# Curriculum Effects in Multi-Schema Learning

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## Introduction

**Question:** How does learning curriculum influence schema representation and consequent learning?

**Connectionism:** Interleaved curriculum required to prevent different schemas from catastrophically interfering [3].

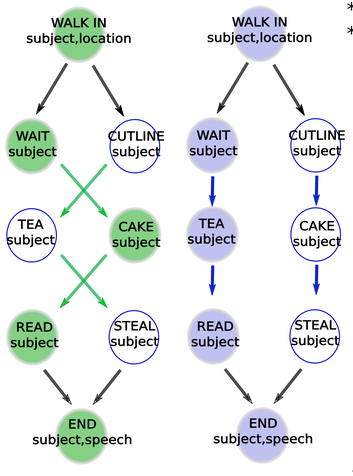
**Event segmentation theory:** Blocked curriculum benefits segmentation; large prediction errors occur at block boundaries, signaling schema switch [1] [2].

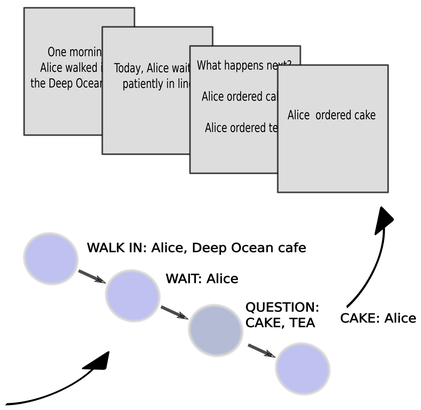
**Approach:** Experimentally manipulate curriculum (blocked vs interleaved) in prediction task involving two schemas.

**Results:** Better learning in blocked supports event segmentation theory. Structured Event Memory(SEM) model posits poor performance in interleaved is due to excessive event segmentation.

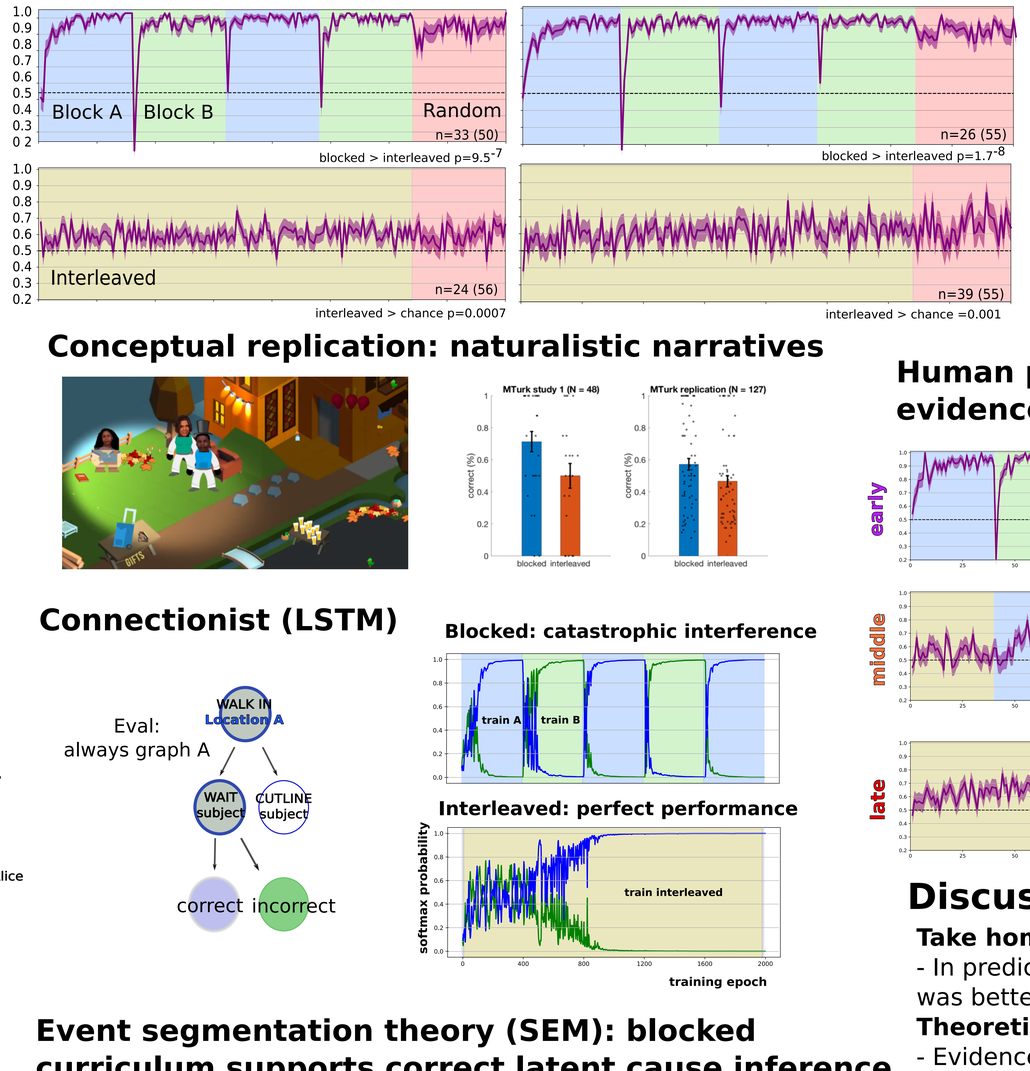
## Paradigm

* 2AFC prediction paradigm
* algorithmically generated narratives
* manipulate curriculum
* measure learning and generalization

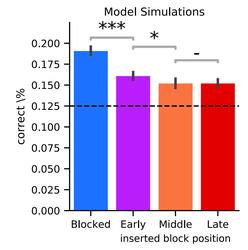


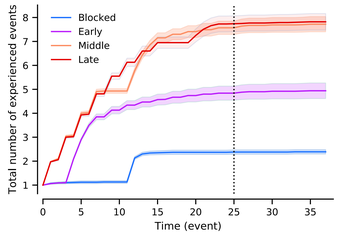




## People learn in blocked but not in interleaved curricula




## SEM prediction: blocked followed by interleaved better than interleaved followed by blocked




## Conceptual replication: naturalistic narratives






## Connectionist (LSTM)



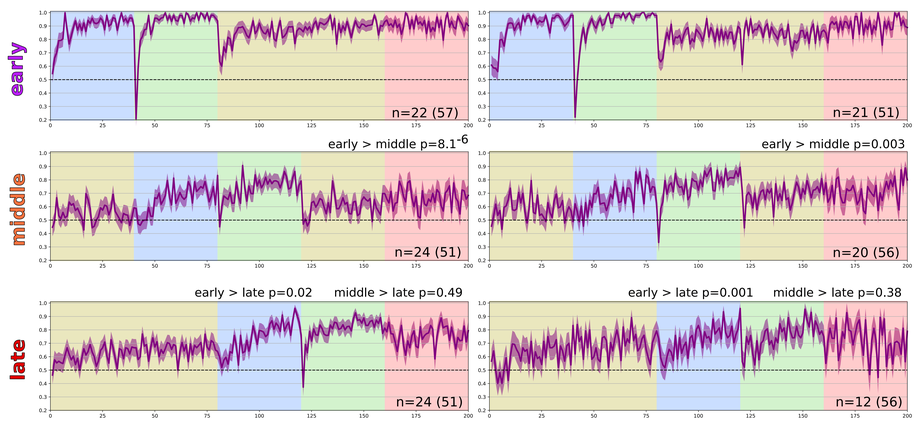

### Blocked: catastrophic interference



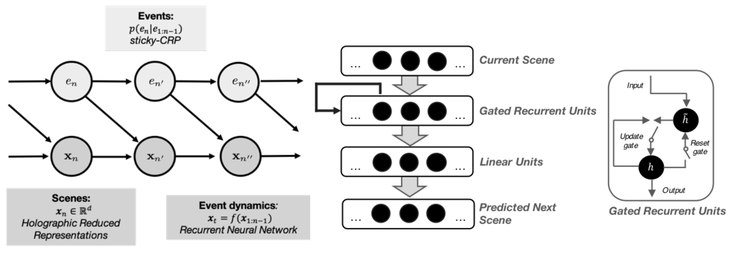

### Interleaved: perfect performance




## Human performance in mixed curricula lends evidence to SEM prediction



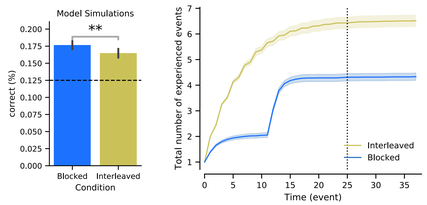

## Structured Event Memory (SEM) [1]




## Event segmentation theory (SEM): blocked curriculum supports correct latent cause inference

**matches human performance**

- *Blocked curricula* give rise to few but pronounced prediction errors that signal event boundaries
- *Interleaved curricula* give rise to noisy prediction error signal that causes excessive segmentation




## Discussion

**Take home:**

- In prediction learning task with two schemas, blocked learning was better than interleaved learning.

**Theoretical implications:**

- Evidence against standard connectionist model which predicts catastrophic interference in blocked curriculum.
- Better learning in blocked curriculum supports models that segment representations based on prediction error.
- These models posit that poor learning in interleaved curricula is due to excessive event segmentation / latent cause inference.

[1] Franklin, Norman, Ranganath, Zacks, Gershman, BioRxiv 2019
[2] Reynolds, Zacks, Braver, Cognitive Science 2007
[3] McClelland, McNaughton, O'Reilly, Psych Rev. 1995

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