



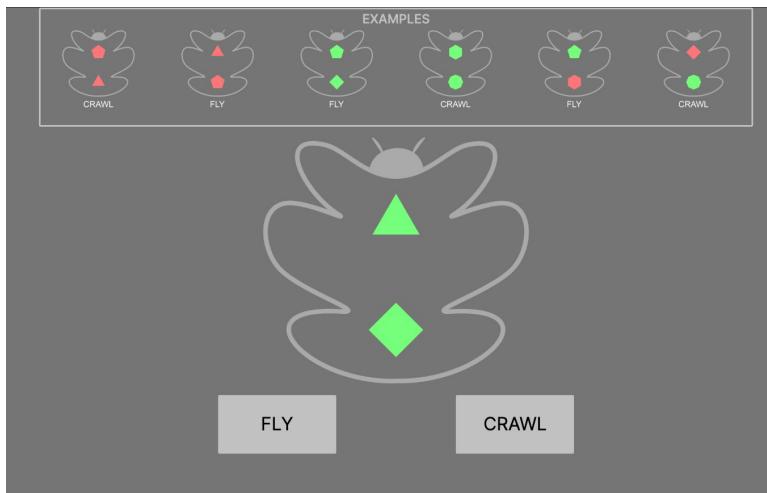
# Fall '25 BERTopic Bugs

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# 2x2 Experimental Design

Blocked_NoSupport	Interleaved_NoSupport
Blocked_LearningSupport	Interleaved_LearningSupport

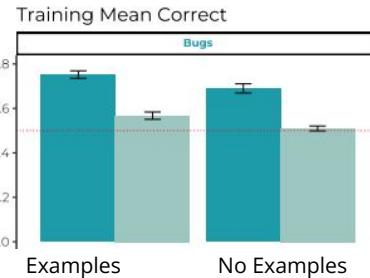


Participants were given context (classifying alien insects) and told to use number of sides, color, and spatial arrangement in the directions.

The task followed a rule-based structure similar to the previous project, but instead of “true/false,” responses were labeled fly/crawl, making the rules context-dependent.



# Previous Findings



**Training Performance**

**Blocking > Interleaving** ( $p < .001$ )  
**Examples > None** ( $p < .001$ )

**Bugs**

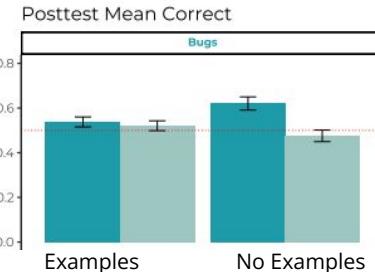
Examples > No Examples ( $p < .001$ )  
Blocking > Interleaving ( $p < .001$ )  
Presentation \* Examples (n.s.)

## Posttest Performance

**Blocking > Interleaving** ( $p < .01$ )  
**No main effect of Examples**

### Bugs

Examples = No Examples (n.s.)  
Blocking > Interleaving ( $p < .01$ )  
Presentation \* Examples ( $p < .05$ )



marking diamond  
color crawl number  
sides fly guess different  
triangle red position  
idk green shape marks  
means shapes hexagon odd  
Pentagon octagon positive  
colors

Participants in the **Bugs** task recorded their current strategy each trial

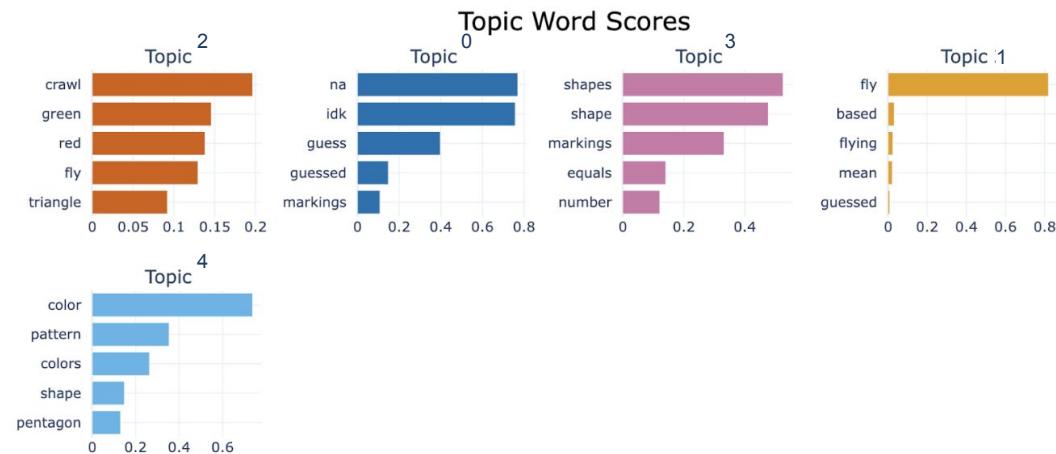
# Project Description

## Data:

- Verbal Responses on participant strategies for Bugs after each trial

## Goal:

- Categorize data into topics to find trends in relational rule discovery using SBERT and BERTopic



# What Is SBERT and BERTopic?

Python Packages!

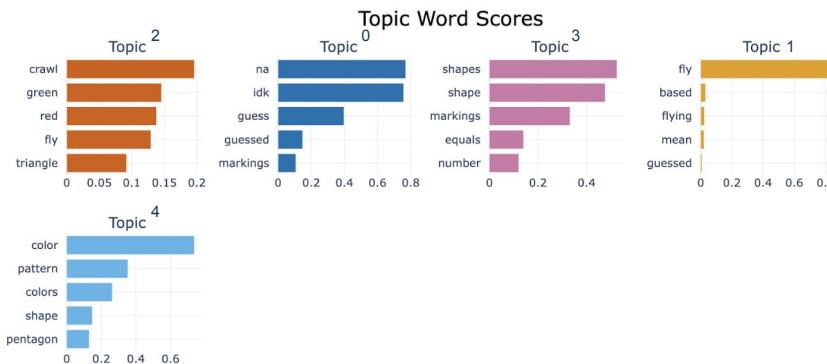
## **SBERT (Sentence-BERT)**

- Creates dense, semantic embeddings that capture the meaning of each participant response.
- Allows us to compare responses in a meaningful, interpretable space.

## **BERTopic**

- Builds topics from these embeddings using clustering (HDBSCAN).
- Produces coherent topics matched to how people actually talk about task strategies.

# How Does Structure Shape Semantic Understanding?



## Methods:

- Reordered seeded topics from BERTopic
  - Lower bins → Surface-level Reasoning
  - Higher bins → Deeper abstraction
- Ran linear regressions

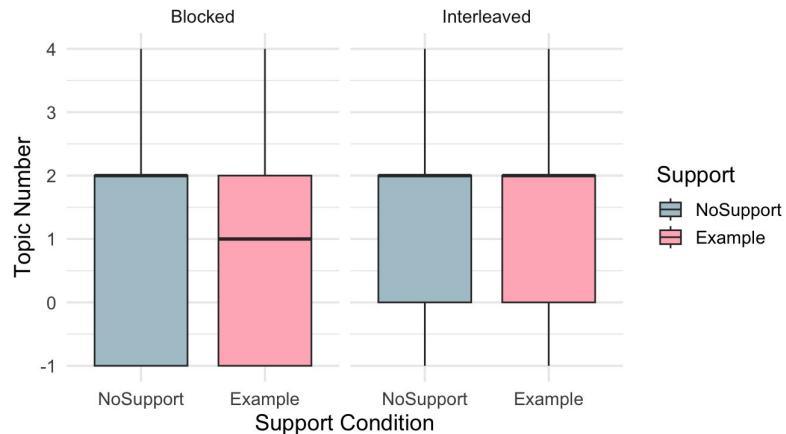
## Results:

Examples → smaller topic bin assignment

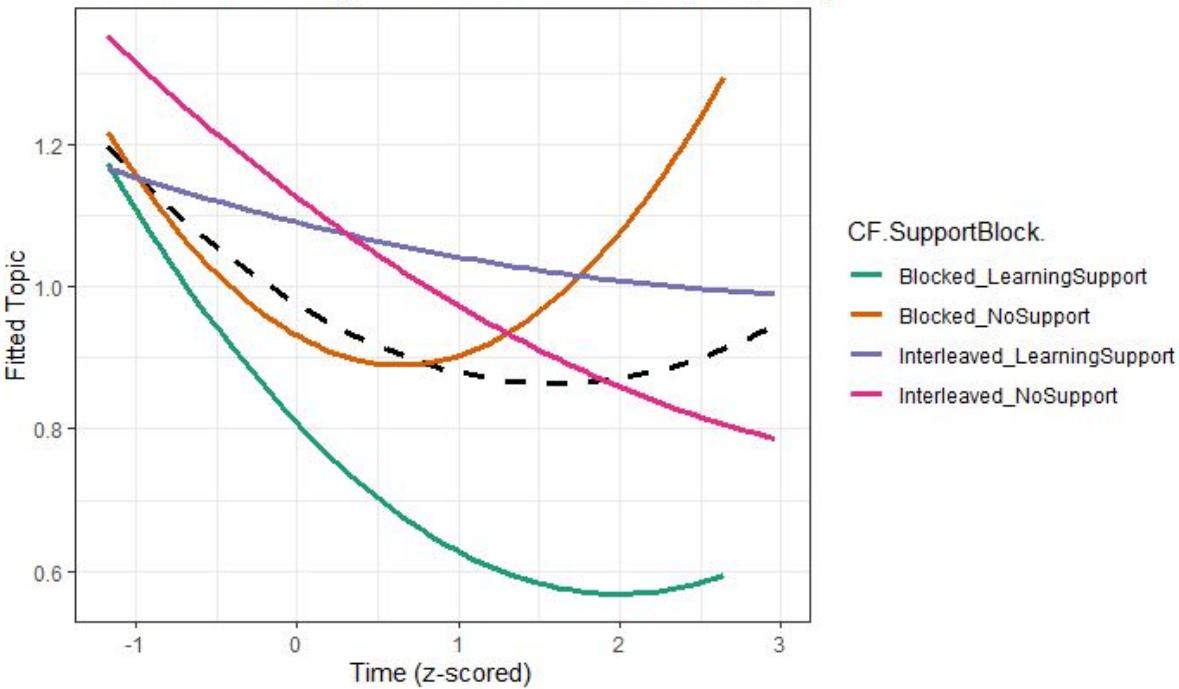
- Learners were more likely to produce simple, surface-level explanations

Interleaved → higher topic bin assignment

- Interleaving promotes deeper semantic thinking



# Topic number shows a U-shaped pattern.



Curvature strongest in blocked

Interleaved patterns flatter overall

Time explains little variance ( $R^2 \approx 1\%$ )

