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Middle school students' patterning performance on semi-free generalization tasks.

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Summary: This longitudinal study empirically addresses the issue of structure construction and justification among a class of US seventh and eighth-grade Algebra 1 students (mean age of 12.5 years) in the context of novel semi-free pattern generalization (PG) tasks before and after a teaching experiment that emphasized a multiplicative thinking approach to patterns. We compared the students' PG responses before and after the experiment and found that (1) one source of variability in their abduced structural processing was in part due to an initial conceptual preference toward thinking either in parts or in wholes and (2) a multiplicative understanding of structures significantly aided them in PG conversion (e.g., from the visual to the alphanumeric) and processing (e.g., from nonstandard to standard function-based formulas). Our findings provide both necessary and sufficient conditions for constructing, establishing, and justifying valid structures in the case of (semi-) free figural patterning tasks.

Classification: H23 G23

Keywords: free and open pattern generalization tasks; mathematical structures; abduction; induction; deductive closure

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