

# ELEMENTARY STUDENTS' USE OF SPATIAL THINKING STRATEGIES IN A LAYERED PUZZLE TASK

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Spatial thinking—being able to embed, disembed, and transform shapes—is important in STEM fields, and puzzle-based interventions can help children develop their spatial thinking. Dynamic and static strategies, involving intrinsic and extrinsic dimensions (Uttal et al., 2013), are important in solving puzzles. Dynamic strategies include reinterpretation (e.g., turning, flipping, or reordering pieces) and combinations (e.g., putting pieces together); static strategies include flexible abstraction (e.g., ignoring details) and borrowing structure (e.g., using known combinations; Martin & Schwartz, 2014). However, we need details of students' use of the strategies and their benefits.

Participants included 25 first graders and 21 third graders from the United States. We investigated students' spatial strategies using a puzzle from Colour Code by Smart Game. In task 1, we gave students the target design (made of four colored tiles) and asked them to make the target design; in task 2, weeks later, students chose which structure they could borrow to create the target design and created it (see Figure 1).

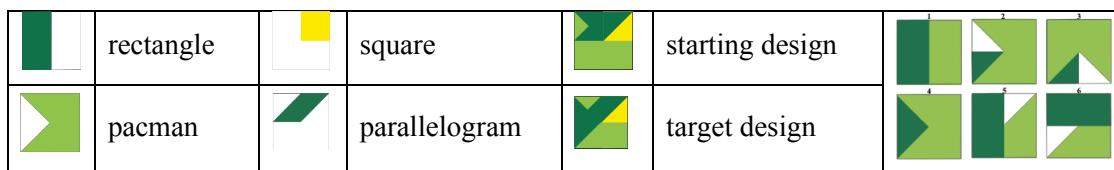


Figure 1: The four tiles, starting and target design, and structure combination choices.

On task 1, only 15% of students made the target design by reinterpreting or rotating the pacman tile correctly; two-thirds rotated other tiles or reordered them. On task 2, selecting the correct combination was significantly correlated with correctly making the target design  $r(44) = .45, p < .01$ , suggesting that disembedding the combination was associated with being able to embed it in the target design and that students could benefit from support in borrowing structure.

## Acknowledgements

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## References

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