PBS KIDS Odd Squad Case Study Research-based Mathematics Media and Outreach that Impacts Early Learners







Corporation for Public Broadcasting







Introductions

Welcome to Odd Squad!







Introductions

Ellen Doherty Executive Producer, Fred Rogers Productions

Tim McKeon Co-creator, Executive Producer, *Odd Squad*

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Jennifer Rodriguez, Ed.M. Director of Digital Learning, PBS KIDS





Mission and Goals

To improve mathematics achievement among young children in low-income communities by:

- Delivering engaging, story-driven, curriculum-based transmedia content in mathematics and literacy with built-in progress tracking;
- Conducting rigorous research on the efficacy of the content;
- Ensuring broad distribution and use of the content on multiple platforms through strategic national and local partnerships; and,
- Enriching and supporting the vital work of families, teachers, and community educators – linking home, school and out-of-school time.



Learning Ecosystem

Public Media in the Community





















Be the Agent! Camps







Learning Frameworks

Learning Frameworks

- Align to Common Core State Standards for Mathematics (K-2), including the Standards for Mathematical Practice
- Incorporate recent scientifically-based reading and math research on preschool children
- Provide a detailed breakdown of mathematics concepts and skills by age ranges for content producers
- Act as a checks and balances system for producers and for PBS
- Become the foundation of an integrated, multiplatform tracking system for parents and teachers





Ready To Learn

PBS KIDS Math Learning Framework

Numbers & Operations in Base Ten				Geometry & Spatial Sense				Measurement & Data				Algebr	aic 1g					
Numbers & Counting Operations			Geometry Spatial Sense			Measurement Data Collection & Analysis			nalysis									
Counting & Cardinality	Place Value & Grouping	Comparing Sets & Numerical Relations	Reading, Writing, & Representing Numbers	Operating with Numbers	Representing Operations	2D & 3D shapes	Shape Attributes	Composition & Decomposition	Position, Location, Direction	Understanding Maps	Spatial Visualizations & Transformations	Measureable Attributes (Length, Weight, Capacity, Temperature, Time, Money)	Estimation	Sorting & Classifying	Data Collection & Analysis	Graphing	Patterns	Algebraic Principles of Operations
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solve problems using numbers, including determining how many (in counting), how big and how much (in measurement and data). Key bases for developing number sense are subitizing of small numbers and later one-to-one counting to determine how many total objects. Additionally, children learn to read, write and represent numbers in various ways as they count and demonstrate cardinality. Grouping and Place Value are two of the most foundational concepts in mathematics. Grouping involves the big idea that smaller units can be combined to former a larger unit. Arranging items in groups and skip counting can provide an easier way to count collections. Place value involves grouping by ten smaller units to make a larger base ten unit, and provides a critical foundation for understanding addition and subtraction.

3 Year Olds	Pre-K and Kindergarten	Grades 1-2			
 -3 Year Olds Counting and Cardinality (total number in a set): Subitize—instantly and reliably recognize and label with an appropriate number word the cardinality (total) with collections of 1 to 3 items Verbally count by ones up to 10 Count in a one-to-one fashion to determine the cardinality of a presented collection of up to 5 objects (3 year olds) Match a collection of objects to a number word and label set (3s) Produce by counting or putting out 1 to 3 objects upon request ("Give me N") Place Value and Grouping: (2-3s are just beginning to learn 1-10. They don't understand place value at all.) Comparing sets and Numerical Relations: Identify which of two sets up to 4 has the same, greater than, or fewer items 	 Pre-K and Kindergarten Counting and Cardinality: Count in a one-to-one fashion to determine the cardinality of a presented collection of up to 10 haphazardly arranged objects (4 and 5 year olds) and up to 25 items in a row (6 year olds) Understands that the number of items is the same regardless of its arrangement or order in which they are counted (older 4 and 5s) Subitize (instantly see how many objects without counting) up to 5 objects (4s and 5s) Understands cardinality principle that the last number name said while counting is the total number of objects counted (5s) Count or put out 1 to 5 objects upon request ("Give me N") Count by ones up to 19 (4s), 29 (5s), 50 (6s) Count by twos to 20 (5s and 6s) Count by fives to 50 (5s and 6s) Count backwards by ones from 10 (5s and 6s) 	 Grades 1-2 Counting and Cardinality: Count by ones to 120 (Grade 1) and 1000 (Grade 2) Subitize scrambled arrangements up to 5 objects. Rely more on common arrangement of items or spatial patterns (like on a dice) to subitize numbers up to 10 (Grade 1) Count by twos, fives, tens to 100 (Grade 1) and 1000 (Grade 2) Count on by multiples of 10 (e.g., Start at 3 and count by 10 Use a number list or number line to visualize the positions of numbers relative to one another Place Value and Grouping: Can identify tens and ones digits in 10-99 (68= 60+8 or 10, 20, 30, 40, 50, 60, 61, 62, 63, 64, 65, 66, 67, 68) (Grade 1) Understand that three digits of a 3-digit number represent numbers of hundreds, tens, and ones (Grade 2) 			



Odd Squad's Approach to Mathematics

Math Advisor – Dr. Francis "Skip" Fennell

"Odd is the Problem, Math is the Solution"

- Problem Solving
- ✓ Reasoning
- ✓ Mathematical Understandings and Skills
- ✓ Teamwork
- ✓ Perseverance
- 🗸 Humor





Content

Become an Agent!



"Is Odd Squad real. If it is real can I see it. Can you send me a necktie for my suit. My birthday is April 16. I would like to get a birthday card from you. I watch your show every time it comes on. I love learning new things. Odd Squad is the best show. I know that 4 cups of water equal a quart and 4 quarts of water equal a gallon. I am homeschooled so shows like this are great to teach me new things."

Your Biggest Fan, Xavier





Become an Agent!







Become an Agent!











Math is fun & funny!



"Math isn't my son's favorite subject and sometimes struggles, so that's one reason I appreciate the show. It makes math fun!"

"My kids LOVE Odd squad! Kudos for equal gender & ethnically diverse characters, funny dialog & the power of math!"

Why family math?

Caring adults who are involved in their children's schooling can improve students academic achievement (Cheung and Pomerantz 2012; Jeynes 2003), social confidence and behavior (Fantuzzo, Davis, and Ginsburg 1995), and attendance (Epstein and Sheldon 2002).



Transmedia Product Overview







Transmedia Product Extensions











Suite B: Odd Squad / Skip Counting



EPS 110: The Trouble with Centigurps

Primary Math focus: Skip Counting by 2s, 5s and 10s to 100 **Mathematical Practices:** Problem Solving & Reasoning



















































Supporting Interstitials





Odd Squad Odd Report: Raining Cats and Dogs

Odd Squad "Needs You!" push to web





Related Digital Game







Be the Agent! Activity

THE CASE OF THE CENTIGURPS THAT KEEP ESCAPING

YOUR MISSION:

Calling Odd Squad! Those silly Centigurps have escaped again, and this time they've moved on from Headquarters and invaded your room! Agents will need to track them down, gather them up and use skip counting skills to be sure all 100 sneaky critters have been captured.

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LEARNING GOALS:

- Skip count by 2s, 5s and 10s.
- Count to a high number effectively (without having to count by ones).
- Reinforce addition and subtraction skills.

MATERIALS:

- Printable: <u>Centigurps Collection Boxes</u>
- Printable: Centigurps Counter
- 100 small colored pom-poms/fuzzy balls, plus a few extra
- A marker or crayon
- A plain manila folder to use as the case file. You can attach the <u>Odd Squad Seal</u> (included in this packet) to the front and put the activity pages inside.

PREPARATION

- Find the Odd Squad episode The Trouble with Centigurps (approx. 11 minutes) online at pbskids.org/learn/oddsquad/afterschool.
- Print the <u>Centigurps Collection Boxes</u> and place them on a table. Fill three of the 10s boxes with the pom-poms (10 in each; 30 total).
- Print/assemble the <u>Centigurps Counter</u> and color the bar up to the 30 mark. Hang it on a wall
 or place it on the table with the <u>Centigurps Collection Boxes</u>.
- Hide the remaining 70 pom-poms around the room, near items that are the same color, if possible. They can be placed in clusters.
- Prepare your case file.



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Be the Agent! Camp







Research

Why "this" work is important...

Young children have remarkable abilities to learn substantial mathematics, yet many adults underestimate what children know and can learn in mathematics as they enter formal educational settings in preschool or kindergarten (Clarke, Cheeseman, and Clarke 2006; Seo and Ginsburg 2004; Young-Loveridge 1989).

The importance of starting children strong in mathematics cannot be overstated. A set of landmark studies found that children's early mathematical knowledge (about age 5) is one of the best predictors of later success in mathematics (Claessens, Duncan, and Engel 2009; Claessens and Engel 2013; Duncan et al. 2007). Additionally, it has been shown that students from low-income communities consistently under-perform in mathematics compared to their middle-income peers in elementary, middle, and high school (NCES, 2011; Rosenquist, Henrick, & Smith, 2015). As technologies and educational digital media become more available to schools serving low-income families, educators are exploring how digital tools and resources can support mathematics learning.





Summative Research - Design

ODD SQUAD CASE #1: PATTERNS



CASE AT-A-GLANCE (SUGGESTED PACING GUIDE)

Day	Classroom Component	At Home Component
Day 1	Agent Briefing – Full Episode (10 mins) Dance Like Nobody's Watching	
Day 2	Online Game – Computers or Tablets (20 mins) <i>Code Breaker</i>	At Home Case – Full Episode (10 mins) & Parent Co-Viewing Activity (15 mins) Totally Odd Squad
Day 3	Agent Training Video – Short Video (2 mins) Training Video #1624: How to Deal with a Spider-Cat Bite	At Home Case – Full Episode (10 mins) & Parent Co-Viewing Activity (15 mins) A Case of the Sing-Alongs
Day 4	Agent Activity – Hands-on Activity (30 mins) <i>Patternista</i>	

Source: https://www.wested.org/resources/odd-squad-math-pbs/





Summative Research - Design

Table 2. List of Odd Squad transmedia resources and activities included in Odd Squad Math.

	Case 1: Patterns	Case 2: Skip Counting & Fact Families		
Odd Squad Episodes	Dance Like Nobody's Watching Totally Odd Squad* A Case of the Sing-Alongs*	The Trouble with Centigurps Picture Day* O Games, Part 1* O Games, Part 2*		
Interstitials (Short Videos)	Training Video: How to Deal with a Spider-Cat Bite	Odd Report: Raining Cats and Dogs Odd Report: Giant Sighting		
Online Games	Code Breaker	Catch the Centigurps		
Activities	The Patternista	Fact Families The Case of the Centigurps Odd Squad Hundreds Chart Odd Squad Number Line		

Source: https://www.wested.org/resources/odd-squad-math-pbs/





Summative Research - Results

• Students were very motivated and worked hard to solve the math problems.

Table 3. Gains in students' early mathematical knowledge.

Measure	N	Mean (SD) Pre	Mean (SD) Post	t	df	p-value
Knowledge of mathematics in the domains of Numbers and Operations and Algebraic Thinking (overall)	83	42.80 (12.03)	48.70 (11.33)	-8.78	82	<.001
Skip counting	83	10.92 (4.15)	13.61 (4.59)	-7.40	82	<.001
Pattern recognition	83	9.49 (2.43)	10.12 (1.90)	-3.26	82	.002
Simple addition and subtraction	83	18.72 (7.09)	20.95 (6.17)	-5.07	82	<.001



Summative Research - Results

Table 4. Changes in students' mathematical vocabulary.

Vocabulary	Incorre	ect (%)	Partia	lly (%)	Corre		
Word	Pre	Post	Pre	Post	Pre	Post	p-value
Pattern	50.6%	34.9%	10.8%	24.1%	38.6%	41.0%	0.037
Conjecture	100.0%	92.8%	-	6.0%	-	1.2%	0.044
Sphere	84.3%	42.2%	7.2%	27.7%	8.4%	30.1%	<0.001
Rearrange	96.4%	78.3%	-	-	3.6%	21.7%	<0.001
Fact families	100.0%	88.0%	-	8.4%	-	3.6%	0.005

Source: https://www.wested.org/resources/odd-squad-math-pbs/





