

# "I don't think it affects lobster that much:" How middle school students engage with data visualization during field trips

Grace Ocular<sup>1</sup>, Elyse Hertzman<sup>1</sup>, Lauren Pagano<sup>2</sup>, Milla Metlicka<sup>1</sup>, David Uttal<sup>2</sup>, Catherine Haden<sup>1</sup>  
 Loyola University Chicago<sup>1</sup>, Northwestern University<sup>2</sup>

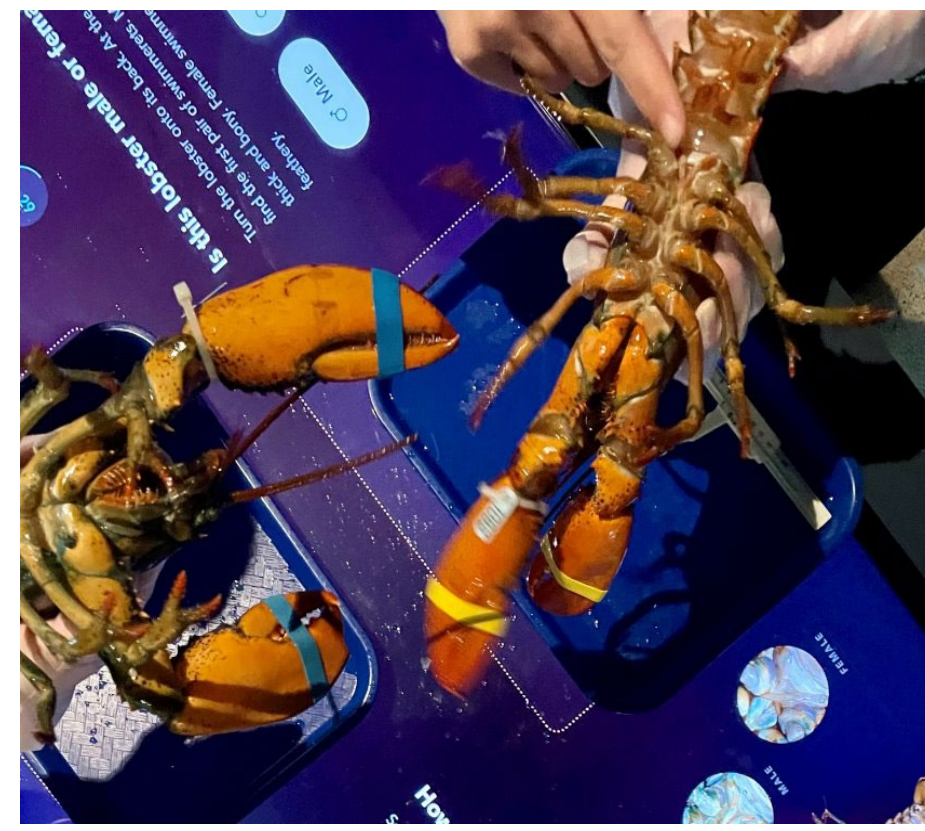


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## Background

Informal science learning experiences (e.g., field trips) can greatly contribute to knowledge and interest in science, but learners may have difficulty using scientific practices and information emphasized during these experiences.

- Student interactions with visual representations (annotation, drawing) can increase STEM engagement and deepen comprehension (Ainsworth et al., 2011; Lai et al., 2016)
- Peer interactions through shared meaning and co-construction of knowledge is important for science learning (Holthuis et al., 2014; Theobald et al., 2015)
- Conversational reflections support encoding of experiences, retrieval of information and learning from STEM experiences (Haden et al., 2021; Marcus et al., 2021; Pagano et al., 2019)



## Research Questions

1. How might *students' STEM talk* while exploring the visual representation relate to their subsequent STEM talk during planning and reflection?
2. How might *students' annotation* of the visual representations relate to their STEM talk when planning for and engaging in reflection at the end of the activity?



## Participants & Procedure

- 48 groups of three to four 5<sup>th</sup> and 6<sup>th</sup> grade students from 38 schools in Maine attended the LabVenture field trip at the Gulf of Maine Research Institute
- 28 of the school groups were from coastal communities and 15 from non-coastal communities

### Black Sea Bass (BSB) Stomach Dissection Act

- **ACTIVITY.** Students digitally dissected BSB, sorted through different species, entered data, and compared with data from scientists on BSB stomach contents.
- **ANNOTATION.** Students were prompted to annotate their BSB stomach contents table.
- **PROMPT.** Students were asked whether black sea bass were a threat to lobsters in Gulf of Maine.
- **PLANNING.** Students had 30 seconds to discuss, negotiate and develop their response to prompt.
- **REFLECTION.** Students recorded their 30-second final reflections addressing the prompt.



## STEM Talk Coding

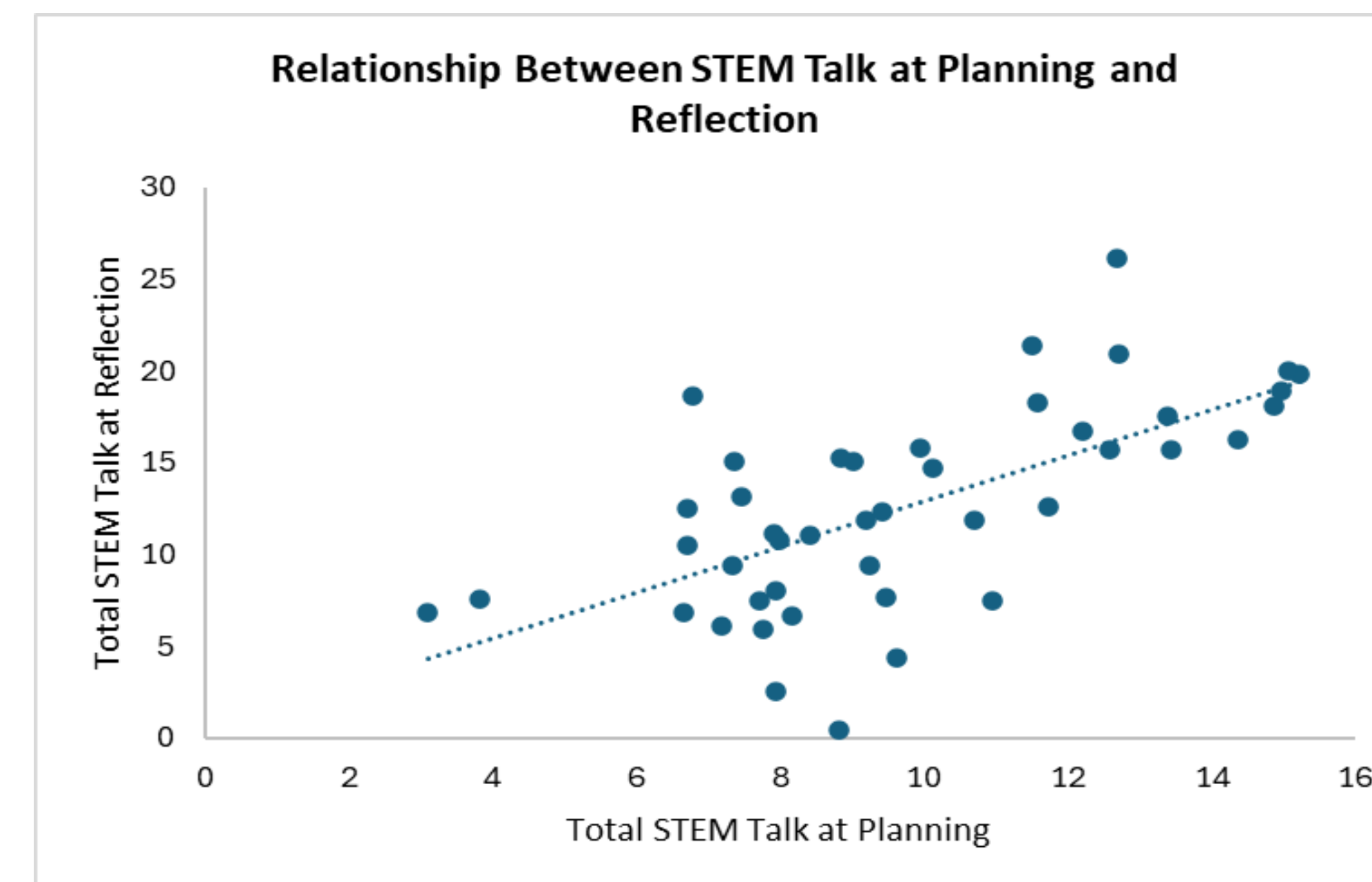
Codes	Definition
Biology	Talking about biological processes (e.g., eating, dying), marine species (e.g., lobster, black sea bass), or marine habitats
Data Analysis	Making data observations or referring to visualizations (e.g., table)
Geography	Referring to a specific location (e.g., Earth, Gulf of Maine)
Math	Mentioning quantities or mathematical formulas
Metacognitive	Describing thought process.
Spatial	Describing spatial locations, patterns, features, orientations, etc

## Annotation Coding

Writing	Using words or numbers (sub-coded as > or < 3 words)
Circle/Underlining	Underlining or circling an area or data
Drawing	Drawing images, symbols, shapes or Xs

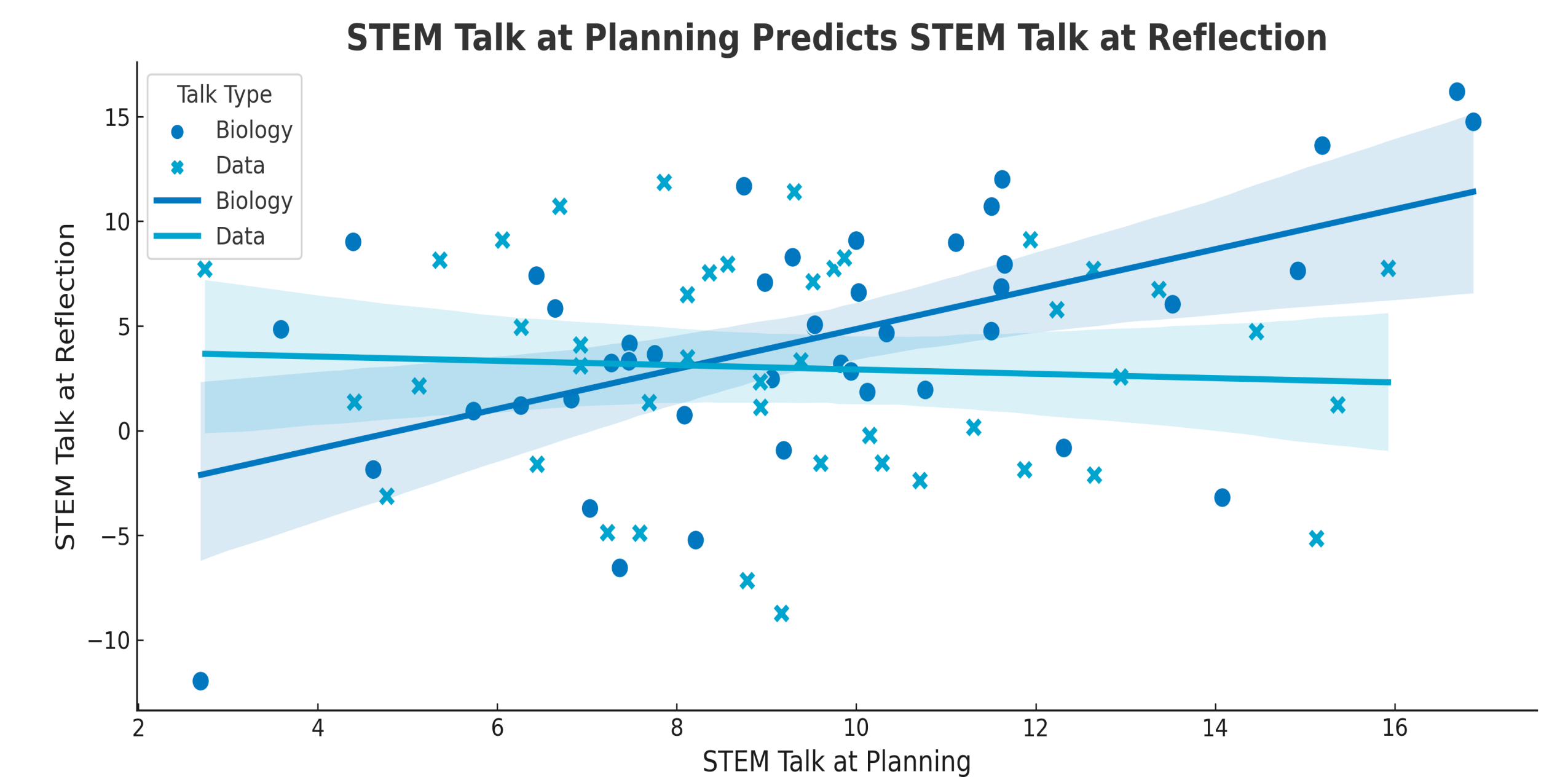
## Results

**Figure 1.** Relationship Between STEM Talk at Planning and Reflection

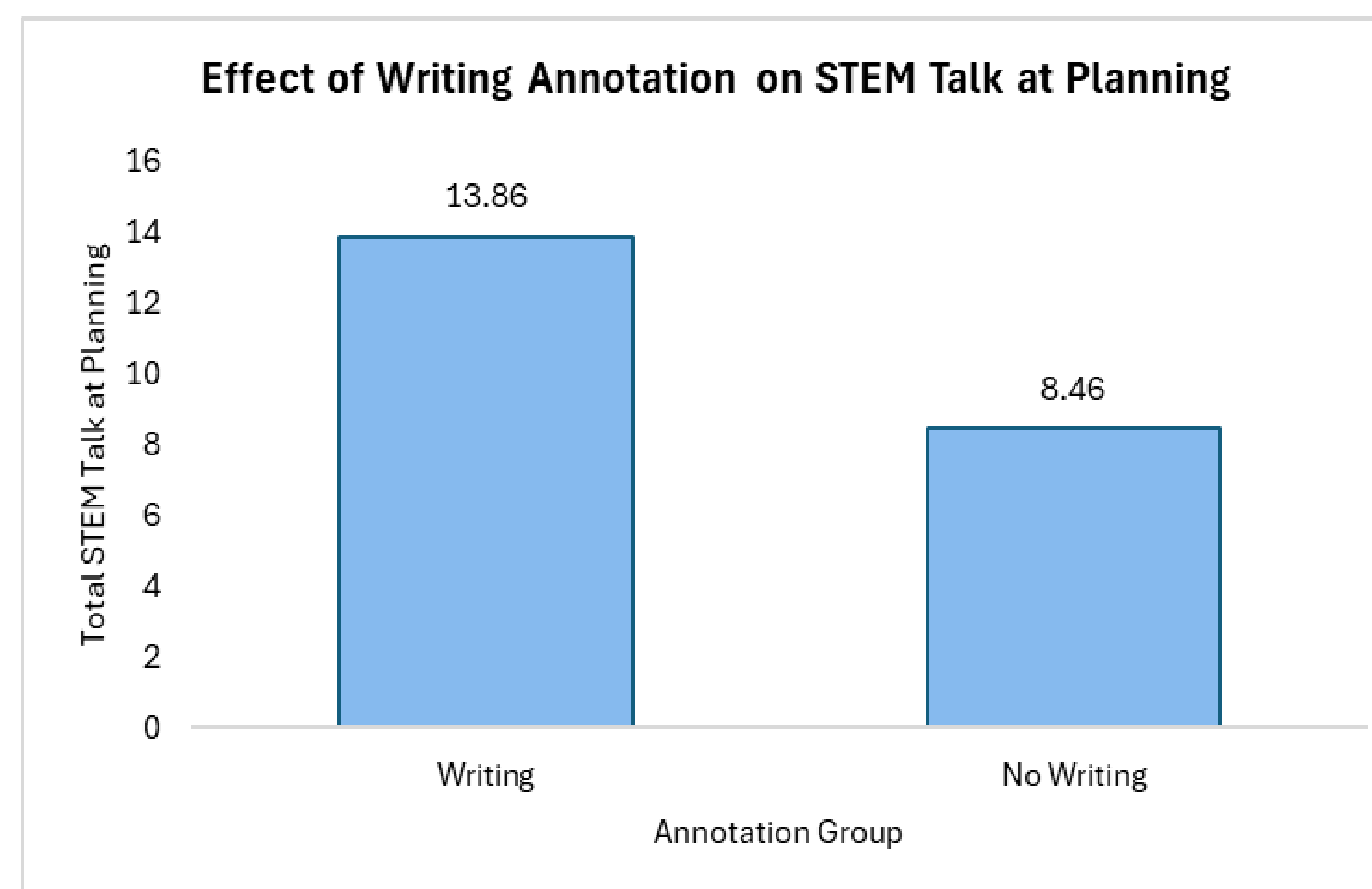


- Total STEM talk during the activity was not a significant predictor of total STEM talk at reflection,  $F(1,44)=.111, p=.740, R^2=.003$ , but **total STEM talk at planning significantly predicts total STEM talk at reflection**,  $F(2,41)=6.04, p=.005, R^2=.227$  (Figure 1)
- Biology talk at planning significantly predicts Biology talk at reflection ( $\beta = .495, p = .003$ ), while Data talk shows a marginal effect ( $\beta = .274, p = .058$ ).

**Figure 2.** Biology and Data Talk at Planning and Reflection

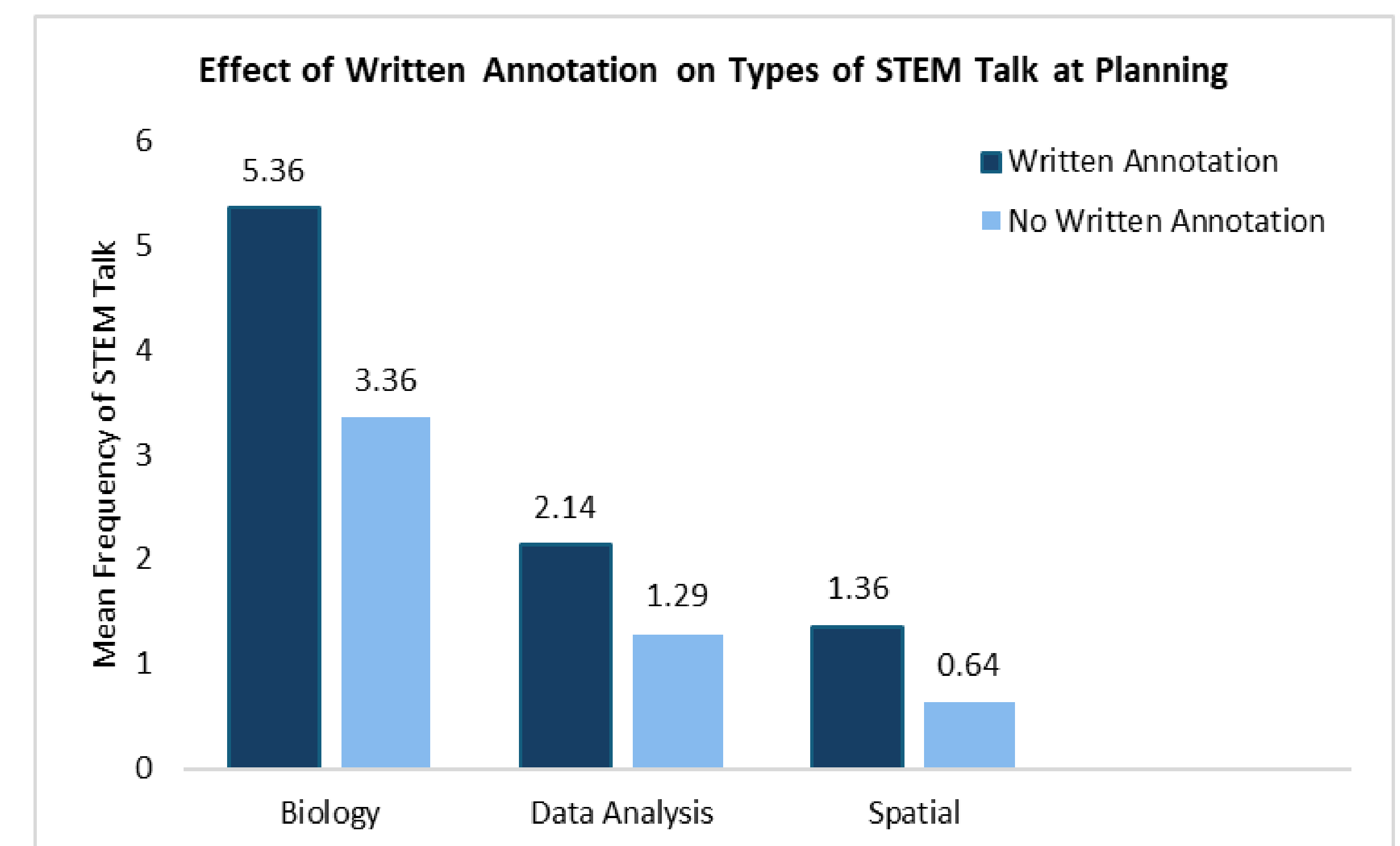


**Figure 3.** Effects of Annotation on Science Talk at Planning



- As shown in Figure 3, students who annotated in writing engaged in more STEM talk at planning than students who did not annotate.
- As shown in Figure 4, students who wrote annotations engaged in more specific types of STEM talk.

**Figure 4.** Writing Annotation and Specific STEM Talk



## Discussion

- Overall, engagement in science talk during the planning conversations supported students' discussion of STEM in their reflections.
- Effects of annotation on science-talk are present in students' planning discussions but not reflections.
- This suggests the importance of prompting students to engage in discussion, even briefly, after engaging with visual representation to support learning with data visualizations to promote STEM educational opportunities from field trip experiences.