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# Cambium

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INNOVATIVE K-8 CURRICULUM FROM THE ARBOR SCHOOL OF ARTS & SCIENCES

## REASON TO PLAY

### *In this issue*

TAKING THE TRAUMA  
OUT OF P.E.  
Page 2

MUSICAL GAMES DEEPEN  
CREATIVITY  
Page 4

ROLE-PLAYING  
IN SENIOR HUMANITIES  
Page 6

ADVANCED MATHEMATICS  
IN TIC-TAC-TOE AND SET  
Page 9

THE CASE FOR  
UNSTRUCTURED PLAY  
Page 12

*Play* comes to us from the Old English word *plega*, which meant “brisk movement,” and is closely related to the Middle Dutch *pleien*, “leap for joy, dance.” We might think first of activity undertaken purely for enjoyment; we might think of drama and music and structured athletic games. Play means all these things at Arbor School, but as we have examined our teaching practices to craft this issue of Cambium, we have been able to discover the kaleidoscopic nature of play and the extent to which it is embedded in all that we teach.

Games engage our students’ minds and bodies, of course. They transmit our school culture as younger children follow the elders’ lead in rousing games of all-school Capture the Flag, laboriously crafted productions of “A Midsummer Night’s Dream,” or imaginative play as pioneers on the Oregon Trail. But we also find that games allow us to push for real depth in all three of the realms that cradle our teaching aims: intellect, character, and creativity. Play in the service of rigorous thinking, of developing the mastery and imagination necessary to improvise and innovate, and of making us better humans permeates our teaching from mathematics to music.

In these pages, you will encounter P.E. as a vehicle not only for the inculcation of sportsmanship and fair play but for assessment of a child’s developing character, confidence, and

care for others. Musical games become a means to deepen creativity, both individually and collaboratively. Role-playing leads students to the heart of curricular content, allowing them to understand the factors involved in the rise of the first human cities or the American civil rights movement. Logical analysis of Tic-Tac-Toe strategy brings young students into contact with some very advanced ideas in mathematics. And free, unstructured, imaginative play comes into the classroom to spark the synthesis of knowledge about whales, Pilgrims, and the human body.

We invite you to leap in and consider how a little brisk intellectual or physical movement might deepen your own students’ experiences at school.

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## TAKING THE TRAUMA OUT OF P.E.

*by Leigh Wood, grades K-8*

When I started teaching P.E. twelve years ago, I encountered two surprises that shaped my novice approach to the job. The first thing I discovered was how many adults felt strongly about their elementary P.E. experiences. I was new to town as well as to the job, and it seemed as though each new person I met had an opinion about my field. I found the commentary particularly compelling: “Oh, I hated P.E.! I was never very athletic.” “I loved P.E. — the parachute was my favorite — I used to make rude gestures to my classmates when we were underneath!” “P.E. was the most miserable part of my childhood.” “P.E. was the best! I used to help inflate the balls for Dodgeball — and I’d overinflate them so they’d really hurt!” It was readily apparent why there was such a strong demarcation between the two groups. The second, albeit related, surprise I had was how much of a person’s character shines through in P.E. I had thought that I was going to be spending my time teaching young children how to skip, kick, and throw, but quickly realized that those skills were secondary to learning to be flexible, willing, and gracious. Thanks to the lessons taught to me by strangers in the laundry room and friends of friends, I became determined to build a program that wouldn’t traumatize anyone. I wanted every student to be able to have fun learning how to play and seeing his skills develop, regardless of his baseline athletic ability. Children who have a positive experience being active grow up to be adults who think positively about being active, and are therefore more likely to do so. To that end, I have used my years at Arbor School to develop a game-based program that emphasizes cooperation and personal challenge and growth.

One of the most important among the factors that have enabled me to shape my program is the autonomy I have as a teacher. I am not required to test the students on the mile run or on how many pull-ups they can do; I am given the freedom to use my space and the school’s land as I judge best. I have come to believe that if children are having fun being active rather than running drills, they will inherently begin to explore how their bodies move and thus build their skills. Games have been my means of achieving that goal.

Games are not only a more dynamic skill-building experience for the students but allow teachers to see their students from a variety of angles as well. Take Capture the Flag, a favorite that we play with piles of plastic cones rather than a single flag for each team. From a strictly skills standpoint, the focus is on running, specifically sprinting. However, you can also see if Sophie is willing to risk playing offense, sticks solely to defense, or contributes to both. If she focuses on defense, is it because she is reticent to leave the safety of her own side, or is it because she sees that no one else on her team is filling this important role? Does she stand around chatting or watching the game happen, or is she in the thick of the action? When she gives chase for a tag, does she pursue the runner all the way back to his side, or give up just when it seems she’s gaining ground? If she decides to cross the other team’s side, does she steal a cone or save teammates from Jail? If she is more of a cone-stealer, will she forego that glory if a significant portion of her team is in Jail? Does she wait for “just the right moment” to run even if it takes all class period, or does she make rash decisions that inevitably get her caught? Or does she seem to have a keen sense of strategy, knowing whom she can outrun and how to traverse the enemy territory? If two players from the other team make a run at the same time, does she go for the easier tag, or does she let that person try to get through while she challenges herself to catch the faster runner? Does she butt heads with other players over trivial matters or does she handle disagreements with diplomacy? Does she cheat? When she successfully steals a cone, does she do a victory dance, flaunting it in front of the other team, or does she modestly begin to lay

plans for her next move? If her team happens to lose, is she in tears, conjuring a multitude of ways the other team cheated, or can she still turn to a classmate and say, “Good game! I had a lot of fun, didn’t you?”

In Arbor P.E. we play all sorts of games, from competitive to cooperative, from structured ones to those that allow more room for free play. No matter the activity, there is an understanding that P.E. is a class and, as in Reading or Math, participation is mandatory. The students know there will be games they love and games they don’t, games they are good at and games that challenge them, but they also know that all I ever ask of them is that they try.

One of the trickiest aspects of P.E. to manage is the competition factor. Before I ever came to Arbor, the school had struggled to find ways to make the competition that many children find thrilling agreeably mesh with the inclusive ethos of the place. There was some sentiment that an entirely non-competitive P.E. program was in order. Within weeks, however, I had learned my third lesson: you can take the competition out of the game, but you cannot take it out of the kids. P.E. stripped of all competitive aspects was compelling to no one. As such, my objective has been to channel the



students’ inherent competitive impulses rather than to squelch them. First and foremost, the kids know that whatever we play, our goal is to have fun. When we play games that typically produce a winner, like Kickball, I cultivate a notoriously poor memory of the score. In games like Capture the Flag, I set up a situation where it is virtually impossible for one team to win outright — neither side can ever steal all the other’s cones without simultaneously giving up some of their own. Games that end with a tie score enable the students to focus on the events within the game that made the game fun. Even though some students can fixate on who was winning when the game ended or really like to keep track of the points, I have found that enough of their peers are relieved to have the pressure of winning and losing alleviated that they will shut down the über-competitive kids with feedback like, “But it doesn’t

really matter,” or “Yeah, but we might have come back if the game kept going.”

For one week of the year, however, the focus is entirely on competition: Record-Setting Week. Tipping my hat to traditional P.E. programs, I devote a week to stations in which the students compete in gendered, leveled groups (i.e. Junior girls, Intermediate boys) to try to set records in a variety of categories. Some are old standards, such as the number of laps, push-ups, or sit-ups one can complete in a 5-minute station. Others, like the number of consecutive pogo-stick jumps jumped, the duration a tripod or headstand is held, or how long someone can hula hoop, cater to more obscure skill sets. Although the structure of this weeklong event is centered on competition with classmates, I also emphasize that any time students try one of these skills and make a new personal best, that is a triumph as well. I compile two sets of results: the best of the year and an ongoing set of “all-time” records. Every year, some of the latter are broken, but there are still records that have stood the test of time — and some of them are held by students who didn’t consider themselves “athletic” and never competed on an extracurricular sports team. Kids who hang back in team-centered competitive events are often drawn to this forum of testing their own personal best.

Arbor has no sports teams of its own (the entire Senior class occasionally competes as a team at a track meet or friendly soccer match), but many of our students play club sports, some at highly competitive levels. We offer just-for-fun sports after school, from cross-country running to Ultimate Frisbee to lacrosse, according to student and teacher/parent-volunteer interest.

I have often thought that Physical Education could be renamed Character Education, except that then the kids probably wouldn't like it. It is about learning to move, refining your motor skills, and developing your body, yes, but it is also about being willing and effortful, challenging yourself, and ensuring that each person in the group is able to be safe, feel supported, and have fun. As we say, it is just as important to "exercise your kindness muscles." I want my students to graduate from this program interested in being lifelong athletic learners and participants, but I also hope that they walk away having internalized lessons that make them better people.



A clutch of Primary boys prepares for a cooperative raid on the other team's cones during Capture the Flag

## BEING GAME MUSICAL PLAY DEEPENS CREATIVITY

by Laura Frizzell, grades K-8

Today, the eighth graders were all "in the bucket." Shorthand for community service or after-school tidying jobs? No — the "bucket" is a basket-weave formation from one of the many singing games in Bessie Jones's *Step It Down*, a wealth of songs, games, and chants from the African American traditions of the deep South. Can a game that these teens learned when they were eight still be fun? By the cheers today when Draw Me a Bucket of Water was suggested, the answer is a definite *yes*.

This year, as their Humanities curriculum revolves around the peoples and history of the Americas, these Eights are able to imagine the original context of this game in a deeper way. Forging links across the curriculum to give students a multifaceted appreciation of their academic studies is always a goal at Arbor, but our Music periods also offer a particular opportunity to ask each child to draw more deeply from his well of character and creativity. The first requirement in our music games is to engage one's brain and body in partnership with classmates so that the game can begin, and then to lend a hand in shaping it.

The element of collaboration is one reason Draw Me a Bucket and similar games have such staying power. The words have a connection to real life — work, play, quarrels, courting — that resonate in this modern school community just as they did for the young originators 200 or more years ago. The co-author of *Step It Down*, Bess Lomax Hawes, wrote in her preface to the book about the games that Ms. Jones called *plays*:

Jones, Bessie and Bess Lomax Hawes. *Step It Down: Games, Plays, Songs, & Stories from the Afro-American Heritage*. First published New York: Harper & Row, 1972; now available from University of Georgia Press, 1987.

“When they were ‘played,’ they were constructing over and over again small life dramas; they were improvising on the central issues of their deepest concerns; they were taking on new personalities for identification or caricature; they were acting. They are ceremonials, small testimonials to the ongoingness of life, not miniature battles. In order to be enjoyed properly, therefore, they must be played properly—that is, joyfully and humorously, but with an underlying seriousness of intent to make it all come out right, to make, as Mrs. Jones says so often, ‘a beautiful play.’”

The underlying stories of the singing games are compelling, too. In *Step It Down*, the children might be singing about “the little old lady from Brewster” or “Little Johnny Brown” (another favorite of youngers and olders at Arbor), characters whose stories or situations beyond the game are intriguing to imagine with the children and to spin into new verses or movements. In other games, the protagonists are animals with the same quirks and charms as their human counterparts. In a Spanish ring game, *El Lobo*, the second and third graders in the circle call to the child in the middle, “*Lobo, estás?*” The “wolf” answers, “*Sí*, but I am putting on my *chaqueta* (jacket),” and mimes that action. Excitement builds as the question returns, and the wolf answers, nonchalantly, about the various things she is doing until she shouts, “*Sí, tengo hambre!*” (Yes, and I am hungry!) and runs to tag others in the circle. The child in the center has the delicious position of creating a bit of nervous anticipation in the circle: when will she decide it’s time to give chase? At the same time, we can’t help but enjoy the wolf’s creative stalling. This game and others like it can help students who are normally shy or quiet feel the empowerment of shouting out and taking charge. For those students who are no strangers to the latter, they also get the chance to experience a contrast: a silent tiptoe, a “frozen” statue, a hushed rhyme.

Our games give every student the chance to take a turn in the spotlight, improvising and showcasing her creativity. Some relish the opportunity to shake their tail feathers in a circle of dancing peers; for others it’s a real challenge to set aside self-consciousness. But risk-taking is something we ask of our students in the realms of intellect and character every day at Arbor — can you argue a position that doesn’t accord with popular beliefs? Will you be the one to invite a lonely newcomer into your play? — and creativity need be no different. Music games ask that you stretch yourself. Let your body and your voice be expressive. Build your confidence. Make your friends laugh, and laugh with them. Don’t be afraid to experiment and fail and try again.

And now, a joke: The tourist asks a New Yorker, “How do you get to Carnegie Hall?” The New Yorker answers, “Practice, practice, practice.” Skills and drills have their place in most classrooms, from times tables to the list of planets, the periodic elements, and more. On a recent day, the fifth graders were practicing B, A, and E on their soprano recorders. I gave them a short melody to help “cement” the fingerings. If we had played only that melody over and over, drill style, our brains would probably have cemented, too. Musicality and attentive playing would certainly have suffered. The drill became a circle game when the recorder tune was followed by a word on the beat from each child in succession, spoken over two of our recorder notes, with no repeats. If Jack missed the beat or couldn’t think of a word that hadn’t been already used, he simply picked up his recorder to cue the tune, and we’d practice all together. The next round of words began with Jack until someone else couldn’t continue the word chain. Listening for others? Anticipating one’s turn? Indeed. And just a hint of risk-taking with a one-word

Intermediate dancers play  
*Draw Me a Bucket of Water*



original solo and a ready safety net in case the moment proved too much. This word game helped us inject a little spontaneous creativity into practicing the recorder, and the person who caused the game to stop momentarily got to start it up again as the leader of the next round.

Whether you aim to sharpen academic skills or foster a sense of community among your students, a game can make the idea engaging and memorable.



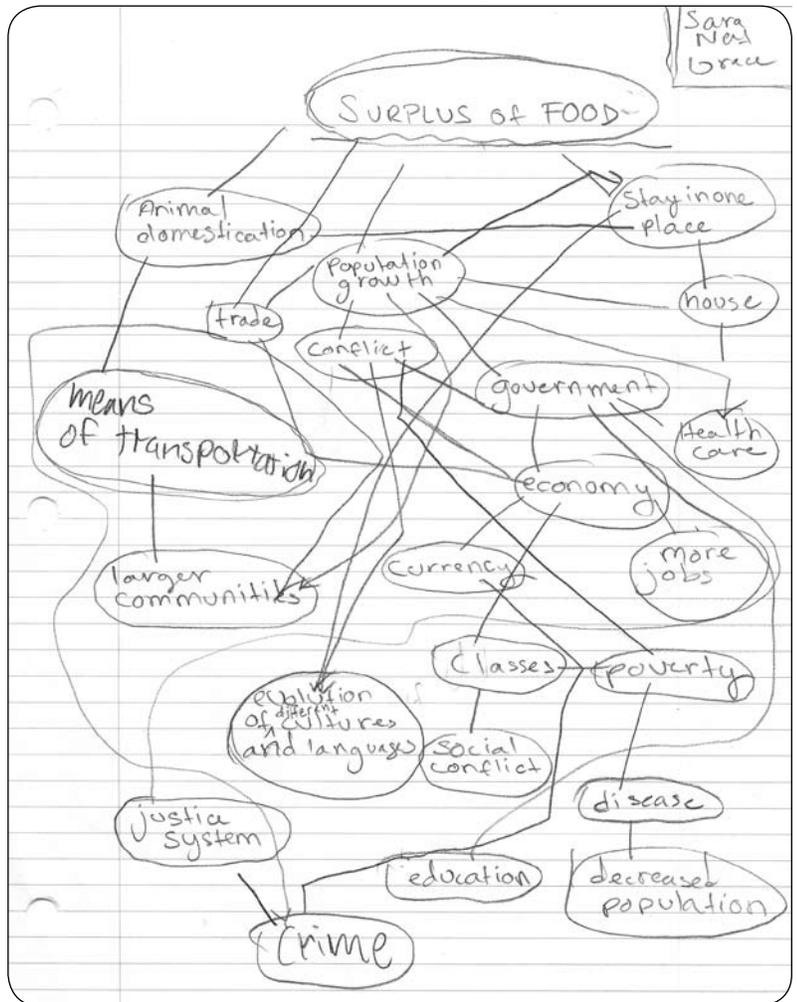
## SEEKING INSIGHT, BUILDING EMPATHY ROLE-PLAYING IN SENIOR HUMANITIES

by *Cara VanGorder-Lasof, grade 6-8*

“How will we ever mature if you continue to control us?” Playing the role of an American Patriot prior to the Revolutionary War, Charlie sat on the edge of his seat, eagerly awaiting a reply. Several Loyalist students responded by raising the point that the colonists needed the protection of the British to survive and that taxation was a fair and natural consequence. In Humanities, we often ask students not only to imagine the perspective of another but to actively represent that viewpoint. This representation might manifest itself in a role-play, a writing assignment, or a discussion. Creating opportunities for students to encounter, understand, and then portray a character almost inevitably leads to a stronger connection between the students and the ideas at work in history. This perspective-taking reinforces the core Arbor precepts of intellect, character, and creativity, developing skills in each of these domains.

Prior to the role-play in which our Seniors investigated a spectrum of opinions as to whether America should fight for independence from the British, students read and discussed primary and secondary sources on the events leading up to the Revolution. This gave them a firm foundation on which to build the role of the character they were assigned. Careful preparation is critical to the success and value of this type of activity. Our Humanities team plans backwards, discussing our vision of the kinds of conversations and interactions that will need to occur in order for the role-play to achieve the learning objectives we set forth for students.

Imagining the experiences and views of people who lived during a given historical period often piques student interest and enthusiasm at the beginning of a unit. When we introduce ancient Mesopotamia, we assign initial background readings on the economy, religion and government, and art and architecture in the first cities in this region. Students then imagine what it might have been like to live in one of the cities and write an account from the perspective of someone with a specific role in the city — a farmer, an architect, a merchant, a scribe, a temple priestess, or a fisherman, for example. As we begin to examine various problems that might have developed in these first cities, we ask students to discuss how their architects and farmers might have responded. Examining such challenges as building and maintaining irrigation systems and dealing with population growth, small groups of students discuss how the characters they have created might have been affected and speculate about perspectives not represented in their small group. Students quickly realize that irrigation systems might have to cross village boundaries, which could lead to conflict with neighbors. They see that the transition to farming led to a food surplus, and that surpluses bring about the conditions for trade, which would require that rules be established to govern fairness in trading, which would require more complex systems of government and the creation of new kinds of jobs. Once they begin to imagine experiencing these events from a particular perspective, students recognize that negative as well as positive consequences flow from major societal shifts.



Taking the imaginative leap of standing in the shoes of an individual bound by a particular role in a distinct time and place helps to promote the critical thinking skills that students must bring to history studies; it also helps to make an event or concept less abstract to students. When our Seniors study the American Civil War, the topic readily engages the intellect in most young people but can be difficult to understand more viscerally in a time when we take the union of our states and the peace between them for granted. After extensive reading and discussion about the causes of the Civil War and the impact of the war on certain groups of Americans, we asked students to write a series of diary entries from the perspective of someone affected by the early events of the war. Here is an excerpt from Lia’s imagining of life as a Union nurse:

The effects of the war show on the men’s faces, and with each wounded soldier that comes for medical help, I become more accustomed to death. The medical supplies we have been given are usually not sufficient enough to help the men. Elizabeth, the head nurse, told me that I haven’t seen the worst yet. However, I hadn’t believed her until last night, when a soldier came in to the nurse tent with such a badly injured leg that there was no time to get him to a doctor and we were forced to amputate. Now, sitting here, I wonder whether the true effort of this war is to fight for what we believe is right, or to fight death.

A student's adoption of the perspective of a real person in history or creation of a realistic fictional persona can also be an avenue through which teachers can assess her understanding at the end of a unit. Lia's journal entries allowed us to begin to gauge her retention of the content of lessons leading up to this assignment as well as her ability to make inferences and convey ideas in a manner appropriate to the time period and perspective she is representing. Guthrie's diary of a Confederate soldier revealed his growing understanding of how the war shaped American identity and values. Our observations of student work inform whether we need to go back and reteach important concepts or respond to students' desire to study a topic still more deeply.

Arbor Seniors have been coached to practice perspective-taking since they were K-1 Primaries, whether they were attempting to work through a disagreement with a friend during recess or imagining how it felt to be a member of Lewis and Clark's expedition. Implicit in the value we place on this skill is the belief that academic and social perspective-taking helps deepen empathy. As we approached our study of the Civil Rights Movement this winter, students read biographies and then wrote speeches to teach their peers about the impact one individual had on American society during

this period. Stepping into the shoes of John F. Kennedy or Langston Hughes, each Senior wrote his speech in first person. As Rosa Parks, Anna told her classmates, "By the age of six, I knew I wasn't free. I also knew that I would never be free unless I was the one to change the circumstances." The process of crafting one's own speech and listening to others' speeches can be inspiring to young writers, but our deeper motive is to build skills that will help students reflect on their own actions and listen with consideration to the perspective of others. We don't expect that a twelve-year-old will think explicitly of the time she portrayed a civil rights leader while she is struggling to resolve a misunderstanding with a friend, but we hope the experience has honed her empathy and her ability to express herself with consideration for another's experience of the circumstances.

Reflecting on the speech she wrote about Ruby Bridges, one of the first African-American students at a formerly all-white elementary school in New Orleans, Sydney remarked, "I had to read a lot of books about her to really get inside her head. It was hard to imagine something so inhumane happening to someone who was just a little girl, still new to the world's problems. Learning about Ruby's story made me realize that even though we have come a long way in terms of equality, we still have a ways to go." Sydney realized that she could never fully understand an

experience that was so vastly different from her own, but she clearly understands the value in trying to do so.

Debriefing a perspective-taking activity provides just as many opportunities for learning as the activity itself. As we reflected on our New England town meeting, more than one Senior commented on how quickly people became invested in the role-play. Analyzing the variety of perspectives expressed during the meeting, Isabella said that the process helped her to see, "If you want your country to grow, you need to listen to people you disagree with." This critical insight quickly shifted our discussion from the past to the present, as the class wanted to discuss how Isabella's thesis applies in American politics today. They also considered why being open to the perspectives that their character disagreed with was challenging — and came to value the intellectual stretch required to role-play a character whose beliefs do not align with your own. These are precisely the kinds of connections we want students to be making as we study the past in order to better understand our present.



A charcoal portrait of Rosa Parks by Hanna. We treat our Design studies of portraiture as yet another avenue to more deeply consider the lives and experiences of others.

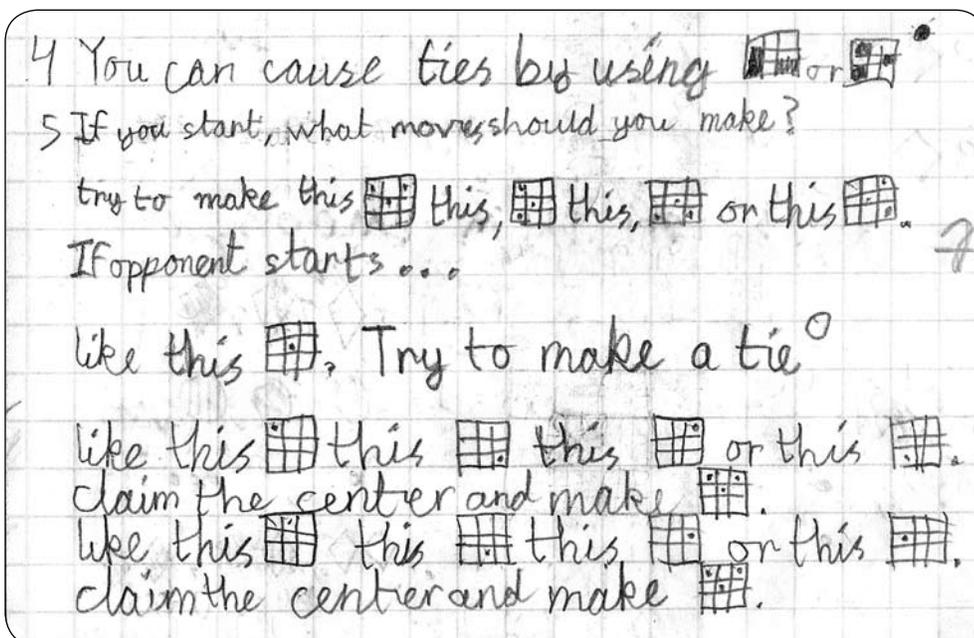
# SIMPLE GAMES, RIGOROUS LOGIC

## ADVANCED MATHEMATICS IN TIC-TAC-TOE AND SET

by Daniel Shaw, grade 4-5

For mathematicians, games contain a particularly intriguing set of curiosities. Simple games like poker and dice give ample opportunity for probability puzzles. Perhaps the most interesting mathematical implications of games center on game theory. Game theory, at its most basic level, focuses on the strategy of games. Mathematicians delve into questions in order to decide the best way to play a game. They ask whether the person who plays first has a better chance of winning — or is it the player who makes the second move? Is there any point at which one player can ensure victory or blunder into a loss? Investigating these questions requires only an understanding of the game at hand and the application of logic, so they offer the perfect opportunity to give even very young students the satisfaction and thrill of creating a mathematical proof. Tic-Tac-Toe and Set are two simple games that permit Intermediate (grades 4 and 5) students to pursue the steps necessary to create a logical argument about each game. Such tasks are essential to deepening students' concept of what it means to be a mathematician. The process also hones students' ability to reason and hypothesize — two essential mathematical skills at any level.

Nearly everyone knows the rules of Tic-Tac-Toe. The game requires only something to write with and something to write on — even sand and a stick suffice. In fact, Tic-Tac-Toe truly is a trivial game. Players quickly discover that the game is futile — in other words, if both players play perfectly, the game ends in a draw. We ask the Arbor Intermediates to experiment with the game in a careful and planful manner. They play against each other, recording their moves and noting if and when someone obtains an advantage. Students get a chance to collaborate, coming up with theories and instantly testing them with a quick game. Finally, students write a strategy manual for the beginning player. They work on ways to clearly express the ideas they just learned. They also work on their arguments, ensuring that the reader will be convinced that he has learned the best strategy for Tic-Tac-Toe.



Excerpt from Hastin's Tic-Tac-Toe manual, illustrating the most strategic openings and responses



for young students in mathematics. The explorations involved in thinking about Set require rigorous logic to prove things about a simple game; however, the rules and steps are entirely accessible to fourth- and fifth-grade students. The balance between the fun of the game and the depth of thinking required shows students a side of mathematics rarely exposed in American primary and secondary schools. The questions involving Tic-Tac-Toe introduce students to the essence of game theory, a topic not often broached until mathematicians reach advanced college courses. Once again, the simplicity of the game allows students of any age to truly prove that Tic-Tac-Toe is a futile game. The two games taken together afford students the chance to delve deeply into the rich and varied texture of mathematics, building an appreciation for all that mathematics encompasses — a truly worthy endeavor.

### The Game of Set

For this exploration you will need a complete deck for the game of Set.

- How many different characteristics of cards are there?
- How many red cards are there?
- How many red and oval cards are there?
- How many red, oval, and empty cards are there?
- How many red, oval, empty, and triple cards are there?
- How many total cards are there?
- Grab two cards at random. Which card do you need to make a set? Repeat with several other pairs.
- Take one card. Can you find out how many sets involve that card?  
Hint: It helps to think of it one characteristic at a time.
- Bonus: There isn't always a set when you lay out nine cards. Is there always a set with 12 cards? What about 15? How many cards do you have to lay out in order to be certain that there is a set?

### The Strategy of Tic-Tac-Toe

For this exploration you need a pencil, a sheet of graph paper, and a partner.

- Experiment playing Tic-Tac-Toe. You can play against yourself if you don't have a partner nearby; this may even give you better results as you have to think about both sides at once. Try playing many different games, being sure to use all the different starting positions.
- How many different starting positions are there? Think really carefully before answering this question.
- Does any one position lead you to win every time?
- Does any one position lead you to lose every time?
- Does the player who starts win every time? Does she win most of the time?
- How can you cause a tie?
- Without including the basic rules, write a strategy guide for a new Tic-Tac-Toe player.

Similar explorations offer opportunities to introduce middle-grade students to advanced concepts in other mathematical realms: The Konigsburg Bridge problem lies in graph theory; explorations with graphs of tauri, moebius strips, and spheres introduce topology; and an investigation of the Goldbach Conjecture falls into the purview of number theory.

# THE CASE FOR UNSTRUCTURED PLAY

## GROWING, PRACTICING, SYNTHESIZING NEW LEARNING

by Lori Pressman, grade K-1

Last fall, Annmarie Chesebro, director of the Arbor Center for Teaching, and I attended the Conference on Innovative Learning at The Nueva School in Hillsboro, California. For two days we attended workshops hosted by master teachers from Nueva as well as renowned professionals in areas of child development, design process, poetry, mathematics, and neurobiology. After our sessions, we would discuss what we had learned and the impact it might have on our practice at Arbor. As we synthesized our findings, it became apparent there was a unifying theme in all the sessions we attended: the importance of play. Whether we were discovering patterns as we built number bracelets, pondering how free play has changed over time, or learning about the role of mirror-neurons in social learning, play arose as a vital factor in human development. Returning to my K-1 classroom, I saw play in a new light: there was profundity in my students' simple Choice time activities or the playful gathering of pinecones at recess. In continuing to research the complexity of play and its applications in the classroom, I've been inspired and informed by Dr. Stuart Brown, Dr. John J. Ratey, Dr. Michael Thompson, and Scott Eberle. Dr. Benjamin Spock wrote, "A child loves his play not because it is easy, but because it is hard." How can we encourage that growth-provoking play in the curriculum we design?

Play is not so much an activity as a state of mind. Playful activities may include running, pretending, painting, building, dancing, joking, climbing, spinning, creating, play fighting, drawing, balancing, music-making, experimenting, collecting, problem-solving, socializing, kicking, competing, spooking, and speculating. Clearly, play is broad and what individuals deem as play varies tremendously. However, there are some key components: play is apparently purposeless, voluntary, pleasurable, seems to suspend time, decreases self-consciousness, and prompts a desire to have it continue.

Scott Eberle from the Strong National Museum of Play in Rochester, New York breaks play down into a six-step process:

**Anticipation** leads to  
**Surprise** gives rise to  
**Pleasure** increases  
**Understanding** builds  
**Strength** contributes  
**Poise** enables  
**Anticipation**

This cycle happens again and again for children at school and home. For instance, this fall Sadie was drawn to the monkey bars. She *anticipated* the activity, asking Carly and Ivy, "Do you want to play on the bars?" as they ate a pre-recess snack. Numerous *surprises* arose in their play: losing your grip, developing blisters, the improvisation of new challenges, interactions with other players. *Pleasure* ensued as Sadie reached self-imposed goals: crossing the bars, skipping bars, hanging by one arm, and finally attempting a tricky maneuver called an "Armadillo Roll." Sadie began to *understand* how the swinging of her body propels her to the next rung. She grew stronger and more confident. She developed *poise*

as she climbed upon the bars, effortlessly gliding from side to side. "Watch me!" Sadie now calls to her teachers as she confidently swings across one more time before running back to class.

Carly prepares to demonstrate an "Armadillo Roll"



Why does Sadie return to these bars time and time again? It's fun and it's challenging. Play by its very nature is pleasurable, but it also serves a broader function. Play is an opportunity to practice physical and social skills that will be used in the future. Every day we see our students challenging the limitations of their bodies, whether they are climbing trees, throwing a football, flying off the rope swing, or dragging a board over to a fort. Strength, skill, confidence, and vitality are the result of active play.

Play has tremendous social benefit as well. Scientists have found that kittens that were kept away from other kittens and denied the practice of play fighting were still able to hunt as adults. However, these cats had a difficult time socializing with other cats. They had never learned the social cues necessary to distinguish friend from foe. Neuroscientist Jaak Panksepp believes, "Play takes you to the perimeter of your social knowledge. Play constructs the higher social brain." Children come up to this edge all the time. How rough can a game become before it is too rough? How do you respond when your friend does something that you know is wrong? How can we accommodate one more classmate in the game? How can we trade baseball cards so that we're both happy? Social rules are complex, nuanced, and ever shifting. The element of surprise makes play exciting, but can also make it difficult to navigate. Life itself is ever changing and filled with unexpected challenges and ambiguities, and the beauty of play is that it provides plenty of opportunity for rehearsals — there are consequences, but the stakes are lower. After all, you can simply explain, "I was just playing."

Play is also essential in brain development. In 1898 Karl Groos wrote, "The very existence of youth is due in part to the necessity for play; the animal does not play because he is young, he has a period of youth because he must play." In fact, there is a correlation between brain size and the duration of this juvenile period across species. The larger the brain, the longer an animal plays. Play stimulates nerve growth and connections in the cerebellum (motor learning and attention), prefrontal cortex (executive function), and the amygdala (emotions). Our complex brains are sculpted and developed through play. The most rapid brain development occurs during our earliest years, when play is most prevalent. This juvenile period is essential to learning and responding to one's environment, allowing us to become flexible and adaptable.

Convinced that this scientific evidence supports what I have observed anecdotally in my years as a teacher, I took a fresh look at the ways we have tried to build unstructured play into the Primary curriculum at Arbor. Learning is strengthened by play, and children seem to know this intrinsically. As they wrestle with new concepts, they hone their understanding through imaginary play. Currently, "marine research centers" are set up in both the Primary classrooms to support our study of whales. The kids frequently dive into the research tank to play with the plastic and plush whales that have taken up residence there. Without prompting, they sort the whales by species or into groups of baleen and toothed whales. They make "plankton" from materials in the Junk Box to feed to the baleen whales. Clicks and whistles are heard as the orcas breach, spy hop, and lob tail. Information is being synthesized; knowledge and understanding are increasing. All the while, each child is working with his peers, teaching, learning, clarifying, sharing, cooperating, and creating new narratives.

Our latest Science class is an example of how complex ideas can be explained through playful means. The students explored the different feeding methods of whales — skimming, gulping, gunking, and grasping — by trying the techniques themselves. They skimmed tiny pepper flake "plankton" that were floating on the top of a bucket of water using their comb-and-toothbrush "baleen." A gulp of chicken and rice soup, with the broth pushed back out between the teeth, represented the gulping method of humpbacks. Gunking gray whale cups dove to the bottom of a bucket to scoop up sand and gummy worms. The Primaries pretended to be orcas catching salmon as they grasped Swedish Fish using only their mouths — no pectoral fins.

The kids are completely engaged and attentive during lessons such as these. This heightened level of attention contributes to greater retention of information, which in

*Social mammals and smart birds are intrinsically programmed to play. We're all familiar with puppies tussling, cats pouncing on toys, and baby apes swinging from branch to branch. But ravens also roll and slide down snowy slopes, seemingly just for the fun of it. And playful relationships between species occur: there is fascinating footage of a sled dog and a hungry polar bear coming into contact. The dog displayed canine play signals and the polar bear accepted his invitation. For a week the polar bear returned to visit this dog for a daily play date. Despite the bear's hunger, the desire to play was greater than the desire to eat.*

Stuart Brown defines different play personalities. A child is not exclusively one or another; these are just archetypal categories:

The Joker

The Kinesthete

The Explorer

The Competitor

The Director

The Collector

The Artist/Creator

The Storyteller

turn refines the free play. Now the gray whale can be seen gunking in the bottom of the Marine Research Tank, and the kids can be seen grasping for pretzels with their teeth during Snack, just like orcas.

“The genius of play is that, in playing, we create imaginative new cognitive combinations,” writes Stuart Brown. Imaginative play often begins with the child modeling what he/she sees, such as playing mommy and baby. Over time the child is introduced to new content through books, experiences, and peers, and can spin that information into amazingly creative story lines. A delightful example occurred during our study of the *Mayflower* voyage last fall. “Let’s play Church of England Tag,” Ollie called out to his classmates one day as he packed up his lunch. “King James is It, and if he tags someone, she’d have to say, ‘I love fancy things!’ until a Pilgrim tags her and says, ‘Tis a gift to be simple;’ then she could run again.” A new narrative was introduced and the kids worked it into the familiar structure of Tag, creating a completely novel reality. Leigh Wood, our P.E. teacher, helped Ollie refine the rules and extend the game to our whole class during her time with them.

What are the keys to crafting an invitation for students to engage in unstructured play based on the curriculum? We have found that doing what grown-up professionals do is a strong enticement. During our studies of the human body, we invited a parent into the classroom to tell us about his work as a cancer researcher. He was kind enough to bring real medical supplies — test tubes, cotton balls, bandages, a stethoscope, various chemical test strips and the like — and a classroom laboratory and medical clinic was quickly constructed. Another family lent us a wheelchair their daughter no longer required. Access to real tools and materials made the play irresistible; soon doctors were filling out lab charts of their patients’ symptoms and planning surgeries. Writing journals overflowed with real-life gory tales of trips to the hospital. During our *Mayflower* unit, the block area became the ‘tween decks of the ship, with a cardboard ceiling installed at an accurate 5.5 feet and supplies of pewter cups, dried food goods, and other period props. Peter ffitch, who now teaches grade 2–3 at Arbor, once led a merry band of



Dr. Torben, spinal surgeon

Will finds a quiet corner of the *Mayflower* to pen a journal of his voyage to the New World



Primary woodworkers in constructing a throne for Zeus to supplement play based on their new knowledge of Greek mythology. And no study of the Greeks at Arbor could now be complete without a culminating performance for parents of “The Golden Apple,” a play originally written by two Primaries grown and gone to college. An authentic audience for the fruits of those creative labors the children undertake on their own shows that we value their contributions and goes a long way toward encouraging further imaginative play.

Of course, every group of students is different. While the chance to set up a mock hospital seems to have universal appeal, other opportunities to play with the curricular content sometimes flop. A strong director with a grand vision of the possibilities is usually needed to gather a core group of players, and not every group of children has such a figure. And different

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topics hook different students; the backdrop of marine mammal research may strike a chord with one year's class of children, but fail to do so the next year. We don't force the issue if our Primaries opt for math games or marble chutes rather than togas or hardtack during our morning Choice periods. We simply look for the next opportunity to kindle the fires of play and watch as it transforms our classroom.

Observing children engaged in imaginative play always yields insights about the dynamics of group, too. Participation requires ingenuity, creativity, and tremendous amount of give and take among the players. How are new ideas shared and received? How can everyone's voice be heard? Is it okay if an individual takes the reins? When does leadership turn to bossiness? The rules are not pre-set, as in soccer or Four Square. They develop as the game evolves and morph in response to situations that arise as the game ensues. In order to play peacefully, the individuals need to share a base-level understanding of how to interact and openness to the input of others. Imaginative play provides an opportunity to anticipate unfolding events and determine the most appropriate actions in advance. It lets us practice improvising in unexpected situations.



At Arbor, we expect that children will use the skills built in play to solve problems — academic or social — with ever-increasing creativity, persistence, and poise.

There are many compelling reasons to guard the time given over to play at school. Play makes our brains work better. Physical activity wakes up our brains, releasing neurotransmitters that optimize the brain for learning. Play makes us less fidgety, reduces stress and anxiety, increases attention, and helps students achieve higher levels of performance. The focus, motivation, and brain stimulation that is so apparent while children are playing actually helps train their brains for learning.

Play brings people together, whether we're dancing, taking turns on the tire swing, painting a sign, or building boats. We learn how to take turns, merge ideas, solve problems, include others, meet new people, understand different

perspectives, empathize. Meanwhile, play nourishes imagination and innovation. Generating new, fresh ideas is invigorating and empowering and helps a child develop internal motivation, confidence, and a strong sense of self. Creating something completely new is why we refer to play as *recreation*. And now that you're done reading this article, go play. It's important!



ARBOR SCHOOL  
OF ARTS & SCIENCES

4201 SW Borland Road  
Tualatin, OR 97062

# Cambium

INNOVATIVE K-8 CURRICULUM FROM THE ARBOR SCHOOL OF ARTS & SCIENCES

THE ARBOR CENTER FOR TEACHING AT  
ARBOR SCHOOL OF ARTS & SCIENCES

**Arbor Director:** Kit Abel Hawkins  
**ACT Coordinator:** Annmarie Chesebro  
**Editor:** Sarah Pope  
**Design:** Mary Elliott  
**Photos:** Linus Rollman, Lori Pressman,  
Sarah Pope, Arbor archives

4201 SW Borland Rd.  
Tualatin, OR 97062  
503.638.6399  
[www.arborcenterforteaching.org](http://www.arborcenterforteaching.org)  
[cambium@arborschool.org](mailto:cambium@arborschool.org)

**Cambium:** (n) the cellular growth tissue of trees and other woody plants, from medieval Latin "change; exchange."

What content would you like to see offered in Cambium? Do you have ideas about how we can improve it? Send us an email: [cambium@arborschool.org](mailto:cambium@arborschool.org)

*Masthead by Jake Grant, after an 1890 botanical illustration.*

*The Arbor School of Arts & Sciences is a non-profit, independent elementary school serving grades K-8 on a 20-acre campus near Portland, OR. Low student-teacher ratios and mixed-age class groupings that keep children with the same teacher for two years support each child as an individual and foster a sense of belonging and community. An Arbor education means active engagement in learning, concrete experiences, and interdisciplinary work. For more information on the Arbor philosophy, please visit [www.arborschool.org](http://www.arborschool.org).*

*The Arbor Center for Teaching is a private, non-profit organization created to train teachers in the Arbor educational philosophy through a two-year apprenticeship while they earn MAT degrees and licenses, and to offer guidance to leaders of other independent schools. In 2007 its mission expanded to include the publication of material underpinning the Arbor School curriculum.*



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