Supplementary Material - Learning Casual Overhypotheses through Exploration in Children and Computational Models

Below is the exact testing script we use with the children per condition:

Experimental Script:

During the training phases the children see a video demonstration for how two blicket detectors work, and they are pre-recorded for consistency. We have attached the links here, but cropped out the portion where you can see the researcher giving instructions to keep the submission double-blind. We will also include this in the supplementary material for the camera-ready.

Given hypothesis space condition: Part 1: Training: https://drive.google.com/file/d/1Z8bLzXjHSdXQL-0ap3OcpSq4HDPuhU5D/view?usp=sharing And this one since the order is counterbalanced https://drive.google.com/file/d/1CGdxi_VBpVuiq-VNUtU_ogynSqkOwFfm/view?usp=sharing

Part 2: Testing: "Look, I have a third blicket detector. It could work like the polka dot one, or it could work like the striped one. Can you figure out how it works and make the detector go, and which blocks make it go?"

"Great! Is there something else you want to try?"

Repeat this until they say "no" Stop them after 10 minutes.

Then ask which objects are blickets by pointing to each one, then clicking the star button. "Is this object a blicket?" (point to leftmost) "Is this object a blicket?" (point to middle) "Is this object a blicket?" (point to rightmost)

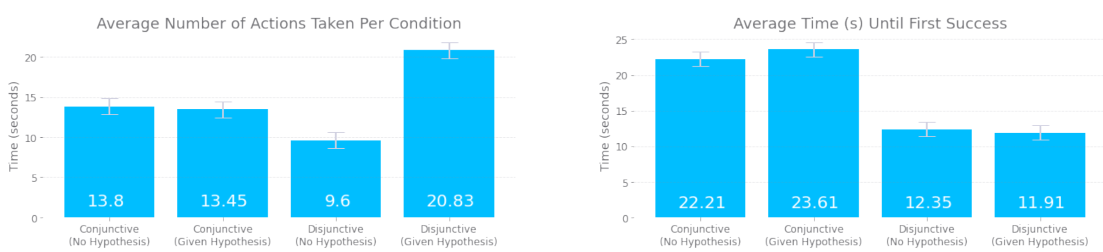
"Now click the shapes that will make the machine go."

"Now that you tried it, can you tell me how this machine works?"

Not given hypothesis condition: Part 1: Training: https://drive.google.com/file/d/1DhuYXZ48BuuT9212Iq29NAzxjLB6s5dV/view?usp=sharing

Part 2: Testing: script is the same as in the GIVEN-HYPOTHESIS condition

End of the script



(*a*) (*b*)

Figure S.1: The average number of actions taken per condition, and the time that children require to make the first successful action (lighting up the detector) per causal model and condition.

Test Object C	(Detector on) - Test Object B	(Detector on) - Test Object A	(Detector off) **Done**		
			(Detector on) **Done**		
		(Detector off) - Test Object A	(Detector on) **Done**		
			(Detector off) **Done**		
Test Object C	(Detector off) - Test Object B	(Detector on) - Test Object A	(Detector on) **Done**		
			(Detector off) **Done**		
		(Detector off) - Test Objects B,C	(Detector on) Test Objects A,C	(Detector on) **Done**	
				(Detector off) **Done**	
			(Detector off) Test Object A	(Detector on) **Done**	
				(Detector off) Test objects A, C	(Detector on) **Done**
				(Detector off) Test objects A, C	(Detector off) **Done**

Figure S.2: The optimal policy for the PER-STEP model under UNIFORM prior. The observation tree is represented from left to right, with the first column representing the first action taken and the second column representing the resulting observation outcomes and subsequent action taken by the PER-STEP model. The model tests single objects, and if both tested objects are off, tries combinations of objects to attempt to reduce the uncertainty. The model is done when it knows the exact condition of the space.

Test Object C	(Detector on) - Test Object B	(Detector on) Test Object A and **Done**		
		(Detector off) Test Object A and **Done**		
Test Object C	(Detector off) - Test Object B	(Detector on) Test Object A and **Done**		
		(Detector off) - Test Objects B,C	(Detector on) **Done**	
			(Detector off) Test Object A	(Detector on) **Done**
				(Detector off) Test objects A, C and **Done**

Figure S.3: The optimal policy for the PER-STEP model under the EXPERIMENTAL prior. This choice of prior reduces the number of policy branches, but also increases the average time to solution.

Test Object C	(Detector on) - Test Object A	(Detector on) - Test Object B	(Detector off) **Done**	
			(Detector on) **Done**	
		(Detector off) - Test Object B	(Detector on) **Done**	
			(Detector off) **Done**	
Test Object C	(Detector off) - Test Objects B,C	(Detector on) - Test Object B	(Detector on) - Test objects A,C	(Detector on) **Done**
				(Detector off) **Done**
			(Detector off) - Test objects A,B	(Detector off) **Done**
				(Detector off) **Done**
		(Detector off) - Test Objects A,C	(Detector on) Test Object A	(Detector on) **Done**
				(Detector off) **Done**
			(Detector off) **Done**	

Figure S.4: The optimal policy for the MINIMUM-STEP model under the UNIFORM prior.

Test Object C	(Detector on) - Test Object A	(Detector on) Test Object B and **Done**	
		(Detector off) Test Object B and **Done**	
Test Object C	(Detector off) - Test Objects B,C	(Detector on) - Test Object B	(Detector on) Test objects A,C and **Done**
			(Detector off) Test objects A,B and **Done**
		(Detector off) - Test Objects A,C	(Detector on) Test Object A and **Done**
			(Detector off) **Done**

Figure S.5: The optimal policy for the MINIMUM-STEP model under EXPERIMENTAL prior.