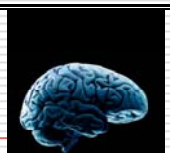
Slide 1

Who am I?

- Integrating physical activities with academic subjects for 23+ years in pre k-12 and university settings.
- Written numerous books on integrating academic subjects with physical activities.
- Currently writing curriculums, grants for schools/companies, presentations/trainings on this and many other topics.

Slide 2

Research



- To improve our brains, we have to move our bodies (Increases blood flow & oxygen to brain).
- Exercisers have improved short-term memory, exhibit faster reaction times & demonstrate higher levels of creativity.
- Music neuroscience research:
  - A steady beat affects attention behaviors in humans.
  - Music keeps students engaged in an activity for longer periods of time.

Slide 3

Research (Continued)

- We process musical beats in the premotor cortex of the brain, an area also related to attention (Bengtsson et al. 2008).
- Students are more engaged when listening to a steady beat than when listening to verbal only instructions.
- Therefore, listening to a steady beat pattern during activities in the classroom promotes better retention & increased engagement.

Slide 4

What Happened to our Rhythm?

- Primitive cultures had rhythmic games for their children.
- Native Hawaiian children have ADHD at only 20% of the rate of other children in Hawaii
- Amish children do not have ADHD
- 4x more boys have ADHD than girls
- Cultures without rhythm did not flourish
- Hawaiian children take hula lessons at early age
- Amish children have no video games or TV. Rhythmic activities include milking cows, churning butter, etc.
- Girls play hop-scotch, hula-hoop, patty-cake, jacks

http://www.adhdfree.com/main_rhythmicity.htm

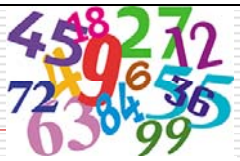
Slide 5

Math Activities

- When observing younger students at play, we see that they naturally engage in mathematical activities.
  - They sort, arrange, stack, organize & count toys.
  - They build & compare towers to see whose is the tallest.
  - They use color & shapes to create patterns, & notice patterns in their surroundings.

Slide 6

Math Activities (Continued)



- Once students gain a cardinal knowledge of numbers (i.e. when they know that the last number they count to [when counting a set of objects] tells “how many”) then they are able to reason about number tasks & problem solve.
- The games we will play today capitalize on this time of learning & curiosity.

6

Slide 7

Math Activities (Continued)

- The mathematics chosen for these games are based on recommendations from:
  - *National Council of Teachers of Mathematics*,
  - *National Association of Educators of Young Children*, and
  - Recommendations for preschool standards as developed at the *Conference on Standards for Prekindergarten and Kindergarten Mathematics Education*.

Slide 8

Math Activities (Continued)

- FUN developmentally appropriate activities
- Standards based
- No elimination
- Everyone participates/no waiting
- Include authentic assessments

Slide 9

Game 1: **Repeat Patterning**

- 6 volunteers
- Say pattern out loud w/students clapping (or pat knees, or combo: clap for big, pat knees on little)
- Student pick up ball (in correct sequence), performs locomotor task to 4th dome, places ball on dome, performs locomotor task back to line, sits at the back of the line
- Waiting students do fitness skill (count a loud)
- Get 1st ball, take to goal, perform task into goal, (retrieve ball from goal), bring back to line
- Waiting students do fitness skill (count a loud)

Slide 10

Game 1: Repeat Patterning

Assessment/modifications:

- Tell student to draw the pattern
- Draw pattern; # balls in consecutive order
- Predict the 10th ball
- Identify odd and even numbers
- Use other objects other than balls (bean bags, scarves)
- Use colors (shapes, transportation, etc.)
- Repeat patterning using 2 different objects (ball, beanbag, ball, beanbag, etc.)

Slide 11

Teaching the BRAIN to see patterns and sequences:

Standards – What we are supposed to teach
+
Meaning – Learning will not occur if standards are not meaningful
+
Patterns – Seeing patterns promotes higher level thinking

http://www.lodestarlearning.com/newsletter/HaenkeBrainBasedArticle.pdf

Slide 12

Patterns and the Brain

- Sensory stimuli enter the brain & neural networks check it out:
  - Match: the brain determines that the stimuli "makes sense" (has meaning)
  - No match:
    - Brain pays attention for awhile as new stimuli is novel information
    - If no sense made of stimuli brain will not process any further
    - Our job is to make "matches" thus creating patterns

Slide 13

Making Matches + Creating Patterns = Meaningful Learning

- Pose appropriate level of challenge
- Provide time for practice & give feedback
- Tap into students' needs & goals – connect to their lives
- Connect what is being taught to current events
- Provide choices to reduce stress & increase intrinsic motivation
- Tie into past success & experience

Slide 14

Game 2:How Many Ducks

- "Adams family"

(First stanza)

- How many ducks (clap, clap)
- How many ducks (clap, clap)
- How many ducks, how many ducks, how many ducks (clap, clap)

(Second stanza)

- How many baby ducks does mother, have following her in line?
- Quack, quack, quack, quack, quack, quack
- Let's count together & see (students count ducks & teacher keeps beat): 1, 2, 3, 4, 5, 6

(Third Stanza)

- How many ducks? SIX, SIX (clap while saying "six")
- How many ducks? SIX, SIX (clap while saying "six")
- How many ducks, how many ducks, how many ducks? SIX, SIX (clap while saying "six")

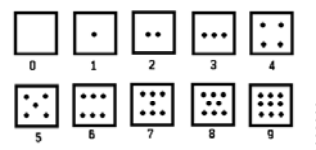
Slide 15

Game 2:How Many Ducks

- After 3rd stanza, student #1:
  - Performs locomotor skill to the 6th ball,
  - takes it,
  - performs locomotor skill to goal,
  - performs task to get ball into goal (throw, balance, roll, etc.),
  - performs locomotor skill back to line.
- Waiting students do fitness skill (push-ups, sit ups, jumping jacks, etc.) for # of reps there are baby ducks (i.e. 6 sit ups), counting out loud
- Continue counting down

Slide 16

Game 3: Numbers & Dots



- Each student gets a necklace (have multiple numbers/dots given d.a.p. i.e., if can only count to 5, w/20 students, need 4 sets of 1-5 numbers/dots).
- On start signal, students perform task.
- When music stops, students find matching number/dot partner as quickly as possible.
- Together, they collect that many balls & put in goal.
- Play multiple rounds & rotate necklaces

Slide 17

Game 3: Numbers & Dots

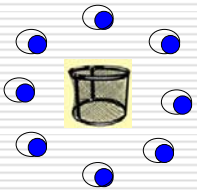
Modifications:

- Use a different color for each set (blue for 2, etc.)
- Time each round & see if students improve times.
- Increase/decrease numbers/dots sets.
- ***Ten Black Dots*** By Donald Crews is counting book that shows pictures that can be made with different numbers of dots.
- "What if?/I wonder?" Question: What can we make with black dots? What happens if we make a path with black dots? Where would it lead us? (use any number up to 100 polyspots (dots) and make a path for students to follow. How far could 20 black dots take you? 50? 100?

Slide 18

Game 4: Circle Chase

- Calculate math problem. If your # is called, foot dribble ball around outside of domes until reaching original position.



- Kick ball into goal (must stay in).
- Top = 3 pts; side = 1 pt
- Other students perform fitness activity. Count reps until all students shot ball. The # of reps is added to the kicking score.

Slide 19

Game 4: Circle Chase

Check This Out:

- Perform other skills while running, getting ball into goal, & fitness activities: lacrosse cradling, volleyball setting/bumping, slide, hop, skip, etc.

EASIER

- Walk around circle.
- Decrease radius around goal.

HARDER

- Award points for first goal (rather than everyone receiving a point for a successful shot).
- Increase radius around goal.
- Increase number to 3.
- Other computations.

Slide 20

Game 4: Circle Chase: Assessment
(use the numbers/concept used in the game)

2

(or write a word sentence with written odd/even numbers; or have students write a word sentence, etc.)

Directions: Glue your colored/cut pictures in the right section.

These are odd numbers

These are even numbers

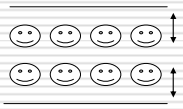
Slide 21

Learning Updates

- Physical activity stimulates body to create a hormone like Miracle-Gro for the brain.
- Hands-on explorations contributes to understanding of abstract concepts & 4 critical thinking skills: making distinctions, recognizing relationships, organizing systems & taking multiple perspectives.
- Exercise increases key proteins that build brain's infrastructure for learning & memory.

Slide 22

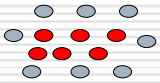
Game 5: Quick Math



- In partners, stand facing partner
- Pound closed fist into open hand stating "I love math!
- On "math" show 0-5 fingers.
- First to add (multiply, etc.) "wins" and runs away from partner trying to get to the safety line behind them before getting tagged by partner.
- Show fingers, teacher shows greater than or less than sign. If greater than is called partner with greater number chases other partner.

Slide 23

Game 6: Rounding off while slimming down



- What does rounding off a number mean? Round off 17 to the nearest multiple of 10. Let's put that concept to work as we shape up our bodies and minds.
- Partners stand on numbered polyspot
- On signal jog around inside area.
- On signal go to a polyspot, look under it to reveal a # card, remember #, go back to home polyspot.
- Add (multiply, etc.) the 2 numbers for a sum, round off the sum to nearest multiple of ten. Poartners look under polyspot to reveal fitness card & perform fitness exercise on card that # of reps.

Slide 24

Game 7: Macarena Multiplication

- Perform macarena dance steps to multiplication table.
- Instead of "hey macarena!" "Hey the 2's!" (or the multiplication table being used)
- Modification:
  - Try in a push up position!

Slide 25

Game 8: $5.00

- Group of 4, one is the thrower.
- Start with $.25 increments
- Each catch is worth that amount. If miss: continue, go back to 0, subtract $.25.
- Continue till reach $5.00 or 3 throws/change thrower
- Modifications
  - Start w/amount of money
  - First catch = $.25, second = $.50, etc.

Slide 26

Game 9: Bowling makes cents

- 10 pins per group of three students
- 1 bowler; 1 score keeper, 1 pin spotter
- Each bowling pin is marked with money values or percentages
- When we aim at a target, the brain in a split second calculates the path, the force, the angle of the roll/throw and distance it must travel to hit the target. That's a lot of problem solving! Math is a problem solving activity too. Let's use bowling to help us with our math skills.

Slide 27

Game 9: bowling (continued)

- Pins marked in dollars and cents.
- Add up the sum of pins knocked down for each student.
- Modification:
  - Play regular bowling with each pin marked as $1/10^{th}$. As a % of the whole, each student gets $1/10^{th}$ for each pin knocked over. A strike = 100%. The score sheet reflects the new scoring. Total score is in whole and decimals.

Slide 28

Game 10: Human Graphs

- Perform different exercises/sport skills for 30 seconds.
- Students time how many they do.
- Students line up one behind the other representing a line on the bar graph.
- Transfer the information to paper.

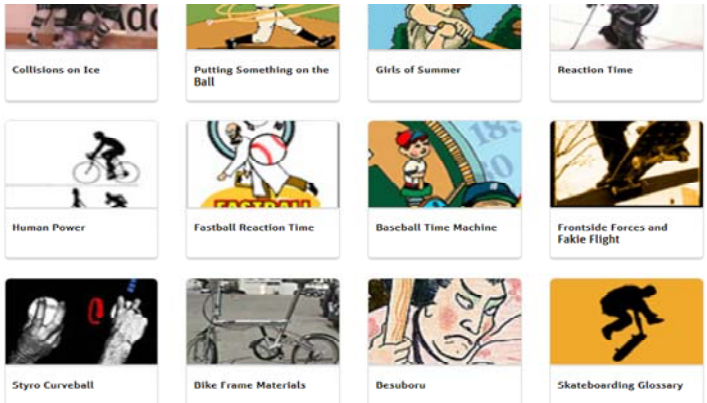
Slide 29

Game 11: Estimation

- Estimate how many of the following you can do in one minute:
  - Jumping jacks
  - Steps on a stepper
  - Jumps over a line
  - Laps back and forth
- Modifications: Partner activities
  - Throwing a ball
  - Sit/stands
  - Dish rag

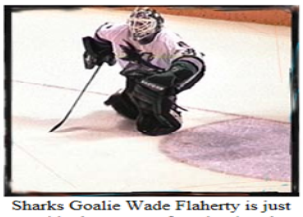
Slide 30

Game 12: Laws of physics labs http://www.exploratorium.edu/explore/staff_picks/sports_science



Slide 31

Just how fast is a goalie's reaction time?



Sharks Goalie Wade Flaherty is just outside the crease after clearing the puck down the ice.

Let's see what reaction time is required of Sharks Goalie Kelly Hrudey when an opposing player launches a speedy slapshot towards the net. If the opposing player has time to tee up and get solid wood on the puck, Hrudey could easily be facing a shot of up to 90 mph. The reaction time of the goalie can be calculated using the equation

$$\text{Time} = \frac{\text{distance}}{\text{rate}}$$

Describing motion is a part of mechanics known as *kinematics*. Physicists call this a kinematic equation.

If someone shoots from the blue line, a rather generous distance of 60 feet, the time it takes for the puck to travel to the net is

$$\text{Time} = \frac{d}{r} = \frac{60 \text{ ft}}{90 \text{ mph}}$$

Slide 32

To translate 90 mph into feet per second (5280 feet =1 mile/ 3600 seconds =1 hour), then
90 x 5280 = 475, 200 feet per hour.

$$\frac{475,200}{3600} = 132 \text{ feet per second} = 90 \text{ mph}$$

$$\frac{60 \text{ feet}}{132 \text{ feet per second}} = .456 \text{ seconds}$$

This doesn't allow very much time for the goalie to move himself and all that equipment over to save the puck. Try testing your own reaction time, for a better understanding of what a goalie has to do.

Lab to test own reaction time; etc.

Slide 33

Physics calculation labs

- Calculate the force (Newtons) of an 8lb bowling ball leaving the hand (accelerating) 5 miles per hour (show your work). _____
- Knowing Newton's 2nd law of acceleration, a heavier bowling ball will take more or less force to accelerate? _____

Slide 34

Physics calculation labs

- Calculate the force (Newtons) of an 8lb bowling ball leaving the hand (accelerating) 5 miles per hour (show your work). 8 X 5 = 40 NEWTONS
- Knowing Newton's 2nd law of acceleration, a heavier bowling ball will take more or less force to accelerate? MORE

Slide 35

Game 13: Fitness calculation labs

1. The method for establishing your personal target zone is given below. Work out your own target zone.
   a. Maximum heart rate X 70% = target heart rate zone.
   b. Maximum heart rate = 220 - your age.
   c. 220 - your age _____ = _____ (your maximum heart rate)
   d. Maximum heart rate _____ X .7 = _____ (your target heart rate zone)
2. What would your target heart rate zone be if you were 45 years old? Show your work and circle your answer.

Slide 36

Game 13: Fitness calculation labs

3. Compare your target heart rate you calculated with the average of 140. Is your threshold higher, lower or about the same?
4. Is the target heart rate for a 45 year old person higher, lower or about the same?
5. What conclusion can you draw about the target heart rate and increasing age?

Slide 37

Game 14: That's the way the Ball Bounces

Test 1: Ball Bounce Height Comparison

- The first time you drop the ball do not take a measurement, just watch where the ball goes so the next time the observer knows where to look. This help to greatly increase the accuracy of the experiment.
- Drop a ball from 1 foot off of the floor, slightly in front of a yardstick.
- Measure the height the ball reaches after the first bounce and record.
- Repeat this test from ½ ft, 2 ft, and 3 ft.
- Do this test for each ball and record data.
- You may have to try more than once to accurately judge the height of the first bounce.

Slide 38

Game 10: Ball Bounce Experiment

Ball	Trial 1			Trial 2			Trial 3			Average		
	½ ft	2 ft	3 ft	½ ft	2 ft	3 ft	½ ft	2 ft	3 ft	½ ft	2 ft	3 ft
Rubber												
Tennis												
Whiffle												
Golf												

Slide 39

Game 10: Ball Bounce Experiment

Test 2: Ball Bounce Time Comparison

- Drop a ball from a height of 3 ft, timing from when the ball is released until the ball stops bouncing. Record the time.
- Talk with the students about coming up with a system for releasing the ball and starting the stop watch. Possible suggestions are to have the same student drop the ball and start the watch, or have the two students count down from five.
- Repeat this test for each ball.

Slide 40

Game 10: Ball Bounce Experiment

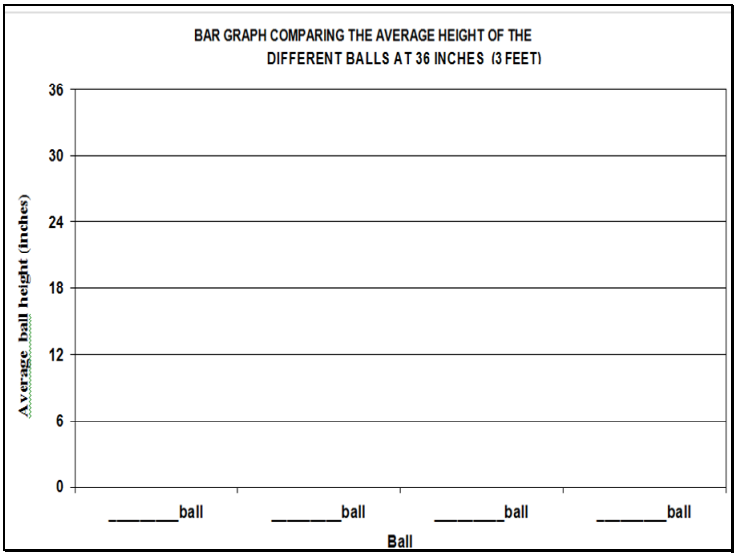
Type of ball	Trial 1	Trial 2	Trial 3	Average
Rubber				
Tennis				
Whiffle				
Golf				

Slide 41

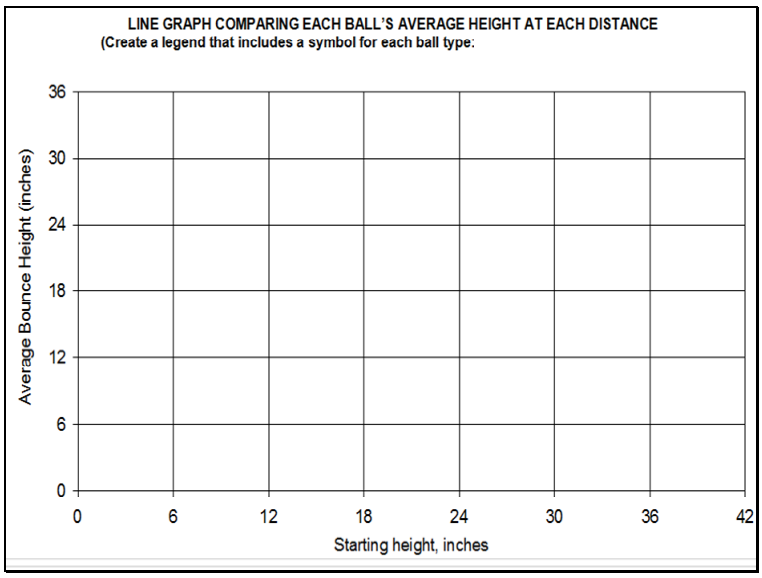
Game 10: Ball Bounce Experiment

- Graph results. (If this activity is not able to be accompanied by a math lesson on graphing, introduce the topic before the activity starts or perhaps after the class has recorded its data and worked through it as a group. You could also make this into a homework assignment where the students must use an Excel spread sheet and graphing techniques as part of the assignment).
- Compare results as a class. Collect data from all groups and have students create a class graph as a homework project.

Slide 42



Slide 43



Slide 44

Rubric for Performance Assessment					
Activity Title: Ball bounce experiment					
	1	2	3		
Criteria	Developing	Proficient	Advanced	Weight (X factor)	Subtotal
Data Collection	Missing some data and doesn't appear accurate.	Data may not be completely accurate.	All data is collected for each ball. Everything is accurate.		
Cooperation	No group work.	Little contribution to group work.	Contributes as expected to group work.		
Results	Graphs not complete.	Graphs not completely accurate and not labeled completely,	All graphs accurate and well presented.		
				Total:	
Teacher Comments:					

Slide 45

Game 10: Ball Bounce Experiment

- Description of different graph types (line, scatter, bar, pie). Nice example pictures. http://wwwslap.cern.ch/doc/NExS/html/node260.html
- Examples of graphs and how to use different types, and how to calculate mean, medium, mode. http://www.mathleague.com
- Allows children to create graphs and experiments with probability. http://nces.ed.gov/nceskids/Graphing/

Slide 46

Game 10: Ball Bounce Experiment

Additional questions:

- Explain how height effects a balls bounce.
- Does the height a ball bounces increase in proportion to the height it is dropped from?
  - Calculate the rebound rating: the ratio of height ball bounces *to*, divided by height ball dropped *from* (eg. rubber ball dropped from 50 inches, & bounced to 35": 35/50 = .7
  - That is, the ball rebounded 70% from a height of 50 inches.
  - Calculate the rebound rating for each of the 3 levels for each ball in experiment 1.

Slide 47

Game 10: Ball Bounce Experiment

	½ ft	2 ft	3 ft
Rubber			
Tennis			
Whiffle			
Golf			

After the calculations, explain if the height a ball bounces increase in proportion to the height it is dropped from. Use the percentage data above in your answer.

Slide 48

Game 4: Ball Bounce Experiment

Ball Bounce Experiment ANSWERS

- Explain how height effects a balls bounce in at least 3 sentences. A BALL DROPPED FROM A HIGHER DISTANCE BOUNCES HIGHER.
- Does the height a ball bounces increase in proportion to the height it is dropped from? CHECK THE CALCULATIONS AS ALL THE ANSWERS WILL BE DIFFERENT BASED ON THE DATA COLLECTED.
- After you performed the calculations above, explain if the height a ball bounces increase in proportion to the height it is dropped from. Use the percentage data above in your answer. YES, THE HEIGHT A BALL BOUNCES INCREASES IN PROPORTION TO THE HEIGHT IT IS DROPPED FROM. THE STUDENTS SHOULD HAVE INCLUDED THE PERCENTAGE DATA FROM THE CALCULATION ABOVE.

Slide 49

In Conclusion:

- Strong neural networks are built by incorporating physical activity into the school day.
- The brain creates patterns & we teach the brain to create patterns on a daily basis.
- Exercise itself doesn't make us smarter, instead exercise makes us more able to learn and focus.
- Physical activity is related to better cognitive health & effective functioning across the lifespan.

http://news.illinois.edu/news/06/1218exercise.html

Slide 50

Thanks!

Questions?

For Handouts/
Additional Questions:

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