



# Separating Surface from Structure: Study Schedules Affect What is Learned From Examples



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## Background

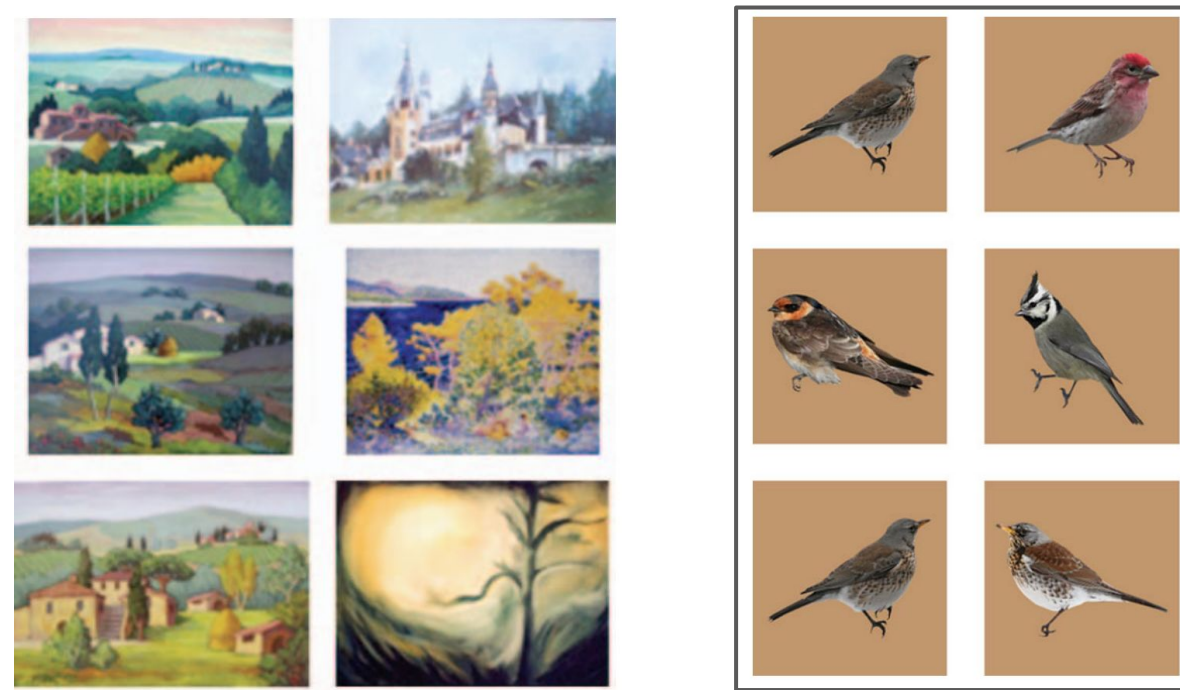
### How should study exemplars be arranged to improve transfer?

Interleaving often improves classification of new exemplars compared to blocking.<sup>1</sup>

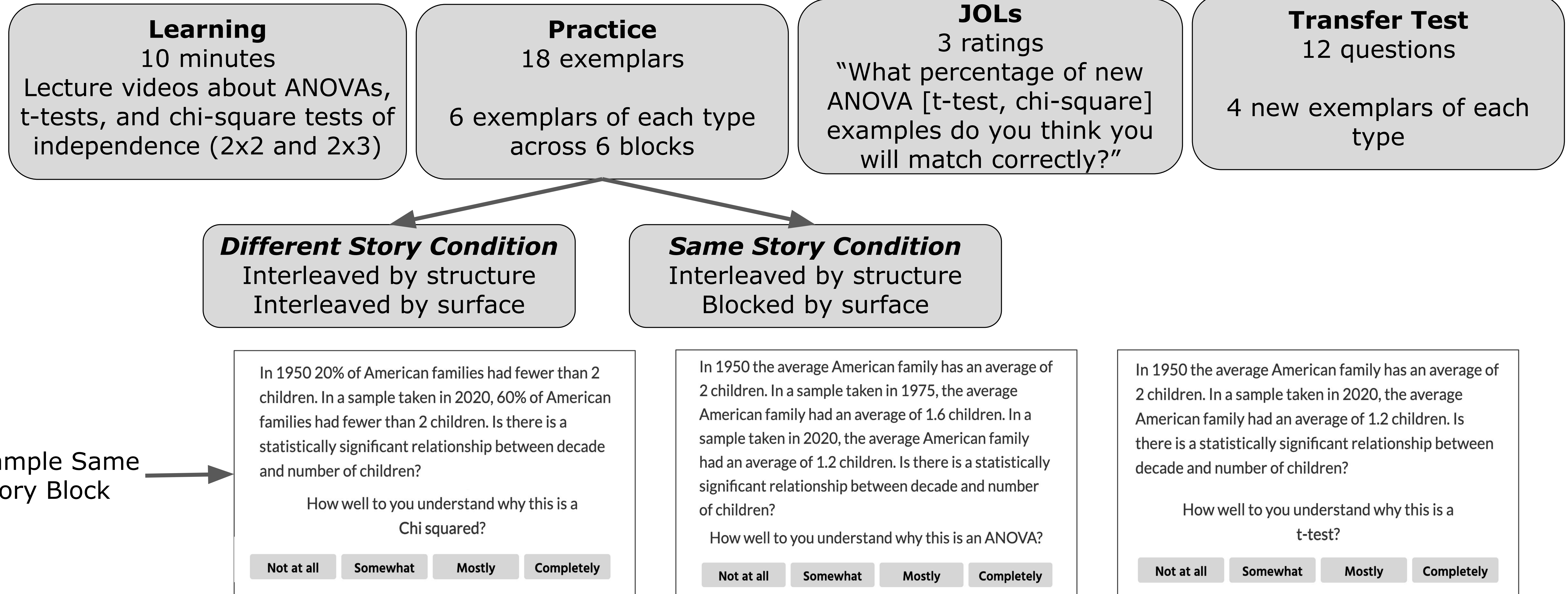
- **Interleaving:** mixing exemplars of different concepts
- **Blocking:** studying all exemplars from one concept at a time

Interleaving promotes discriminative contrast.

- Comparison process that facilitates identifying features that differentiate concepts



## Methods

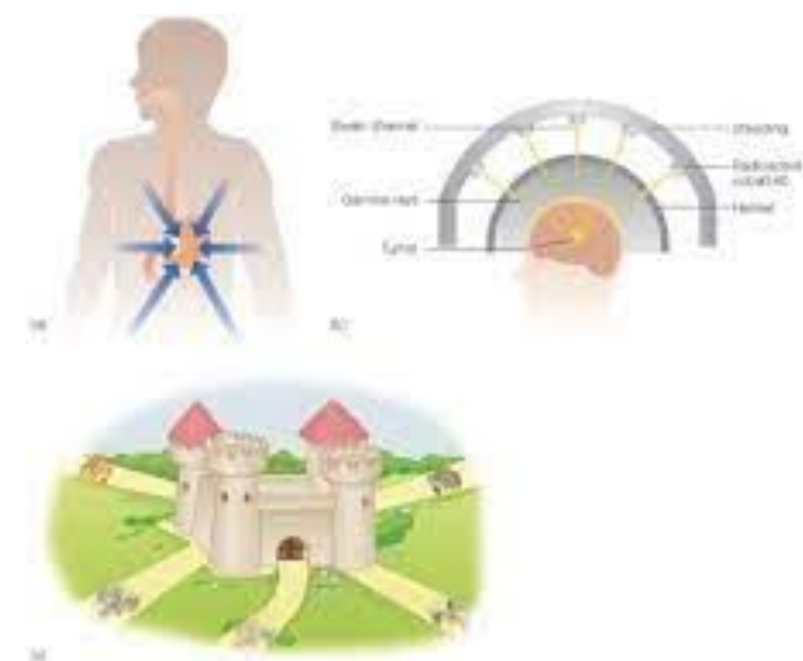


## Research Question

Exemplars of educational concepts can differ by:

- **Surface features:** things you can see
- **Structural features:** the concept; relationships and meaning

Novices attend to surface features over structural features.<sup>2</sup>



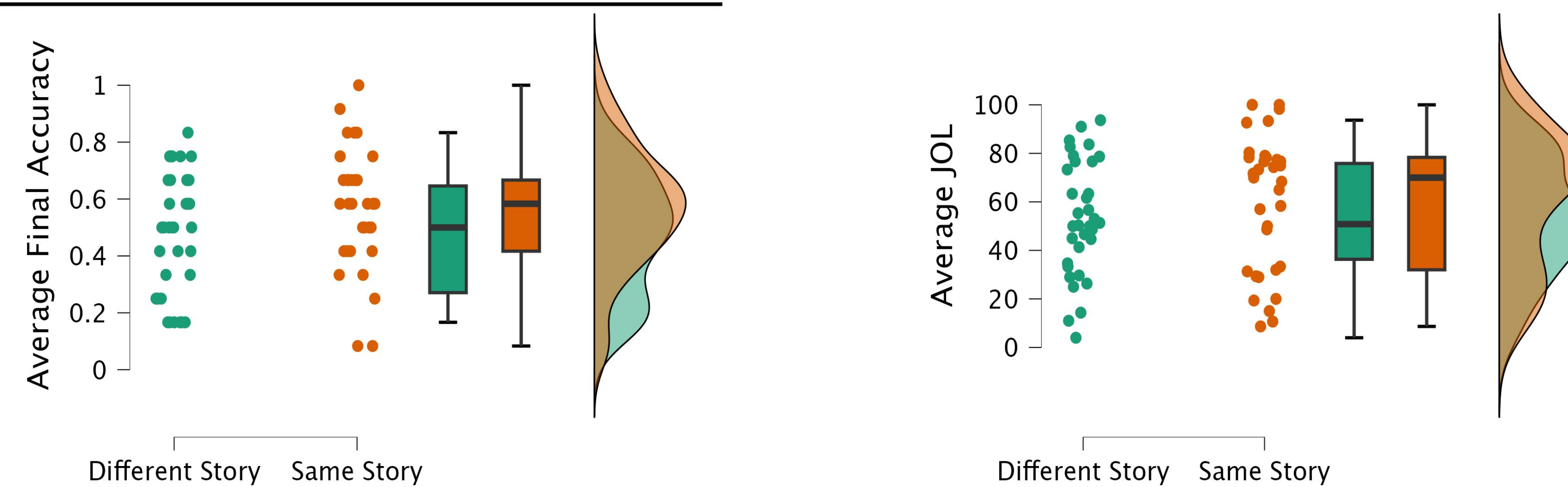
### Should we interleave by surface and/or structural features?

We hypothesized that when interleaving by structure (type of problem), blocking by surface features (storyline) will improve learning by making structural differences easier to identify.

## Results

|               | Group           | N  | Mean   | SD     |
|---------------|-----------------|----|--------|--------|
| Avg JOL       | Different Story | 34 | 53.216 | 23.673 |
|               | Same Story      | 33 | 59.737 | 27.891 |
| Avg Final Acc | Different Story | 34 | 0.471  | 0.206  |
|               | Same Story      | 33 | 0.566  | 0.212  |

- Same story condition had better accuracy on the transfer test than the different story condition.
- Calibration did not differ dramatically between the two conditions.



## References

<sup>1</sup>Brunmair, M., & Richter, T. (2019). Similarity matters: A meta-analysis of interleaved learning and its moderators. *Psychological Bulletin*, 145(11), 1029.

<sup>2</sup>Chi, M. T., Bassok, M., Lewis, M. W., Reimann, P., & Glaser, R. (1989). Self-explanations: How students study and use examples in learning to solve problems. *Cognitive science*, 13(2), 145-182.

<sup>3</sup>Wahlheim, C. N., & DeSoto, K. A. (2017). Study preferences for exemplar variability in self-regulated category learning. *Memory*, 25(2), 231-243.

## Conclusion

### Discussion

Interleaving by structure but blocking by surface features helps learners abstract conceptual understanding that isn't visible in the examples themselves.

### Future Research

Control for exposure to the total number of storylines and the benefit of same story may be even larger.

- Different story condition had 18 stories
- Same story condition had only 6 stories
- More exemplars often improves learning.<sup>3</sup>

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## **Abstract**

Compared to blocking, interleaving examples of different concepts can improve transfer of learning to novel examples. Often, examples (statistics problems) can differ in terms of structure (concept: t-test, ANOVA, chi-square) and/or surface (storyline: number of cars, temperature). We compared transfer of statistics learning to new problems when practice problems were blocked or interleaved by storyline, but always interleaved by concept. Interleaving by concept is thought to help participants identify the key features that differentiate concepts through a process known as discriminative contrast. However, we hypothesize that interleaving the story line may increase difficulty identifying important structural differences between concepts as the surface features also differ between successive examples. Initial data supports this prediction, with blocking leading to better performance on a transfer test than interleaving by storyline. Results will be discussed in terms of structure mapping theory. Exploratory analyses of metacognition and mind wandering will also be discussed.