 (0%)	2 (11.1%)	0 (0%)
Self-describe	1 (4.8%)	0 (0%)	2 (11.1%)	1 (9%)
African American, African, or Black	10 (47.6%)	3 (27.3%)	4 (22.2%)	1 (9%)
White	4 (19%)	4 (36.3%)	1 (5.6%)	6 (54.5%)
Hispanic/Latinx	4 (19%)	0 (0%)	13 (72.2%)	3 (27.2%)
Asian American or Asian	6 (28.6%)	5 (45.5%)	0 (0%)	1 (9%)
Native Hawaiian or Pacific Islander	1 (4.8%)	0 (0%)	0 (0%)	0 (0%)
Other/Prefer not to say	0 (0%)	0 (0%)	4 (22.4%)	0 (0%)

DATA COLLECTION: The research team conducted 216 total 20-minute observations over 16 weeks during the 2022-2023 school year. Fieldnotes focused on: (a) the activity; (b) interactions (youth-mentor, youth-youth, mentor-mentor); (c) social support and recognition; and (d) science behavior.

Using the fieldnotes, each observer wrote up a summary for each table they observed that addressed: (1) What are three things that stood out for you from this observation? (2) What questions have emerged that you’re uncertain about? (3) How would you characterize this table group today? How does it compare to previous observations or tables? and (4) What are examples of how mentoring might support youth’s science identity?

ANALYSIS: 122 pages of observation summaries were coded using reflexive thematic analysis (Braun & Clarke, 2022).

RESULTS



Mentoring Group Dynamics and Characteristics

Project disengagement vs. Project engagement

“Youth has **little interest** in pursuing her prototype further or improving it...continuously made comments about not thinking it will be a good prototype... said she’d **rather not join** the competition... work on it next week... **distracted and away** from her project.”

“Youth was **actively testing** [her prototype] out and **asking staff more about next week’s competition**. By the end of the day she seemed **very pleased** that it worked to **pick up moon rocks and the bucket of water successfully**.”

Task-focused vs. Relational-focused

“Youth **don’t really talk to each other** or the mentors about personal topics. Youth **only speak when giving an answer** for one of their observations or to ask a question about the task.”

“Youth shared **he is from {South American country}**. Mentor seemed surprised and **asked questions about when he arrived in the U.S.** This is the first time that youth speaks about being from there. Mentor shared she is from {another South American country} before.”

Mentor-driven vs. Youth-driven

“Mentor appears to do a good job of **managing the youth and helping their ideas come to life**. She **pointed out areas that could be improved, telling youth the handle seems too weak and encouraging them to explore improving**...asks youth what he would like to add...**gives options of materials**.”

“Youth worked hard **under their own guidance** since their mentors were absent. Youth **directed a lot of the operations** with two of them helping. All had a sense of urgency, wanted to do a good job, and were **contributing suggestions**. Youth **insisted they make more modifications**. At the end, a youth said he was **very proud of the team**.”

Collaboration

Mentor-mentor collaboration

“The two mentors seem to **communicate with one another more than other groups**. It is mostly one mentor **asking the other clarifying questions** about a related subject (e.g., Is milk a base or acid?) or related to the activity (e.g., Do you know if we have a control to compare it to?) This is the first time the mentor has a co-mentor so this might be her way of **making him feel more welcomed or encouraging collaboration** between them.”

Youth-youth collaboration

“Youth was **open to helping** another youth perfect her prototype... he made a suggestion when she **expressed not knowing how to make her prototype better**... based on her design, he **suggested securing it to make sure the rocks didn’t fall and then he demonstrated how**. When the bucket of water slipped out of the hook, he **suggested electrical tape and said that’s what he did to his**. She didn’t show the same interest in his prototype but was **open to advice**.”

Youth-mentor collaboration

“Mentors appeared to **gravitate or pay more attention to the youth that are most engaged and testing new ideas**. For example, a youth seemed less engaged than another youth in the prototype building and it appeared that the mentor spent more time helping him improve and test his idea. Is this a display of **mentors assisting when they are specifically asked for help and letting the youth explore their own ideas on their own**? This could be a result of different personalities of the youth and how mentors manage those relationships.”

Whole-group collaboration

“**All youth are engaged in the activities and interested in knowing the next steps**. Compared to other tables, the youth **interact with the whole table** while they complete the tasks. When observing the taste of the potato the youth **turned to each other to talk about the taste and dared one another to try the salt water potato**. They decided to **try the potato together, encouraged playfully by the mentor**. Other tables have youth choosing to interact with one mentor or completing the tasks on their own instead of together.”

DISCUSSION

CONCLUSIONS:

- This is one of the first observational studies to examine group mentoring in an in-person science out-of-school-time program for early adolescents. It also took place over a year.
- Some groups were more task-focused versus relational-focused or more youth-driven versus mentor-driven overall. Other groups exhibited those characteristics under different conditions (e.g., type of lesson/activity, youth personalities and preferences, length of relationship).
- Since it was group mentoring, youth interacted with other youth and also saw how scientist mentors interacted with each other. Groups exhibited different types of collaboration and different levels of engagement.

LIMITATIONS:

- Observation data made it impossible to tell what the youth or mentors were thinking or feeling.
- Observation summaries were dependent upon what the observers paid attention to and were able to record in the moment.
- Not every table was observed every week. Other dynamics and characteristics might have taken place outside of our observations.

IMPLICATIONS FOR YOUTH PROGRAMS:

- Encourage mentors to think about what conditions might lead to being more task-focused or more relational-focused and how to find a balance.
- Examine how and when youth make decisions during science activities and how this influences their engagement.

FUTURE RESEARCH DIRECTIONS:

- Incorporate interview and survey data with the observation data.
- Explore how different types of collaboration lead to different youth science behaviors.

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