Curriculum Effects in Multi-Schema Learning

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Introduction

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

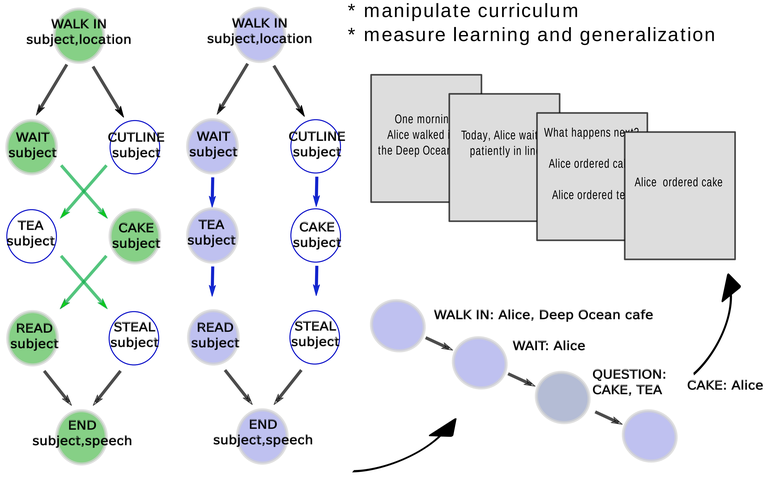
Connectionism: Interleaved curriculum required to prevent different schemas from catastrophically interfering [3]

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.

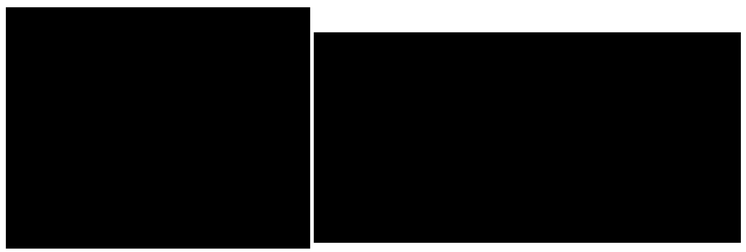
Results: Better learning in blocked supports event segmentation theory. Structured Event Memory(SEM) model posits poor performance in interleaved is due to excessive event segmentation.

Paradigm

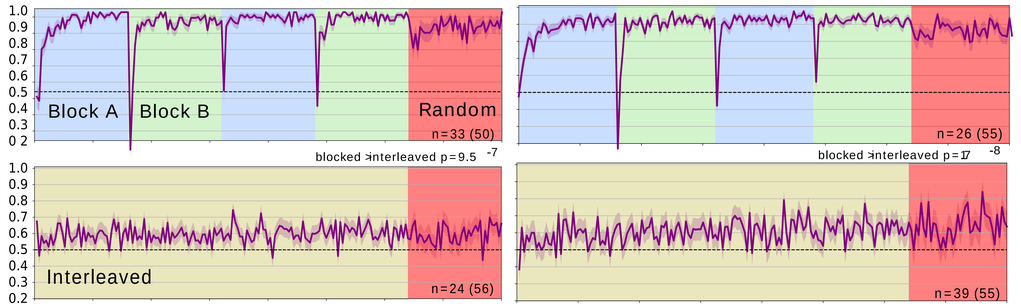


* 2AFC prediction paradigm
* algorithmically generated narratives
* manipulate curriculum
* measure learning and generalization

Structured Event Memory (SEM) [1]

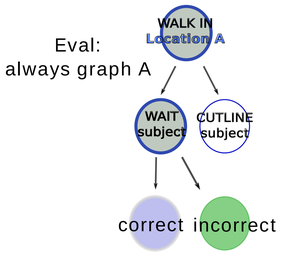


People learn in blocked but not in interleaved curricula

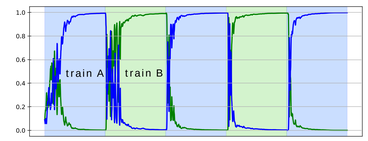


Conceptual replication: naturalistic narratives

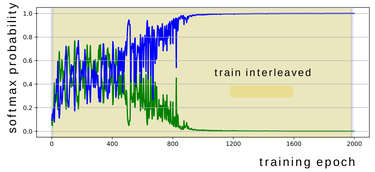
Connectionist (LSTM)



Blocked: catastrophic interference



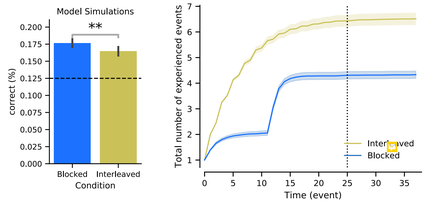
Interleaved: perfect performance



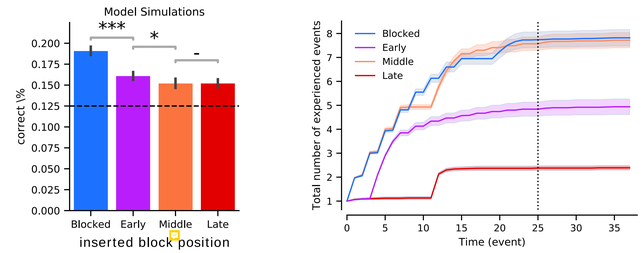
Event segmentation theory (SEM): blocked curriculum supports correct latent cause inference

matches human performance

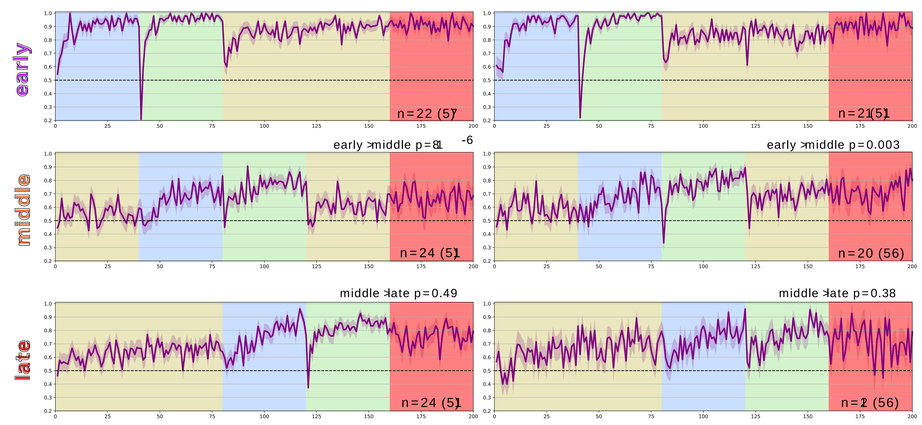
- Blocked curricula give rise to few but pronounced prediction errors that signal event boundaries
- Interleaved curricula give rise to noisy prediction error signal that causes excessive segmentation



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



Human performance in mixed curricula lends evidence to SEM prediction



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 et al., 2019
[2] Reynolds, Zacks, Braver, 2007
[3] McClelland, McNaughton, OReilly, 1995

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