What's going on? Surprising difficulties in complex relational rule discovery

Julia J. Conti, Kenneth R. Koedinger, & Paulo F. Carvalho
Carnegie Mellon University

Relational problems are hard

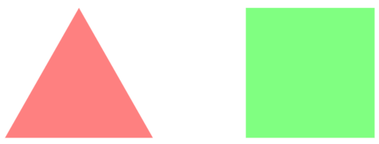
$3 > -4$

And they only get harder...

$-3 + 5 > 3 - 4$

Tackling relational complexity is key to making real-world inferences

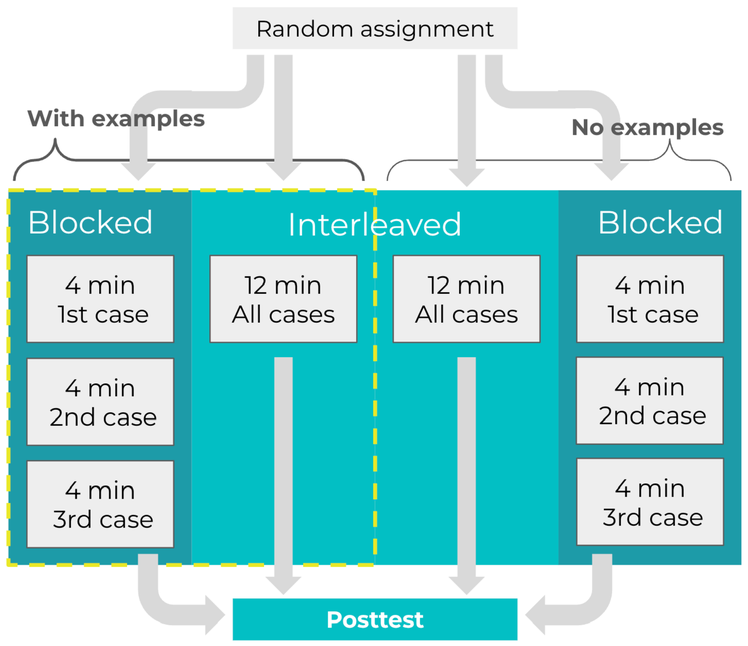
What environments facilitate the discovery of complex relational rules?



-3 +4

In this task, no. of sides represents the integer and color represents the sign

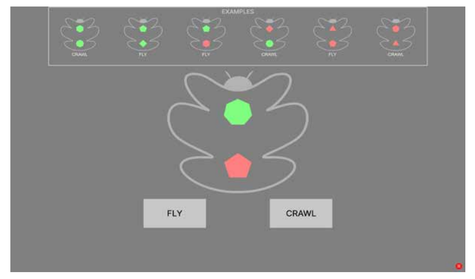
Participants completed an analog of an inequality task (n/task = 200)



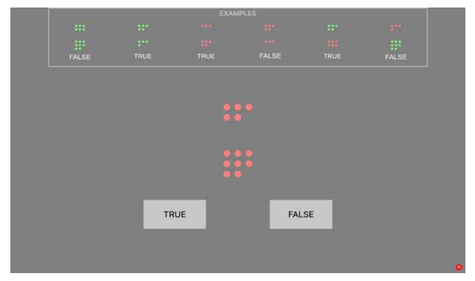
Hypotheses

Examples > No Examples
Blocking > Interleaving

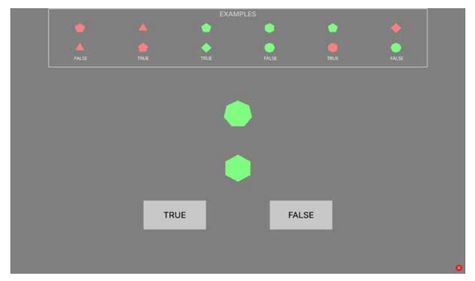
Task: Bugs
Case: Mixed



Task: Dots
Case: Red

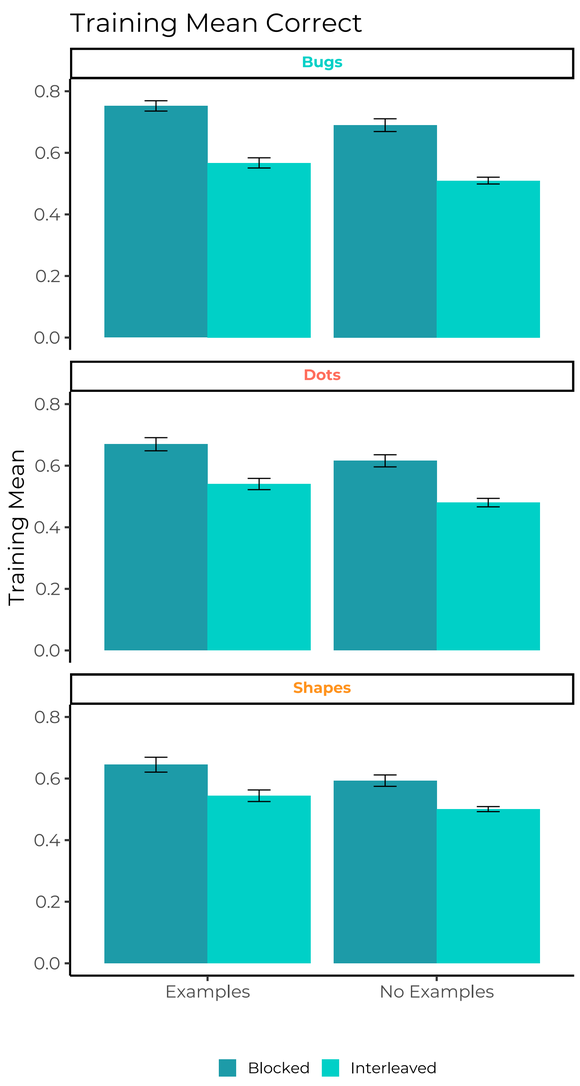


Task: Shapes
Case: Green



Participants in the **Bugs** task were given extra context (classifing alien insects) and told to use no. of sides, color, and spatial arrangment.

Those in the **Dots** and **Shapes** task were not.



Training Performance

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

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

Dots
Examples > No Examples (p<.01)
Blocking > Interleaving (p<.001)
Presentation * Examples (n.s.)

Shapes
Examples > No Examples (p<.01)
Blocking > Interleaving (p<.001)
Presentation * Examples (n.s.)

Presentation x Examples (n.s)

Posttest Performance

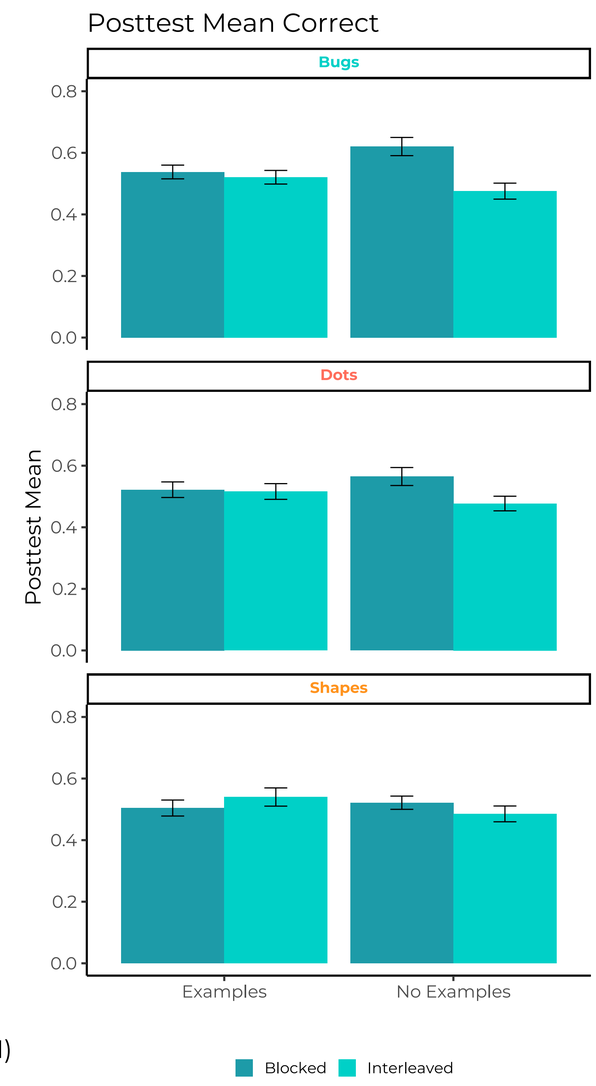
Blocking > Interleaving (p<.01)
No main effect of Examples

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

Dots
Examples = No Examples (n.s.)
Blocking > Interleaving (p=.076)
Presentation * Examples (n.s)

Shapes
Examples = No Examples (n.s.)
Blocking = Interleaving (n.s)
Presentation * Examples (p=.17)

Presentation x Examples (p<0.01)



Complex relational rules need to be discovered in context and in parts
Blocking can direct attention to relevant features
The extent to which examples support transfer may be dependent on task difficulty