

BUILDING INSIGHTS
THROUGH
OBSERVATION

Building Insights through Observation (BIO): Researching Arts-Based Methods for Teaching and Learning with Data

Scan for
more!



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BIO MODEL

1 Observation and Discussion: Art/Data

“VTS-inspired” observation sessions of at least two images – artwork relating to the topic of the unit, and a related geospatial data visualization.



2 Bridging Approach: Fence Post Activity

Students represent personal data, thoughts, and opinions in a graphic form and observe and discuss gathered responses.



3 Data Sketches

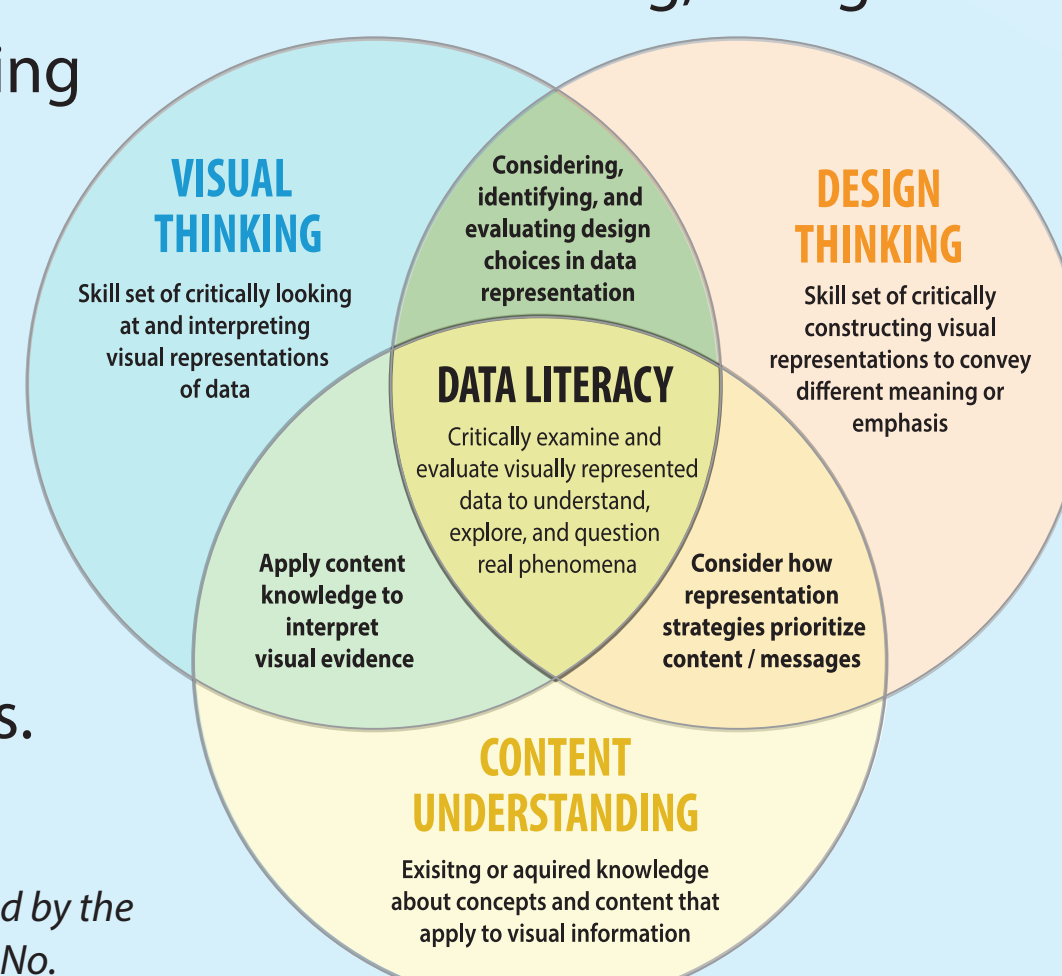
Using a design thinking process, students draw their own representations of geospatial datasets on tracing paper, then overlap those different “data layers” to discuss patterns and correlations.



Theoretical Framework

The BIO approach activates and intertwines Visual Thinking, Design Thinking, and Content Understanding to improve Data Literacy.

The BIO model was tested and iteratively refined with 10 middle school science teachers who participated in professional development workshops and used the model in their classrooms.



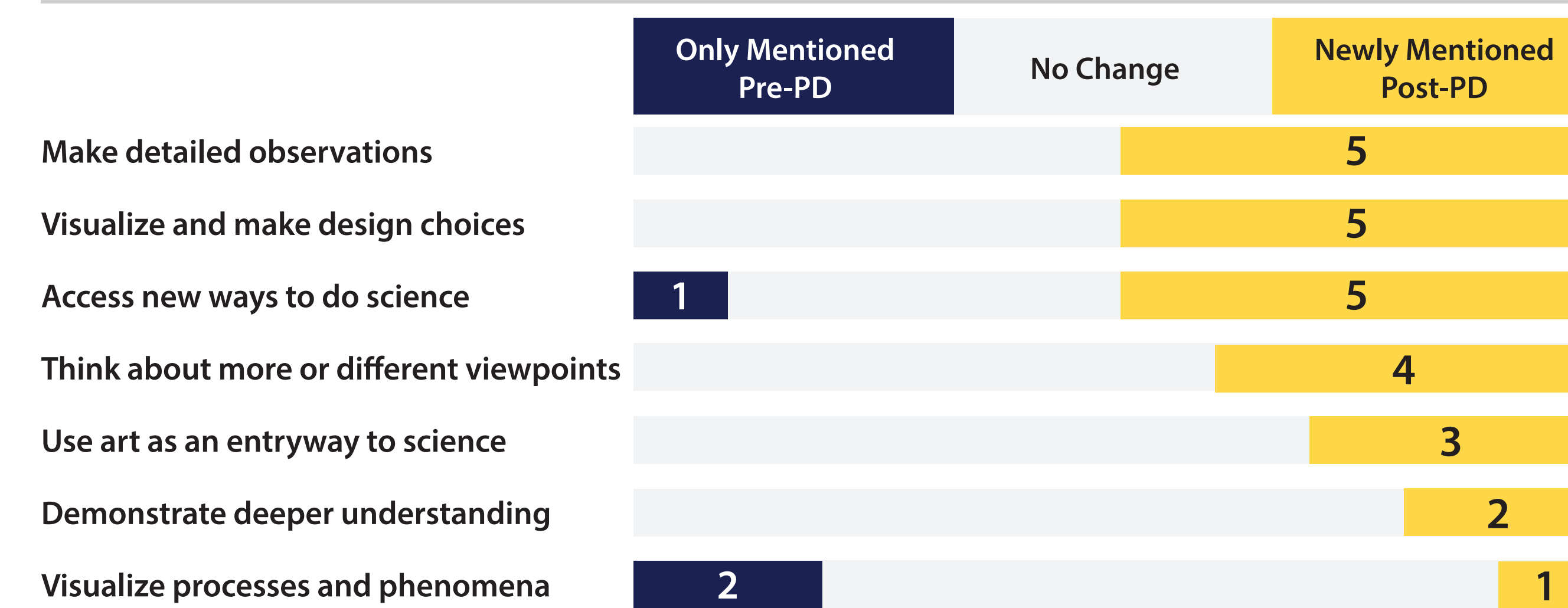
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RESULTS

Teacher Professional Growth & Practices

Individual teachers valued the arts in more and different ways due to BIO Professional Development (PD).

I believe arts-based practices help students...



Data are from coded interview responses (n=10). Numbers reflect the type of change shown by each individual teacher. Yellow bars show the number of teachers for whom an idea was newly expressed post-PD.

“[I used to think] the art is not as important as the data or the science knowledge behind it, but I think my perspective has kind of changed. Art is a good entryway into all the deeper science things, because there's deep science to be found in art pieces.”

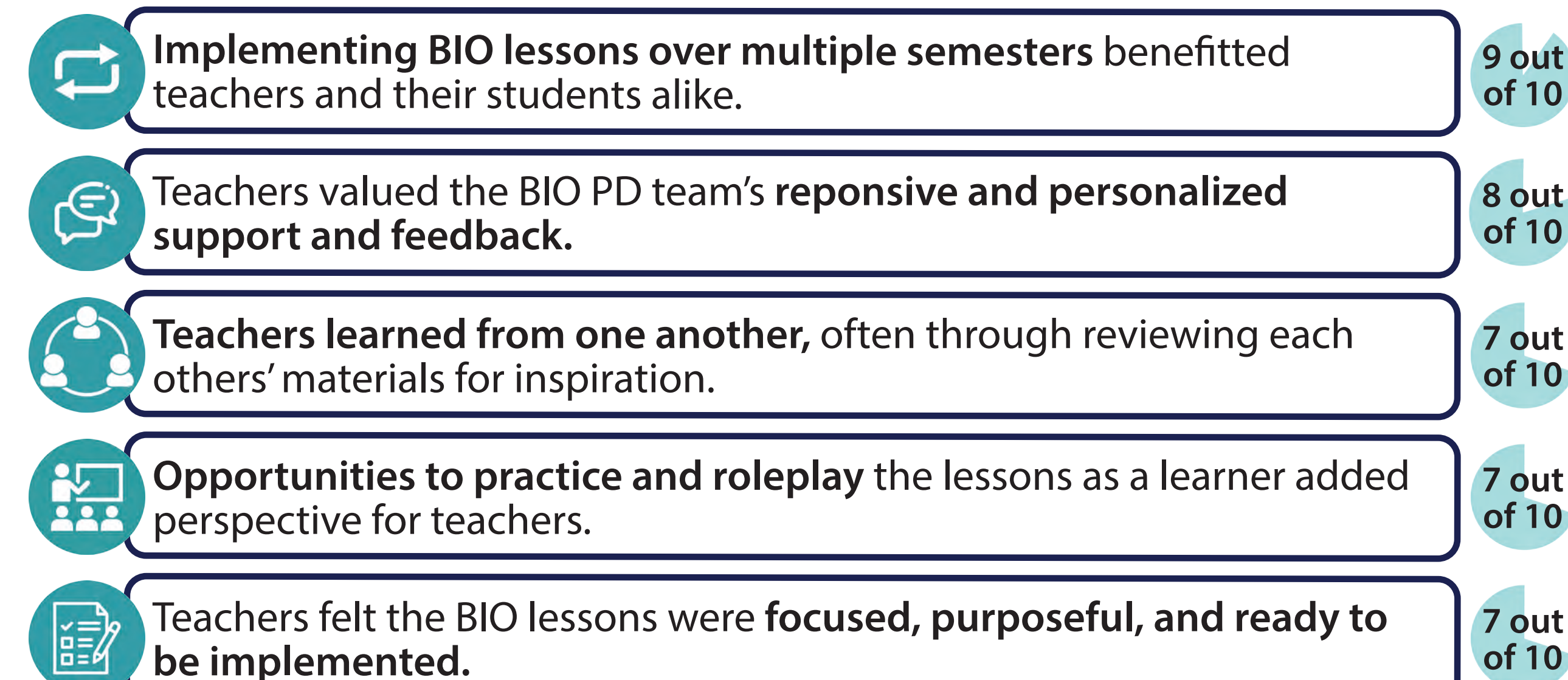
-Teacher Interview

Essential Elements of BIO Professional Development

Teachers described the most valuable or transformative attributes of the BIO PD.

“Because [PD] was so focused, and because we had lots of opportunities to practice and to try it, to reflect on it and to keep going, I think it's changed the way I look at presenting data to kids.”

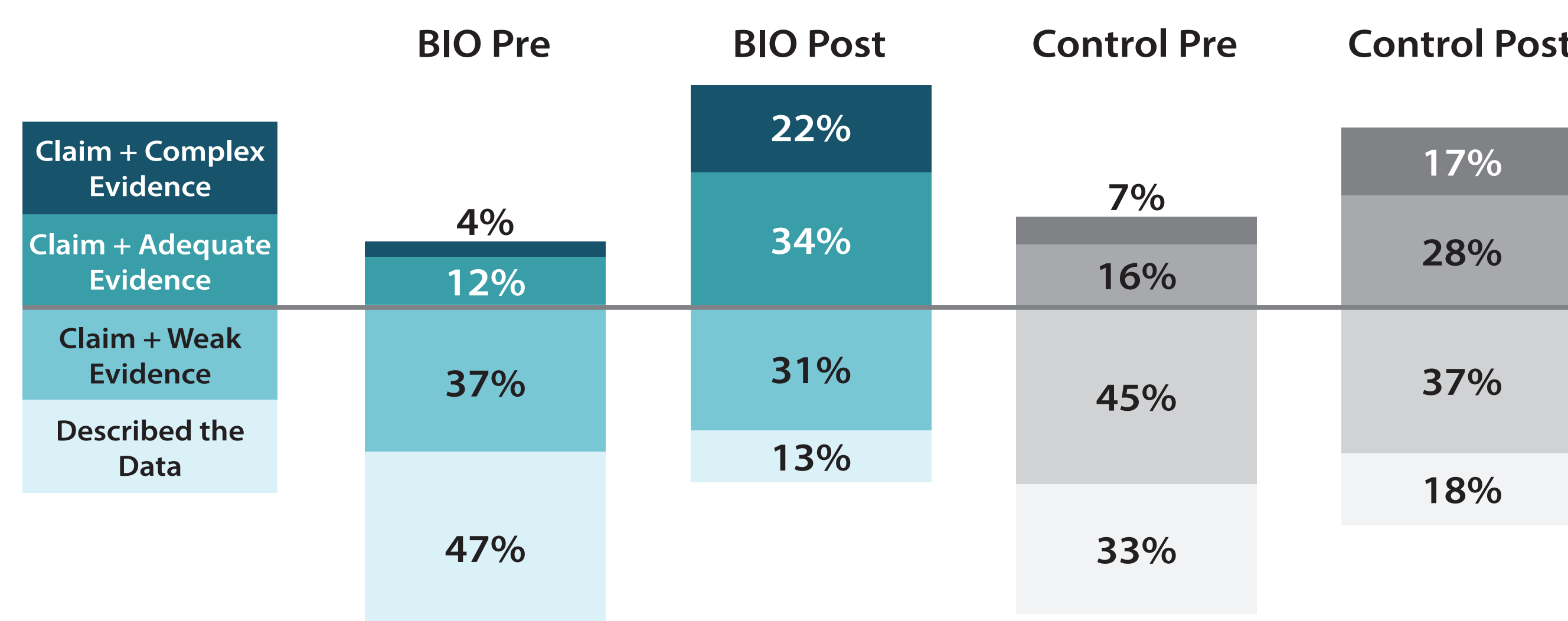
-Teacher Interview



Data are from coded interview responses, post-PD (n=10). Numbers indicate how many teachers focused on each theme at least once in interviews after they'd experience part or all of the PD.

Promise for Developing Student Skills

BIO students showed greater growth in their ability to make a claim and support it with evidence.



Out of three opportunities to say something about a novel data visualization, the data below represent each student's “personal best” – the highest level demonstrated of their ability to interpret from data and support it with evidence. (n=68 BIO students; n=76 Control students)

“I learned that there's always more than meets the eye with some of this data. There are hidden correlations that sometimes you don't see. I did learn to open up and try to find more correlations between stuff.”

-Student Interview

IMPACTS

After participating in BIO Professional Development, teachers:

- Increased their confidence in teaching with complex data and the arts
- Saw greater and broader value in how the arts benefit teaching science
- Increased their use of complex, professionally-collected data

BIO Professional Development was effective for teachers because it offered:

- Lessons that were highly adaptable and useful beyond the BIO project
- Respect for teachers' expertise and input to develop lessons
- Materials, templates, and supply kits designed to ease logistical challenge

Teachers found the BIO approach especially effective for:

- Broadening participation in science class
- Improving ability to recognize patterns and solve problems with data
- Building critical thinking about the design of data visualizations

Compared to control, BIO Students showed greater growth in geospatial data literacy and skills:

- Frequency and diversity of visual observations
- Application of geographic knowledge
- Causal claims about why data show a given pattern, supported by evidence
- Flexibility of interpretations
- Consideration of human population relationship to other datasets (a specific data set used in most BIO classrooms)

<https://nurturenaturecenter.org/bio/overview>

