PRESCHOOL TEACHERS' MATH TALK: EFFECTIVE MATH DOMAINS, SYNTAX & PURPOSE

SUDHA SWAMINATHAN

JEFFREY TRAWICK-SMITH

JULIA DELAPP

CENTER FOR EARLY CHILDHOOD EDUCATION

EASTERN CONNECTICUT STATE UNIVERSITY

Center for Early Childhood Education

THE CENTER for Early Childhood Education

CECE Mission

- Conduct research
- Disseminate research findings
- Support teacher educators and others who prepare current and future teachers and providers
- Provide traditional and video-based professional development

Video Clip Library for Faculty and Trainers

The library contains a collection of video clips that were selected to provide opportunities for awareness and reflection in a class, training, or coaching session. Clips contain categories and tags that can assist in narrowing down the list based on age, setting type, developmental domain and/or content area.

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Four Crackers (0:45) - Clip #1337

A teacher gives a plate of crackers to a preschooler at snack time and tells him to take four. The child places four crackers on his napkin and counts out loud. The teacher then instructs another child to take four crackers.

TAGS

Counting | One-to-One Correspondence

Child Counting Pots (0:20) - Clip #1334

A teacher listens to a preschooler as she counts several flower pots in the classroom. The child skips some numbers and some pots as she counts.

TAGS

Counting | Sensory | Memory | One-to-One Correspondence

SEARCH

TYPE HERE TO SEARCH VIDEOS

TAGS

SELECT TAG

CLEAR SEARCH

CATEGORIES

SETTING

- Center (54)
- Home (10)

AGE

- Infants (0)
- Toddlers (15)
- Preschool (50)
- Kindergarten (1)

DEVELOPMENTAL DOMAINS

- COGNITIVE DEVELOPMENT (50)
- - Logic and Reasoning (35)
- - Executive Function (26)
- LANGUAGE DEVELOPMENT (41)
- - Receptive Language (24)

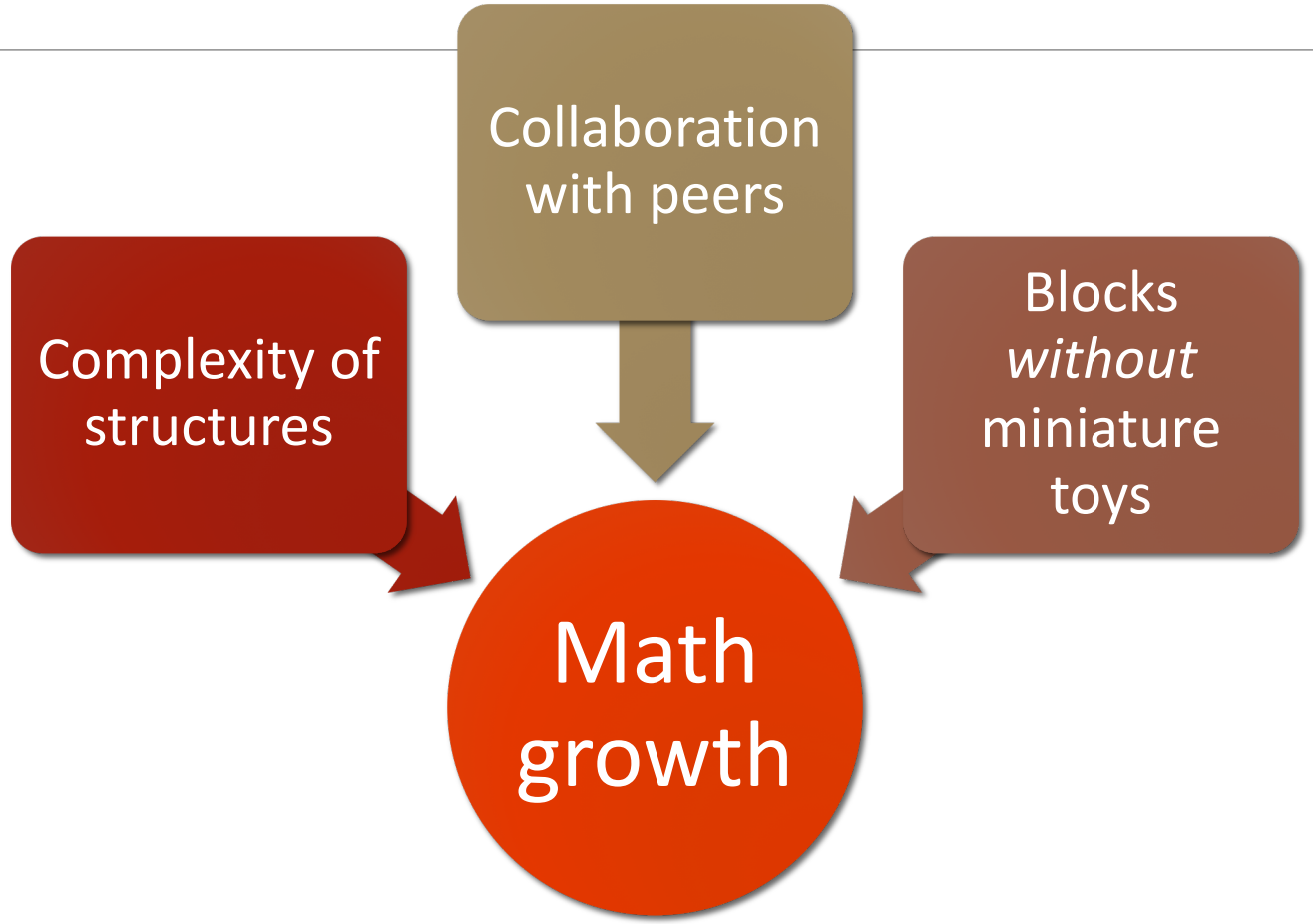
CECE Math-Play Studies

2010 TO 2018

Over-Arching Goal

- To discern if teachers can guide mathematical thinking in children without interfering in their play.
- To determine the teacher-child interactions that support both Math and play.

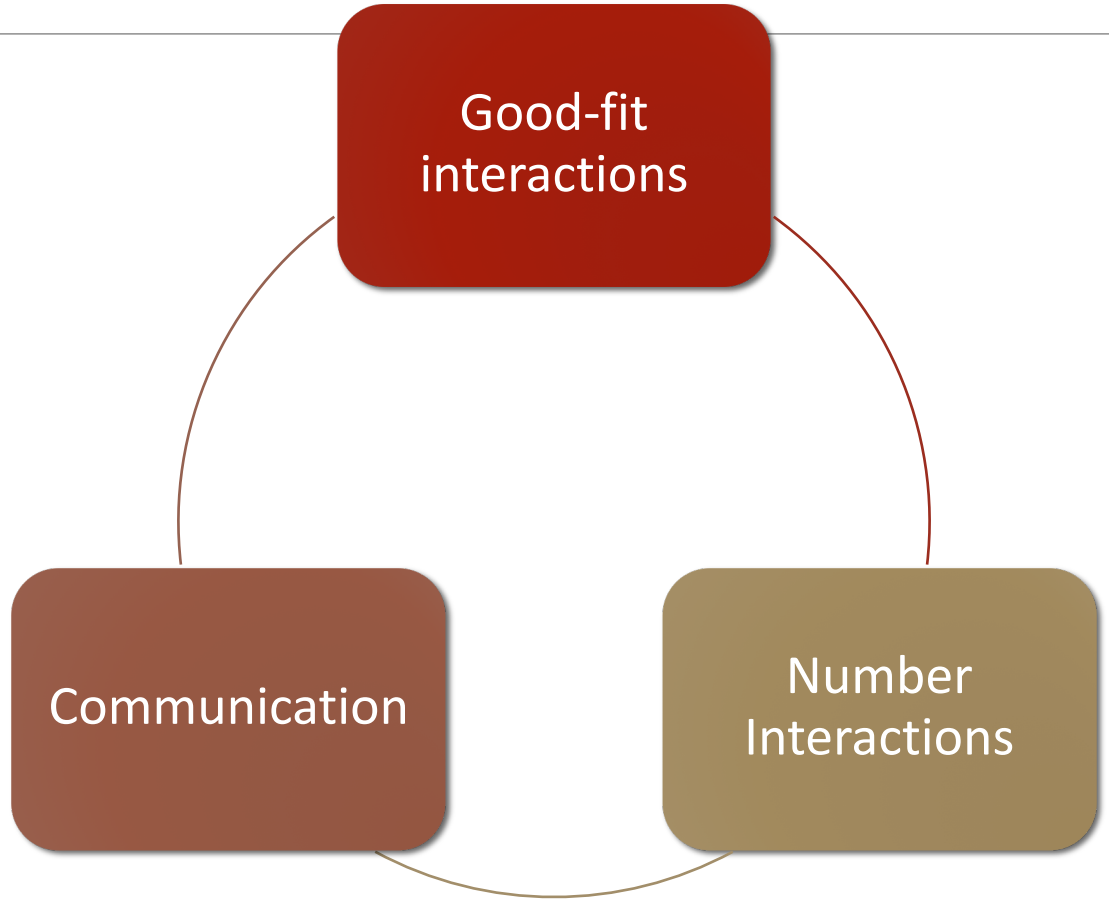
Study 1: Block Play



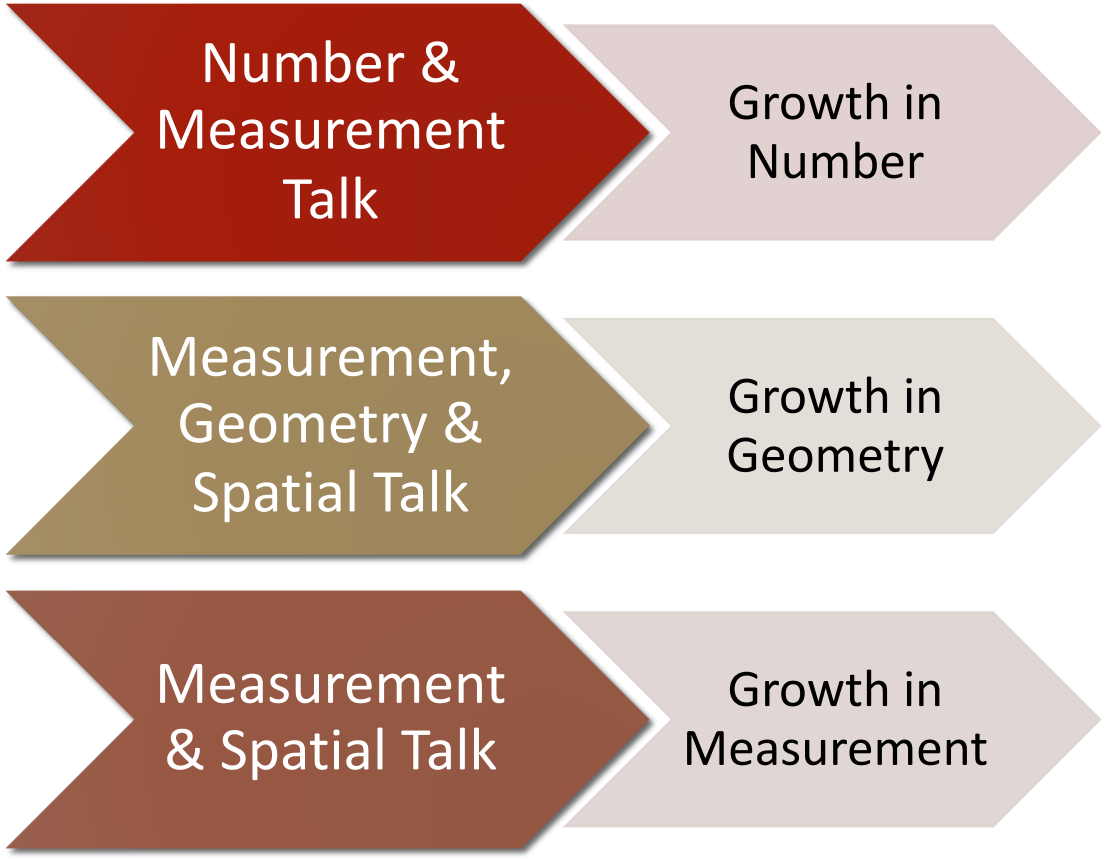
Study 2: Teachers' Natural Guidance During Play

1. Fit	2. Content	3. Process
• Good-fit • Poor-fit	• Number • Geometry • Measurement	• Problem-solving • Reasoning • Communication

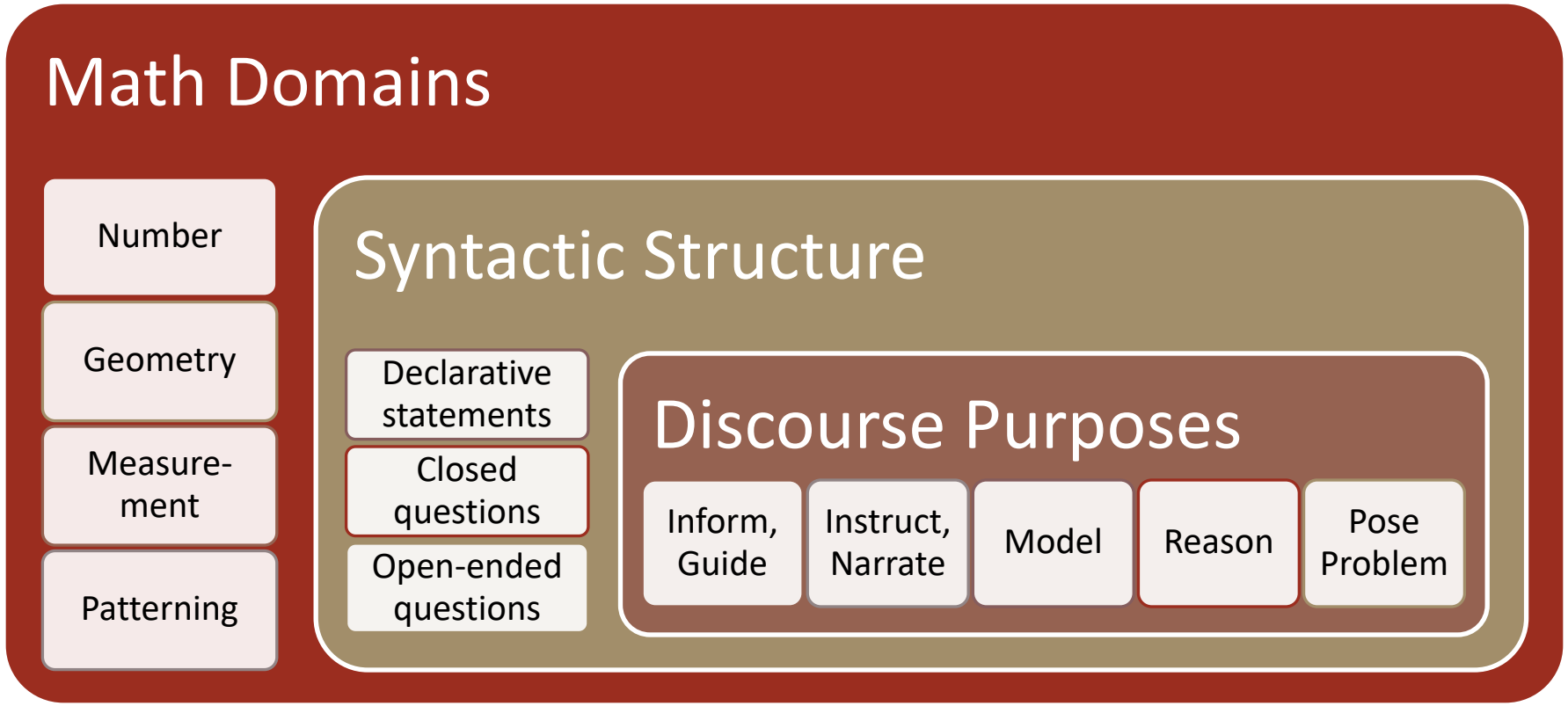
Study 3: Impact on Math Learning



Study 4: Impact of Math-Talk PD



Study 5: What & How of Teachers' Math-Talk



Study 6: Effective Domains, Syntax & Purpose

Objective 1:

Determine the most effective math domain for math-talk

Objective 2:

Determine the most effective syntax

Objective 3:

Determine the most effective purpose

Methodology

Participants: Preschoolers

40 children

3 to 5 years of age

50% female

7% with identified special needs

55% of moderate to high need

45% Euro-American, 50% Latino

4% African American

1% Asian/Indian

Other Participants

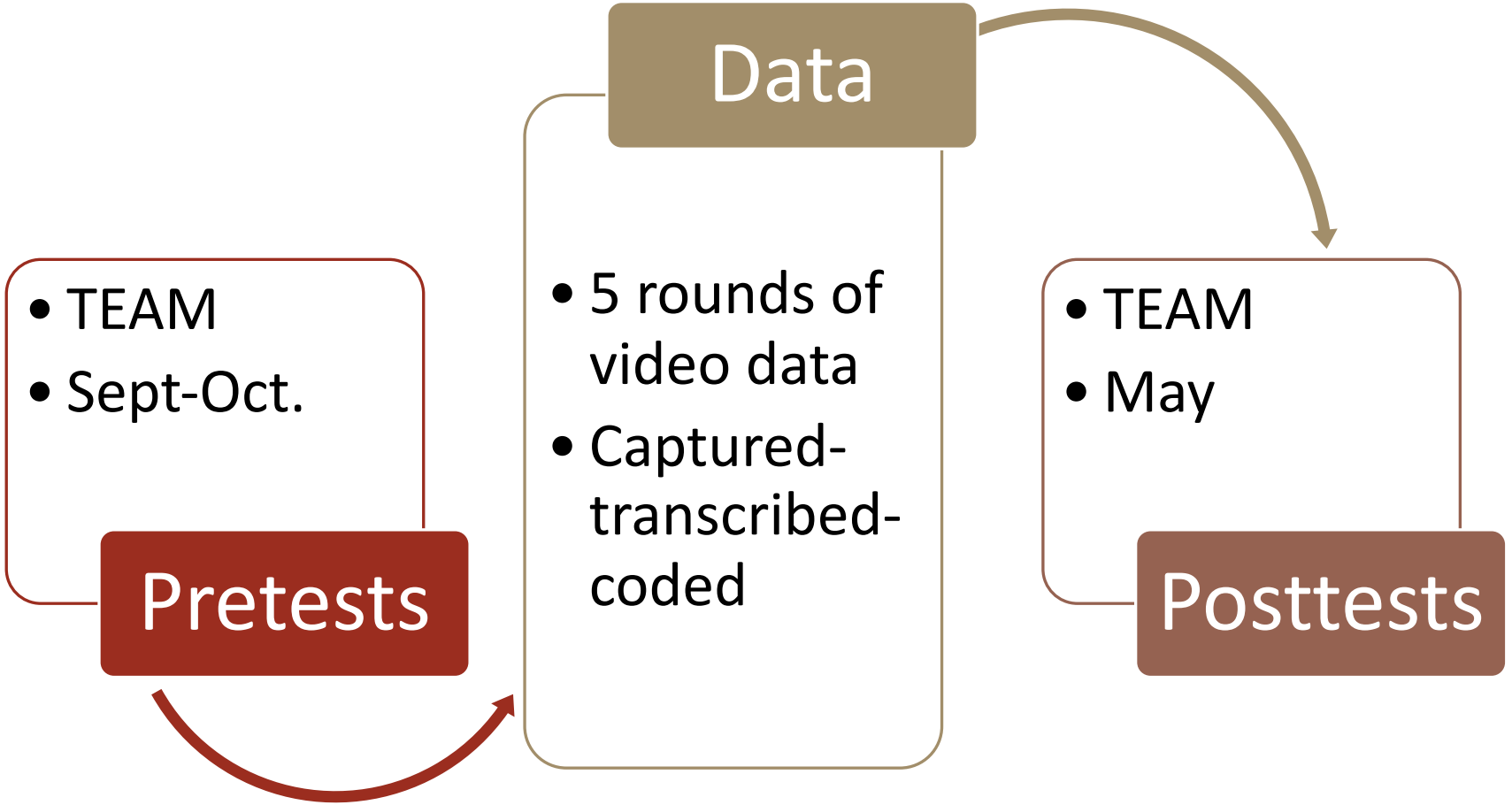
Teachers

- 4 classrooms with each a head teacher, assistant teachers and an associate teacher
- Educational background included master's and bachelor's degrees and several years of teaching experience.

Researchers

- Two early childhood education researchers
- 4 undergraduate research assistants

Procedures


Pretests
• TEAM
• Sept-Oct.
Data
• 5 rounds of video data
• Captured-transcribed-coded
Posttests
• TEAM
• May

Math Talk Coding Instrument

Math Talk Coding Instrument (sample)

File Name: Spencer16/Round 1/Teal Room/T1/T1a Classroom: Teal

Transcriber: Stefanie Coder: Sarah Date:

Time 07;14 ;54;0 3	**Num Domain** N-sym N-cpres N-abs N-card N-ord N-comb **# of Objects:**	**Geo. Domain** G-spatial G-shapeid G-composition G-attributes G-tranform	**Meas Domain** M-measob M-compare M-order	**Patterns** P-ident P-create P-contin	**Syntax** S-declar S-closedques S-openques	**Purpose** T-inform T-Guiding T-Instruct T-Narrate T-Reasoning T-Pose closed T-Pose Open T-Model	**Effect on Play** Unob Intrus	**Transcript**: "My friends, all three of us can use it, right?"
Time 09;34 ;08;0 2	**Num Domain** N-sym N-cpres N-abs N-card N-ord N-comb **# of Objects:**	**Geo. Domain** G-spatial G-shapeid G-composition G-attributes G-tranform	**Meas Domain** M-measob M-compare M-order	**Patterns** P-ident P-create P-contin	**Syntax** S-declar S-closedques S-openques	**Purpose** T-inform T-Guiding T-Instruct T-Narrate T-Reasoning T-Pose closed T-Pose	**Effect on Play** Unob Intrus	**Transcript**: What other shapes will fit that space?

Math Domains and Sub-Categories

Domains	Number (Num)	Geometry (Geo)	Measurement (Meas)	Patterns (Pat)
Sub-categories	Symbol	Spatial location	Measuring object	Identify a pattern
	Counting objects present	Shape identification	Comparing measurements	Create a pattern
	Abstract counting	Shape composition	Ordering by measurement	Continue a pattern
	Cardinality	Shape attributes		
	Ordinality	Transformation		
	Combination			
	# of objects			

Syntax, Purpose, Effect on Play

Syntax	Purpose	Effect on Play
Declarative statements	Informing	Unobstrusive
Closed Questions	Guiding	Instrusive
Open-ended Questions	Instructing	
	Narrating	
	Reasoning	
	Posing closed problem	
	Posing open problem	
	Modeling	

Math Talk Coding Instrument

Math Talk Coding Instrument (sample)

File Name: Spencer16/Round 1/Teal Room/T1/T1a Classroom: Teal

Transcriber: Stefanie Coder: Sarah Date:

Time 07;14;54;03	**Num Domain** N-sym N-cpres N-abs N-card N-ord N-comb **# of Objects:**	**Geo. Domain** G-spatial G-shapeid G-composition G-attributes G-tranform	**Meas Domain** M-measob M-compare M-order	**Patterns** P-ident P-create P-contin	**Syntax** S-declar S-closedques S-openques	**Purpose** T-inform T-Guiding T-Instruct T-Narrate T-Reasoning T-Pose closed T-Pose Open T-Model	**Effect on Play** Unob Intrus	**Transcript:** "My friends, all three of us can use it, right?"
Time 09;34;08;02	**Num Domain** N-sym N-cpres N-abs N-card N-ord N-comb **# of Objects:**	**Geo. Domain** G-spatial G-shapeid G-composition G-attributes G-tranform	**Meas Domain** M-measob M-compare M-order	**Patterns** P-ident P-create P-contin	**Syntax** S-declar S-closedques S-openques	**Purpose** T-inform T-Guiding T-Instruct T-Narrate T-Reasoning T-Pose closed T-Pose	**Effect on Play** Unob Intrus	**Transcript:** What other shapes will fit that space?

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Data and Data Analysis

DATA

7957 codes

Reliability of coding established close to 100%

DATA ANALYSIS

Hierarchical multiple regression analysis

Dependent variable: Post-test TEAM scores

Independent variables:

1. Frequency of math-talk categories
2. Pretest
3. Age
4. SES
5. Gender

Results

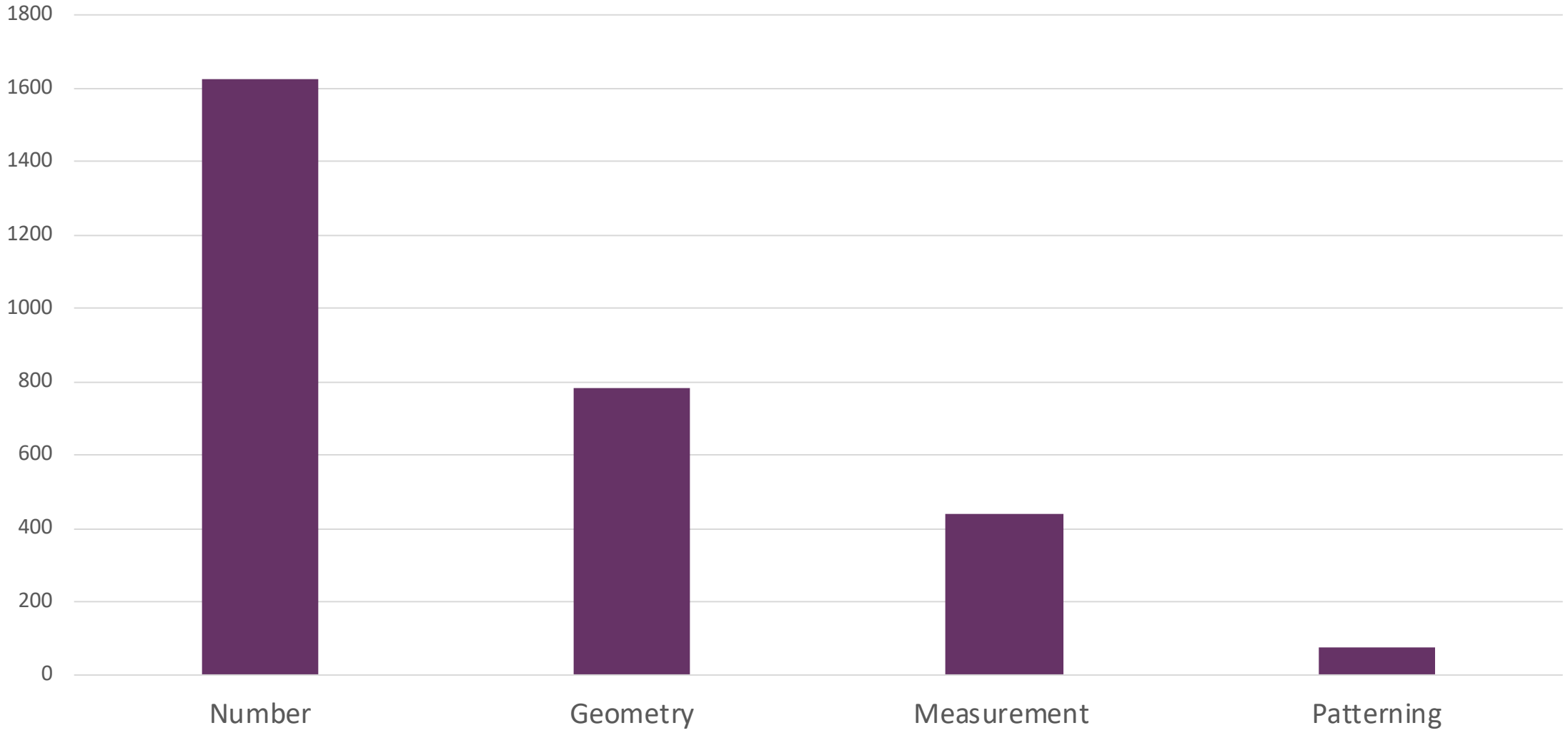
Model 1: Age, SES, Gender & Pretest

Independent Variable	B	Std. Error	Beta	t	Sig.
Age	5.76	3.44	.22	1.68	.10
SES	1.83	1.71	.11	1.07	.29
Gender	3.34	3.17	-.12	-1.06	.30
Pretest Scores	.79	.16	.63	4.81	.00*

Model 2: Math Sub-categories

Independent Variable	B	Std. Error	Beta	t	Sig.
Abstract Counting	.79	.14	.32	5.77	.00*
Cardinality	.11	.06	.11	1.72	.05*
Ordinality	.16	.05	.04	3.18	.01*
Attributes	.30	.09	.16	3.54	.00*

Frequency of Math Domains



Model 3: Syntax

Independent Variable	B	Std. Error	Beta	t	Sig.
Closed Question	-.06	.10	-.06	-.61	.55
Declarative Statement	.03	.06	.04	.45	.66
Open-Ended Question	.77	.11	.50	6.98	.00*

Model 4: Purpose

Independent Variable	B	Std. Error	Beta	t	Sig.
Informing	.05	.12	.03	.42	.68
Instructing	.00	.25	.00	.01	.99
Modeling	.43	.23	.19	1.89	.04*
Narrating	-.11	.28	-.03	-.38	.71
Posing a Closed Problem	-.22	.12	-.15	-1.79	.09
Posing an Open Problem	.69	.15	.43	4.61	.00*
Reasoning	-.11	.18	-.04	-.62	.54

Implications

1. What we say (not how often) does matter
2. Talk about deeper concepts
3. Pose open-ended questions/problems

Why did we study math in PLAY?

Percentage of preschool day devoted to play: 64% (Fuligni et al., 2012)

Play involves mathematical thinking (Sarama & Clements, 2009; Ginsberg, 2006).

- ***Blocks*** (Hanline, 2010a; Wolfgang et al., 2001; Trawick-Smith et al., 2016)
- ***Construction toys*** (Wolfgang et al., 2003)
- ***Pretend play*** (Hanline, 2010b)
- ***Board games*** (Ramani & Siegler, 2008; Siegler & Ramani, 2009; Stebler et al., 2013)
- ***Water play*** (Trawick-Smith et al., 2014)
- ***Puzzles*** (Levine et al., 2012)

Play Pedagogy: Three Perspectives

Enhancing Play	• Play, by itself, promotes development in many domains.
Enhancing Academic Content through Play	• "Good-fit" teacher-child interactions, including rich conversations about math, promote a deeper understanding of math concepts. but also apply them.
Specific play activities support Math learning	• Block Play, Water Play • Puzzles, Pretend Play, Board Games

Challenging Math Talk in Play

NOT AS CHALLENGING

- Let's count the blocks, 1, 2, 3…
- What shape is this?

MORE CHALLENGING

(ENGEL, CLAESSONS, & FINCH, 2013)

- How many blocks do you have? How do you know you have 7?
- How many tickets do you need for your family?
- Why is this a triangle?
- What other shapes would fit here?

Contact

Sudha Swaminathan: swaminathans@easternct.edu
Jeffrey Trawick-Smith: trawick@easternct.edu
Julia DeLapp: delappj@easternct.edu

Videos/research briefs: www.easternct.edu/cece

THE CENTER for Early Childhood Education

Supporting Early Mathematical Development

From a very early age, children are naturally interested in exploring size, shapes, and quantities. Preschoolers begin to count, sort materials by different characteristics, and recognize shapes. These

SUPPORTING MATHEMATICAL DEVELOPMENT IN YOUNG CHILDREN (SERIES)

These videos describe children's early mathematical development and provide examples of how adults can explicitly teach math skills and support their development through daily routines and play. Math areas covered include:

- Counting (3:57)
- One-to-one correspondence (4:08)
- Cardinality (4:42)
- Recognition of quantity (3:49)
- Comparison (3:51)
- Number operations (4:35)
- Measurement (5:30)
- Data (4:37)
- Geometry (5:15)

SEE MORE→

USING MATH TALK WITH PRESCHOOLERS TO SUPPORT LEARNING (5:17)

While many preschool classrooms use explicit, teacher-directed activities to help children develop basic math skills, recent research from the Center shows that a lot of math learning occurs within the context of classroom play, especially when teachers are talking with children about how to solve problems involving number. In this *e-clip* video, Dr. Sudha Swaminathan and Dr. Jeffrey Trawick-Smith discuss the importance of talking with children about numbers and encouraging them to explain their mathematical processes. When teachers and children engage in regular conversations about quantities, measurement, and size, children will gain mathematical and general cognitive skills.

SEE MORE→

INCORPORATING MATH INTO GROSS MOT

In this "Reflection from the Field," pPrescho activity in an obstacle course using toy tru prepare her students for kindergarten, she sorting skills while incorporating gross mo she expresses how an activity similar to th fun and creative ways.

SEE MORE→

THE RELATIONSHIP OF TEACHER-CHILD INTERACTIONS IN PRESCHOOL PLAY TO YOUNG CHILDREN'S MATHEMATICAL ABILITIES (11:02)

Math ability in preschool is one of the best predictors of later school success–research suggests it is a better predictor than early literacy skills. While many studies have found strong relationships between young children's play and literacy, studies of teacher interactions in play and mathematics learning have not been conducted. This edition of "Research Clips" describes findings from a study aimed at identifying classroom interventions in play that are associated with math achievement in three- and four-year-olds. The findings indicate that how teachers interact with and communicate with children while they play has powerful impacts on children's mathematical learning.

SEE MORE→