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Semantic Integration of Knowledge in Young Adults

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Introduction

❖ Semantic Knowledge: concepts, facts, and beliefs- provides a organized structure of related concepts and entities

❖ One way to measure semantic knowledge organization is through the SpAM grid (Spatial Arrangement Method, Goldstone 1994). The purpose of the SpAM grid is to make judgements on the levels of relatedness of entities organized onto the board.

❖ Self-Derivation through Integration (SDI): the process by which individuals integrate novel information from different learning episodes (e.g., *mammals have warm blood*; *pangolins have$_w$arm blood*) to derive new knowledge (e.g., *Pangolins are mammals*) that was not provided

❖ SDI is typically tested by providing two novel facts that can be integrated to produce a self-derivation and then asking an integration questions (e.g., *What type of animal is a pangolin?*). However, the questions may be prompting the cognitive work that leads to self-derivation. Additionally, the process has not been examined when one of the to-be-integrated facts is not novel.

Research Questions

❖ Does the SpAM task show evidence of self-derivation (are they integrating and self-deriving without a prompt)?

❖ Do adults show evidence of integrating semantic knowledge with existing knowledge?

❖ Support for the SpAM task a s method, integration without a prompt, and integrating with existing knowledge would come in the form of a pre/post test difference in the Euclidean Distance such that novel organisms are placed closer to their taxonomic category at post.

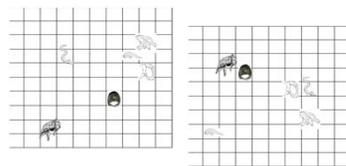## Method

Participants: 18+ college students ($n = 6$)

MATERIALS
SpAM Grid; Organisms (15 ; 6 novel)
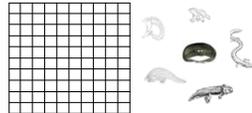
STIMULI
❖ Example paragraph, Pangolin:
The physical appearance of a pangolin is marked by large hardened overlapping plate-like scales, which are soft on newborn pangolins, but harden as the animal matures. Pangolins scales are made out of keratin, which is the same material that makes up hair, fingernails, and horns. Pangolins can curl up into a ball when threatened, with its overlapping scales acting as armor, while it protects its face by tucking it under its tail. The scales are sharp, providing extra defense from predators.
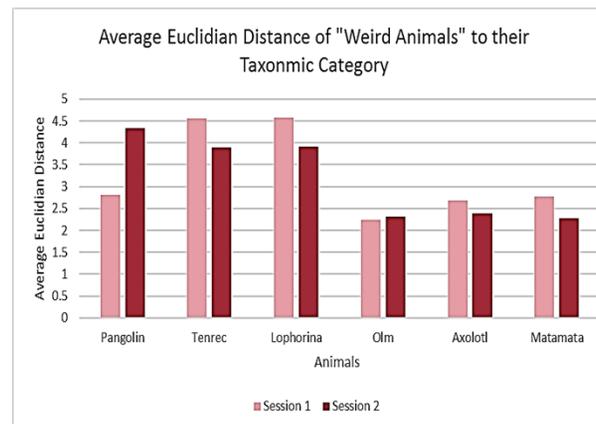
PROCEDURE
❖ SpAM grid with images of both the familiar and unfamiliar animals.
❖ Read the first set of expository paragraphs providing them with information about the animals.
❖ Woocock-Munoz measure of language proficiency

❖ Read the second set of expository paragraphs
❖ Fluency Task, *"List as many foods as you can in 1 minute"*
❖ Complete the SpAM grid again.
❖ Prior knowledge and intuitive thinking measures.

Results

SpAM Grid; Placed Stickers Example Pre/Post

❖ Although participants moved the target animals closer to their taxonomically correct group after hearing the paragraphs, this difference did not reach statistical significance, pre-paragraph (M = 3.8, SD = 1.06) and post-paragraph (M = 3.1, SD = 0.61); t (5) = 1.61, p = 0.17.
❖ The pangolin and the Olim tended to move further from their correct classification, indicating participants were making incorrect integrations.

Discussion

❖ The results with the limited data (due to COVID-19 disruption) suggest that adults did integrate and self-derive existing knowledge with the novel information provided through expository paragraphs, although this failed to reach significance in this small sample size. These results provide support for further research;
❖ With the SpAM task as the measure of SDI such that there is no direct prompt
❖ SDI of existing knowledge with new knowledge

❖ Due to finding that many participants exhibited private speech (the process of talking to themselves out loud. Though it is audible, it is directed at the researcher) future iterations of this study should have a protocol of recording audio of participant sessions to analyze for private speech.

❖ The private speech indicated by the participants indicated that they were in fact integrating the novel semantic knowledge into their existing schemas and were changing their placement of the animal on the grid.

❖ Private speech and a post interview may lend understanding to why the pangolin and olm were placed further from their taxonomic category at post-test.

Acknowledgements

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❖ Coley, J. D., & Tanner, K. D. (2012). Common origins of diverse misconceptions: Cognitive principles and the development of biology thinking. CBE—Life Sciences Education, 11(3), 209-215.
❖ Esposito, A. G., & Bauer, P. J. (2018). Building a knowledge base: Predicting self-derivation through integration in 6-to 10-year-olds. *Journal of experimental child psychology*, *176*, 55-72.

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