

INTRODUCTION

- Problem solving is a cognitive skill focused on mentally representing problems, planning solutions, executing plans, and evaluating and correcting errors (Zelazo & Frye, 1998).
- Children rely on problem solving while navigating many developmental and social tasks (Newcombe, 2017).
- Previous research on early problem solving employed controlled laboratory tasks or structured play paradigms (Fawcett & Garton, 2005).
- No research evaluated children’s use of problem solving in ecologically valid informal learning contexts, such as play with friends.

STUDY GOALS

- Gather reliability and validity data on a new observational measure of children’s problem solving skills.
- Examine associations of problem solving with boys’ and girls’ ability to complete a construction play task.
- Inform scholarly understanding of problem solving as an important early childhood cognitive domain.

METHOD

- 68 same-age 7-year-olds (32 girls; 36 boys) observed in dyads with a close friend to copy a premade construction.
- Video coders documented each child’s rate of engagement in seven language- and action-based problem solving skills during the play task (Cohen’s $K = .79$).
- Each dyad received a task completion score on a 5-point scale (0-4) representing the extent to which the construction was successfully replicated.
- Data was analyzed at the dyad level to account for shared play influences ($N = 34$).

PROBLEM SOLVING OBSERVATION SCHEME ©

Category	Definition	Examples
Planning	Statements or questions involving procedure or organization	“You put the yellow pieces in and I will attach them”; “Can you connect this square?”
Realization	Verbalization that a piece is needed, where it goes, or why it goes there	“I need another square piece”; “The turtle’s leg should go here”
Rejection	Rejections of a building method or building attempt	“I put this in the wrong way”; “You don’t need to connect that piece. It won’t work”
Confirmation	Confirmations of a building method or building attempt	“I got the middle part finished”; “You built the scooter the right way”
Comparison	Holding or placing the construction near or over the premade model to compare	Placing pieces on top of the premade turtle; holding pieces in front of the scooter model
Evaluation	Nonverbal evaluative thinking behaviors or actions	Turning or rotating pieces while studying them; looking back and forth at the model
Observation	Moving around to change point of view or see from a different angle	Leaning over to view the back part of the model; crawling to see the other side

RESULTS

- Data reduction procedures resulted in an aggregate problem solving variable including four of seven behaviors: planning, realization, confirmation, and comparison ($\alpha = .61$).
- The problem solving variable and task completion scale were standardized to z-scores
- Aligning with previous research on early STEM play, there were no significant gender differences in problem solving frequency or task completion (Gold et al., 2021).
- Regression model, controlling for gender and play set, revealed a significant positive association between problem solving and task completion $\beta = .39, SE = .19, p = .049$.
- For each standard deviation increase in problem solving, task completion increased .39 standard deviations.

DISCUSSION

- Results provide evidence that observing play-based problem solving may be an ecologically valid cognitive assessment approach (Kelly-Vance & Ryalls, 2005).
- To our knowledge, this is first study to assess children’s problem solving outside of structured laboratory settings, documenting naturalistic language and behavior as a window into cognitive development.
- Findings suggest providing semi-structured construction play contexts may support children’s goal-directed problem solving.
- Future research should examine specific problem solving behaviors in more detail, including influence of language on children’s collaborative engagement in problem solving.

TASK COMPLETION SCALE

	0	1	2	3	4
Accuracy	Construction does not resemble model	Construction does not resemble model	Construction is beginning to resemble model, but significant parts are still missing	Construction varies from the model in some way (pieces are connected properly)	Construction accurately resembles model (does not have to be perfect)
Organization	No discernable organization or pattern to construction (piles of pieces, not fit together)	Some basic organization (piles, pieces fit together haphazardly)	Pieces are mostly used and organized	Pieces are almost all being used and organized	Pieces are used and organized
Piece use	Almost no pieces used	Some pieces (less than half) are used	Some pieces (more than half) are used	Most of the pieces are used	Almost all of the pieces are used

PLAY SETTING

