

Developing Mathematical Reasoning through Playing Group Games

WHY INCLUDE GROUP GAMES IN EARLY EDUCATION?

Many activities that are sometimes referred to as “games” do not meet the definition of a game that we are using here. That doesn’t mean that they are not good activities; it’s just that we do not call them “group games.” Sometimes adults refer to a task such as a matching or sorting activity, clean up time, or using letter cards to make words as a “game” to make it sound more appealing to the child.

A game is an activity in which children play together according to rules. These rules (or series of rules) describe some goal to be reached. A high-quality game:

- suggests something interesting and challenging for children to figure out how to do.
- makes it possible for children to judge their own success.
- permits all players to participate actively throughout the game.

Teachers who understand the value of playing games do not simply teach children how to play the game. They recognize children’s interest in playing games and capitalize on this opportunity to develop children’s reasoning and their ability to cooperate. **Playing group games in the classroom provides many opportunities for children to grow cognitively.** For example: Children who play High Card judge which of two numbers is more. In a game of Target Ball, children do mental math to calculate a score, use logic in their decision on where to aim the ball to knock down the most targets. Board games can help children connect and have fun together with the added benefit of helping them to build essential learning skills as they navigate the social component of game playing. They can build understanding of numbers, number names, and their relationship to object quantities and to symbols by counting dots on a die, shapes on a playing card and relating it to the numeral, and spaces on a game board as they move their place marker. They can also think about object quantities by identifying how many bean bags landed inside a hoop and outside a hoop when playing bean bag toss. This also promotes part-whole relationships: “I threw 5 bean bags – 3 landed inside the hoop and 2 landed outside the hoop.”



Teachers who understand the value of playing games do not simply teach children how to play the game. They recognize children’s interest in playing games and capitalize on this opportunity to develop children’s reasoning and their ability to cooperate. **Playing group games in the classroom provides many opportunities for children to grow cognitively.** For example: Children who play High Card judge which of two numbers is more. In a game of Target Ball, children do mental math to calculate a score, use logic in their decision on where to aim the ball to knock down the most targets. Board games can help children connect and have fun together with the added benefit of helping them to build essential learning skills as they navigate the social component of game playing. They can build understanding of numbers, number names, and their relationship to object quantities and to symbols by counting dots on a die, shapes on a playing card and relating it to the numeral, and spaces on a game board as they move their place marker. They can also think about object quantities by identifying how many bean bags landed inside a hoop and outside a hoop when playing bean bag toss. This also promotes part-whole relationships: “I threw 5 bean bags – 3 landed inside the hoop and 2 landed outside the hoop.”



In group games, children can gain all of these cognitive benefits *plus* opportunities to grow socially by engaging in perspective taking and the opportunity to engage in conflict resolution. By thinking about other players' moves and turn taking, children begin to recognize different perspectives (decentering*). Because they are motivated, they negotiate with others, make decisions, and deal with conflicts by coordinating different points of view. To play a group game, children must agree upon and follow a set of rules. If someone chooses not to follow the rules, children have an opportunity to decide upon consequences or to decide upon new rules that everyone can agree upon. In this sense, children learn to cooperate in the context of a competitive game.

The desire to “win” gives children the impetus to reason about strategies that will outwit their opponents. As children try to figure out how to win, they begin to anticipate their partner's moves, make predictions about what will happen next in the game, and engage in “if _____, then” thinking. Some teachers may be concerned about promoting unhealthy competition among children. However, by responding to children in a casual, matter-of-fact way, the teacher can promote the attitude that winning a game is not as important as having the fun of cooperating to play. It is important to note that for many young children “winning the game” does not necessarily mean finishing first, it simply means finishing. They often think that everyone who finishes wins. Therefore, we do not push competition. Young children typically play games first as if the games are cooperative. A competitive attitude emerges when children are able to take the other's perspective and think about opposed intentions. Therefore, the emergence of a competitive attitude represents developmental progress

When children play together, their experiences are much richer. Self-regulating children control their behavior not out of fear of punishment, but because they understand and want to play according to the rules. Children who do not have very much experience playing games may not be able to control their behavior without an adult present. This is an important rationale for why **children need lots of experience playing games.** It will help them to acquire self-regulation by having to learn to adhere to rules and control their emotions when they win OR lose. They have the opportunity to learn that if they want to have fun and get along with peers, there is a need to play by the rules or the game falls apart.



Developing Mathematical Reasoning through Playing Group Games

SELECTING GAMES FOR THE CLASSROOM

- Select a wide variety of games.
- Consider which of three elements the game has:
 1. **Chance** (luck)
 2. **Strategy** (the cognitive function in game playing for developing tactics for outwitting one's opponent/winning the game)
 3. **Skill** (something that is practiced and perfected)
- Select games that address standards.
- Select games that address the full range of developmental levels present in the classroom.
 - Continuously monitor games to recognize when games become too easy for children.
 - Make modifications to games in order to meet the needs of all children.
- Include cooperative games that challenge children to work together.

SUGGESTED GAMES FOR 3 AND 4 YEAR OLDS

Balancing Game
Jumping Frogs Game
Drop the Clothespin
Slap Jack
Hi-Ho Cherry-O
Cover Up (9- and 12-grid)
Memory
Slap Jack
Snail's Pace Race
Teddy Bear's Picnic



SUGGESTED GAMES FOR 3, 4, AND 5 YEAR OLDS

Bean Bag Toss
Jumping Frogs Game
Checkers
Cover Up
Tapatan
Tic Tac Toe
Snail's Pace Race
Memory



SUGGESTED GAMES FOR 4, 5, AND 6 YEAR OLDS

Add Up to 5 Bingo
Blink
Connect Four
High Card
Mancala
Max
Memory
Plus Two Bingo
Rat-a-Tat Cat



SUGGESTED GAMES FOR 5, 6, 7, AND 8 YEAR OLDS

Add Up to 10 and Add Up to 12 Bingo
Always 12
Fifty Chips
Guess Who
Othello
Point
Rat-a-Tat Cat
Sorry
Take Ten
Topple
Total Concentration



QUESTIONS AND COMMENTS TO INSPIRE REASONING IN THE GAMES CENTER

- I would like to play this game. Can you show me how?
- What do the rules say about how to play this game?
- Who wants to be first? What is a fair way to decide?
- How shall we decide who goes first?
- What do we need to do next?
- I wonder whose turn will be next?
- What would be your best move there? What would happen if you moved it to the other corner?
- Would it make sense for me to put my marker there? What will happen if I move it there?
- Which one should I pick?
- Is that what the rules told us to do? How should we change them?
- How did you get that whole row filled?
- What did you do first? What was your next move?
- What do you think you will do differently next time you play?
- Where is the best place to start?
- What would you put here?
- Can you think of another way to ...?
- How did you figure that out?

Developing Mathematical Reasoning through Playing Group Games

TEACHER TIPS FOR PLAYING GROUP GAMES

- Play games with other adults first to analyze challenges they present for children.
- Modify rules and/or game if necessary.
- Invite children to play games with you.
- Be aware of developmental levels of game playing: Motor/individual Play; Egocentric Play; Cooperative Play.
- Provide written rules in child-friendly language.
- Make a big deal of presenting written rules, even if the children cannot read.
- Be proactive by teaching children impartial strategies for how to decide who goes first.
- Participate as a player in the game with children.
- Do not confront children with accusations of cheating when they don't play by the rules. Instead say, "*Oh! So, we can look at the cards while we are playing? Okay. Now I'm ready.*" Then play accordingly until child expresses a desire to revert back to previously agreed upon rules.
- Verbalize your thinking as you play games with children to model strategies.
- Keep a pad and pencil ready to jot down what you notice about children's understanding of number and/or use of strategies.
- Watch out for adult domination of the game.
- Put the responsibility of turn-taking on the children. "Whose turn is it now?"
- Involve volunteers or older children in playing games with children.
- Make games available for play at home.
- Encourage families to play games and give games as gifts.
- Compare the amount of mathematical thinking a child does playing a game vs completing a worksheet. Which is more challenging? Which would be more engaging for the child?
- Make games a regular part of the curriculum.
- Revisit the Iowa Regents' Center's <https://ceestem.uni.edu> site to find, download, print, and play more games for your children.
- Revisit the Iowa Regents' Center's to read how each game aligns with the Common Core.