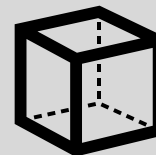
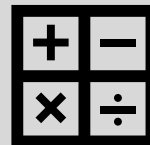
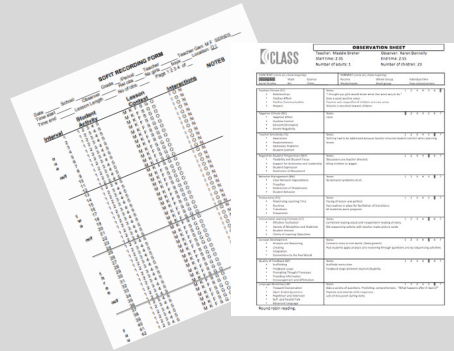


Observational Coding Methods Applied to Child Play Behavior

Lindsey M. Bryant, Ph.D.
Advanced Methods at Purdue
August 19th, 2022



Overview



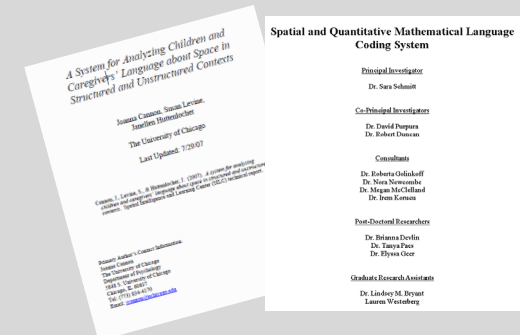
Part 1: Introduction to Observational Methods

- Observational Coding - General
- Methodological Challenges and Considerations
- Theoretical Considerations
- Courses and Resources



Part 2: Applied Examples and Conclusions/Questions

- The Great Recess Framework
- Spatial and Mathematical Language Coding System
- Conclusions
- Questions



Observational Coding

- Utility
- Types
- Coding System Approaches

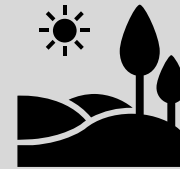
Observational Coding

Utility: Why use observational coding?

- Context
- Rich data

Types of Observational Coding

- Contemporaneous
 - Pros
 - Naturalistic settings
 - Less time intensive



Observational Coding

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 - Cons
 - Missing events
 - Coding system must be established



Observational Coding

Utility: Why use observational coding?

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- Rich data

Types of Observational Coding

- Contemporaneous
 - Pros
 - Naturalistic settings
 - Less time intensive
 - Cons
 - Missing events
 - Coding system must be established
- Examples
 - Classroom Assessment Scoring System® (CLASS)
 - Early Childhood Environment Rating Scale®, Revised (ECERS-R)
 - System for Observing Fitness Instruction Time ([SOFIT Protocol](#))



CLASS		OBSERVATION SHEET						
Teacher: Maddie Dreher		Observer: Karen Donnelly						
Start time: 2:35		End time: 2:55						
Number of adults: 1		Number of children: 23						
CONTENT (check all that report)	FORMAT (check all that report)							
Subject Area Math Science Other Social Studies Art	Format (check all that report) Routine Math/Topics Whole Group Individual time Free Group/centers Small group							
Positive Climate (PC) • Relationship • Positive Affect • Positive Communication • Respect	Notes "I thought you girls would know what that word would be." Took a quiet positive voice. Teacher acts respectful of children and vice versa. Maddie is very kind toward children.	1	2	3	4	5	6	7
Negative Climate (NC) • Negative Affect • Punitive Control • Sarcastic/Derogatory • Severe Negativity	Notes None.	1	2	3	4	5	6	7
Teacher Sensitivity (TS) • Awareness • Responsiveness • Address Problems • Student Comfort	Notes Nothing had to be addressed because teacher ensured student comfort when planning lesson.	1	2	3	4	5	6	7
 regard for Student Perspectives (SP) • Flexibility and Student Focus • Support for Autonomy and Leadership • Student Expression • Restriction of Movement	Notes Discussions are teacher directed. Allow children to wiggle.	1	2	3	4	5	6	7
Behavior Management (BM) • Clear Behavior Expectations • Proactive • Redirection of Misbehavior • Student Behavior	Notes No behavior problems at all.	1	2	3	4	5	6	7
Productivity (PO) • Maximizing Learning Time • Routine • Transitions • Preparation	Notes Pacing of lesson was perfect. Has routines in place for facilitation of transitions. All materials were prepared.	1	2	3	4	5	6	7
Instructional Learning Formats (IF) • Effective Facilitation • Variety of Modalities and Materials • Student Interest • Clarity of Learning Objectives	Notes Combined reading aloud and independent reading of story. Did sequencing activity with teacher-made picture cards.	1	2	3	4	5	6	7
Concept Development (CD) • Analysis and Reasoning • Challenging • Integration • Connections to the Real World	Notes Comments about the real world (seed growth) Had students apply analysis and sequencing through questions and by sequencing activities.	1	2	3	4	5	6	7
Quality of Feedback (QB) • Scaffolding • Feedback Loops • Prompting Thought Processes • Providing Information • Encouragement and Affirmation	Notes Scaffolds instruction. Feedback loops between teacher/students.	1	2	3	4	5	6	7
Language Use (LU) • Frequent Conversation • Open-Ended Questions • Repetition and Extension • Self- and Parallel Talk • Advanced Language	Notes Asks a variety of questions, Predicting, comprehension, "What happens after it rains?" Rewards and extends child responses. Lots of discussion during story.	1	2	3	4	5	6	7

RECORDING FORM

Period _____ Teacher _____ Teacher Gen: M F SERIES
 Rel obs ____ No girls ____ boys ____ Location: D1
 io of obs ____ Page T 2 3 4 of ____

Lesson Context Interactions NOTES

Context	Interactions	NOTES
K F S G O	I O N	
K F S G O	I O N	
K F S G O	I O N	
K F S G O	I O N	
K F S G O	I O N	
K F S G O	I O N	
K F S G O	I O N	
K F S G O	I O N	
K F S G O	I O N	
K F S G O	I O N	
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K F S G O	I O N	
K F S G O	I O N	
K F S G O	I O N	
K F S G O	I O N	
K F S G O	I O N	
K F S G O	I O N	

33	1 2 3 4 5	M K F S G O	I O N
34	1 2 3 4 5	M K F S G O	I O N
35	1 2 3 4 5	M K F S G O	I O N
36	1 2 3 4 5	M K F S G O	I O N
37	1 2 3 4 5	M K F S G O	I O N
38	1 2 3 4 5	M K F S G O	I O N
39	1 2 3 4 5	M K F S G O	I O N
40	1 2 3 4 5	M K F S G O	I O N
41	1 2 3 4 5	M K F S G O	I O N
42	1 2 3 4 5	M K F S G O	I O N

In-Person Coding

System for Observing Fitness Instruction Time (SOFIT)

9.4. Observation procedures

1. The target student is the major focus of the observation, however, place yourself in a position so you can also hear the teacher and observe what the class as a whole is doing. Be as inconspicuous as possible and do not interfere with class activities. Be prepared to relocate frequently.
2. Do not begin observations until the teacher is present.
3. Start the audio player/computer and begin observing when 51% of the students reach the instructional station (gymnasium or designated outdoor space) and the teacher is present. Enter the start time on the first cover page.
4. Data should be representative of the entire class period. Even in emergency situations (e.g., can't find the class), do not begin observations if the lesson has been underway for over five minutes.
5. Observe the student activity, lesson context, and interaction/involvement throughout the 10-second "**observe**" interval. Enter codes by entering the appropriate symbols during the 10-second "**record**" interval.
5. Code Student One for four consecutive minutes (12 observations). Then code Students Two, Three, and Four in sequence. Continue in this manner, rotating the focus on a different target student every four minutes until the lesson ends.
6. End observing when 51% of the students have departed the instructional area. Record end time on the cover page.
7. Cue the audio for the next lesson.

In-Person Coding

System for Observing Fitness Instruction Time (SOFIT)

Series #: The series number is used along with the ID and Seq # (described below) to uniquely identify a form. The series number identifies a new data collection visit. During the baseline measurement period, Series=01, 02, and 03 will be used to identify the first, second and third visits to the school, respectively.

Date: Enter numbers for Month (MM), Day (DD), and Year (YYYY)

Period: Enter the class period being observed at the school that day.

Grade: Enter the school grade of the class (enter median grade for combination classes).

Start Time: Enter time the lesson actually started (Use 24-hr clock; e.g., 13:30 is 1:30PM).

End Time: Enter time the lesson actually ended (Use 24-hr clock; e.g., 13:30 is 1:30PM).

No. girls/boys: At minute 16 (at the end of page 1) enter the total number of girls and boys participating in the lesson (students need not be physically active at that time). Do not include those enrolled in the class, but absent (e.g., in library or at home).

Listed above

Student activity: Identify the activity level of observed student at the "record" signal: **1**=lying down; **2**=sitting; **3**=standing; **4**=walking; **5**=vigorous.

Lesson context: Identify the lesson context occurring at the "record" signal: **M**=management; **K**= knowledge; **F**=fitness activity; **S**=skill drills; **G**=game play; **O**=Other (e.g., free play).

Interactions: Identify teacher verbal or nonverbal interactions to promote physical activity and fitness during the "observe" interval. **I**=in class; **O**=out of class; **N**=none.)

Comments: Write notes to describe the target student, lesson activities, or unusual events.

In-Person Coding

System for Observing Fitness Instruction Time (SOFIT)

SOFIT RECORDING FORM



Date _____ School _____ Grade _____ /Period _____ Teacher _____ Teacher Gen: M F SERIES _____
 Time start _____ Observer _____ Rel obs _____ No girls _____ boys _____ Location: O 1
 Time end _____ Lesson Length _____ No of obs. _____ Page 1 2 3 4 of _____

Interval	Student Activity	Lesson Context	Interactions	NOTES
1	1 2 3 4 5	M K F S G O	I O N	
2	1 2 3 4 5	M K F S G O	I O N	
3	1 2 3 4 5	M K F S G O	I O N	
o n e	4	1 2 3 4 5	M K F S G O	I O N
	5	1 2 3 4 5	M K F S G O	I O N
m/f	6	1 2 3 4 5	M K F S G O	I O N
	7	1 2 3 4 5	M K F S G O	I O N
8	1 2 3 4 5	M K F S G O	I O N	
	9	1 2 3 4 5	M K F S G O	I O N
10	1 2 3 4 5	M K F S G O	I O N	
	11	1 2 3 4 5	M K F S G O	I O N
12	1 2 3 4 5	M K F S G O	I O N	
13	1 2 3 4 5	M K F S G O	I O N	
	14	1 2 3 4 5	M K F S G O	I O N
t w o	15	1 2 3 4 5	M K F S G O	I O N
	16	1 2 3 4 5	M K F S G O	I O N
17	1 2 3 4 5	M K F S G O	I O N	
	18	1 2 3 4 5	M K F S G O	I O N
m/f	19	1 2 3 4 5	M K F S G O	I O N
	20	1 2 3 4 5	M K F S G O	I O N
21	1 2 3 4 5	M K F S G O	I O N	
	22	1 2 3 4 5	M K F S G O	I O N
23	1 2 3 4 5	M K F S G O	I O N	
	24	1 2 3 4 5	M K F S G O	I O N
25	1 2 3 4 5	M K F S G O	I O N	
	26	1 2 3 4 5	M K F S G O	I O N
t h r e e	27	1 2 3 4 5	M K F S G O	I O N
	28	1 2 3 4 5	M K F S G O	I O N
29	1 2 3 4 5	M K F S G O	I O N	
	30	1 2 3 4 5	M K F S G O	I O N
m/f	31	1 2 3 4 5	M K F S G O	I O N
	32	1 2 3 4 5	M K F S G O	I O N
33	1 2 3 4 5	M K F S G O	I O N	
	34	1 2 3 4 5	M K F S G O	I O N
35	1 2 3 4 5	M K F S G O	I O N	
	36	1 2 3 4 5	M K F S G O	I O N
37	1 2 3 4 5	M K F S G O	I O N	
	38	1 2 3 4 5	M K F S G O	I O N
f o u r	39	1 2 3 4 5	M K F S G O	I O N
	40	1 2 3 4 5	M K F S G O	I O N
41	1 2 3 4 5	M K F S G O	I O N	
	42	1 2 3 4 5	M K F S G O	I O N
43	1 2 3 4 5	M K F S G O	I O N	
	44	1 2 3 4 5	M K F S G O	I O N
m/f	45	1 2 3 4 5	M K F S G O	I O N
	46	1 2 3 4 5	M K F S G O	I O N
47	1 2 3 4 5	M K F S G O	I O N	
	48	1 2 3 4 5	M K F S G O	I O N
SUM				



Retroactive Coding

Types of Observational Coding

- Retroactive
 - Pros
 - Luxury of deciding what your coding system can look like
 - Training
 - Cons
 - Time intensive 
 - Technology Issues 
 - IRB Approval
 - Examples
 - Micro-level coding (microanalytic/micro-genetic)
 - [Dyadic Interactions in Children Exhibiting the Broader Autism Phenotype](#)
 - A System for Analyzing Children and Caregivers' Language about Space in Structured and Unstructured Contexts



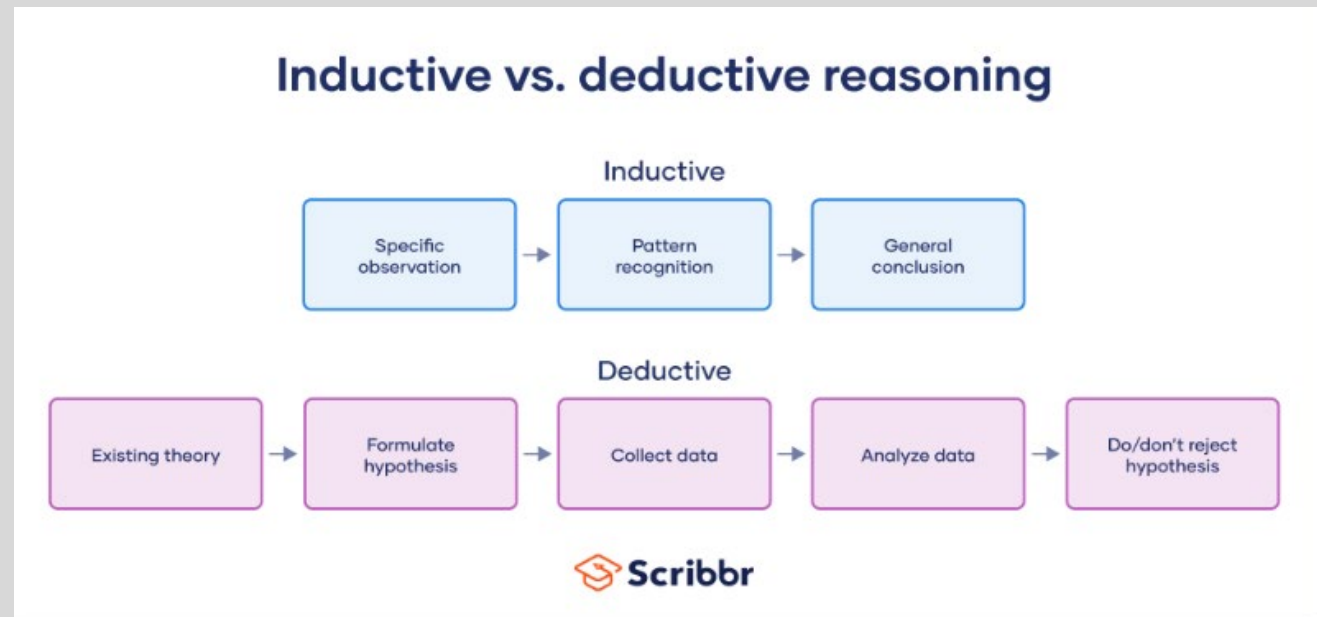
Approaches to Coding Systems

Deductive

- Developing indicators thought to support the construct of interest
- Then create items/criteria to reflect that
- Apply the coding system

Inductive

- Grounded Theory
- Thematic Analysis



Methodological Considerations

- Research Questions
- Coding Systems
- Reliability and Validity
- Additional Considerations

Methodological Considerations

Choosing Observational Tools/Systems

Research Questions

Reliability

- How do determine?
 - Data-specific
 - Approach

Methodological Considerations

Choosing Observational Tools/Systems

Research Questions

Reliability

- How do determine?
 - Data-specific
 - Approach

Validity

- Are you measuring the intended construct?
- Is your measure linked to constructs of interest that we would expect?
- Example: [Variability in Preschool CLASS Scores and Children's School Readiness](#)

Additional considerations:

- Feasibility
- Sensitive to Change
- Time Intensive
- Analyses – Temporal Dependence, Multivariate Structures

Extensions and Theoretical Considerations

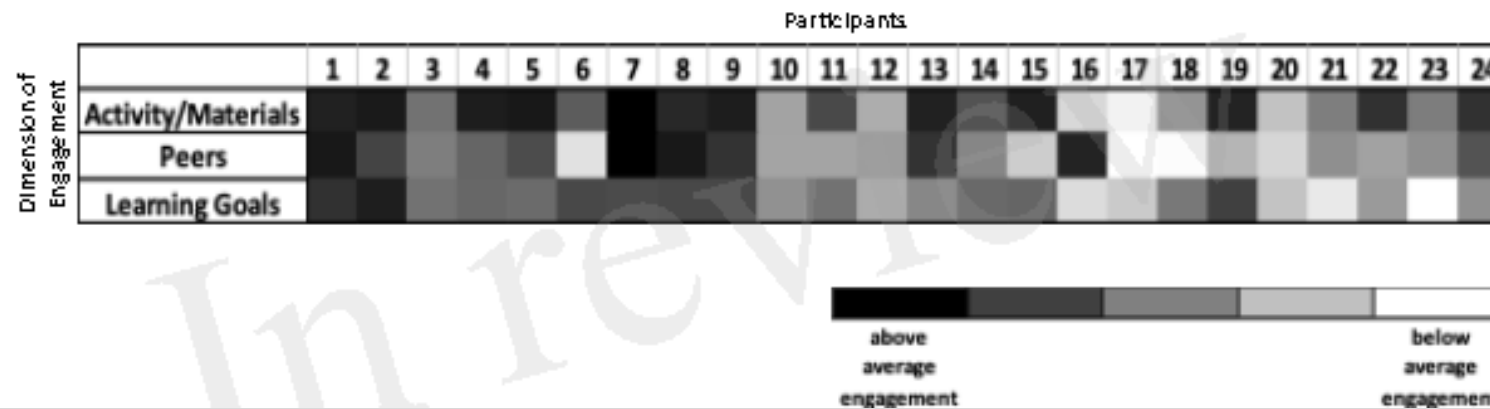
Theoretical Considerations in Observational Coding

Repeated Measures

- Direct assessments
- Naturalistic observation

Figure 5

Heat Map of Individual Children's Multi-dimensional Engagement with the Block Play Intervention



Courses and Resources

Courses and Resources

Courses

- Qualitative Methods (SOC, POL, COM)
- Multilevel Modeling
- Introduction to Computational Text Analysis
- Field Research Methods
- Intensive Repeated Measures
- Focus Groups and Interviewing for Strategic Communication
- Interview Methods

Coding Protocol Development and Examples

- [System for Observing Fitness Instruction Time](#)
- [Classroom Assessment Scoring System Overview](#)
- Chorney, J. M., McMurtry, C. M., Chambers, C. T., & Bakeman, R. (2015). Developing and modifying behavioral coding schemes in pediatric psychology: a practical guide. *Journal of pediatric psychology, 40*(1), 154–164.
<https://doi.org/10.1093/jpepsy/jsu099>

Break

Great Recess Framework

- In-person coding
- Future Directions
- Applying an existing scheme to a different population (i.e., pre-k)

The Great Recess Framework

Background:

- [The Great Recess Framework](#)
 - Evaluation to measure contextual and behavioral components of recess
 - Massey, W. V., Stellino, M. B., Mullen, S. P., Claassen, J., & Wilkison, M. (2018). Development of the great recess framework—observational tool to measure contextual and behavioral components of elementary school recess. *BMC Public Health*, 18(1), 1-11.
- [Scoresheet](#)
- Manual 1 – Example

CIRCLE SCORE FOR EACH				
1	2	3	4	Notes
(1) Safety Concerns- Hazards. Play space ≠ entire playground. Focus on proximity to where kids play				
1- Significant safety concerns in almost all of the play space	2-Significant safety concerns in a majority of the play space	3-Significant safety concerns in some of the play spaces	4- The play space has no safety concerns.	<u>Note specific hazards and where they exist:</u>

- Centered around elementary-aged children
 - Can we apply this to younger children?

The Great Recess Framework

Development:

- Field notes

- General Question/Concerns:
 - Adult Engagement and Supervision 4: How would you determine between some, most, all adults when there are only 3 adults? ___
 - Frequency
 - Do you cut the observations to 30 min max, even if recess goes longer?
 - Safety and Structure 4: Organized games didn't necessarily fit this age— but David commented and said they *did* see these behaviors in China, and Rob noted how there have been organized activities outside
 - Potential solution: Leave the question and code it zero if completely unobserved
 - Student Behaviors 1: What does it mean to have “games are initiated by students” in the context of a preschool classroom?
 - Potential solutions: Add “games/activities”
 - Potential problems: Is it necessarily negative if few of the games are initiated by students and that teachers scaffold activities for the kids to do?

Potential Items to Add:

- Add a section/box/line for number of students
- Add a section/box/line for number of teachers
- Physical Activity— Adding a count for sedentary and moderate to vigorous behavior
 - How to add: have a count every three minutes (10x) about how many children are engaging in sedentary or moderate to vigorous behavior
 - Sedentary: being still, sitting or standing
 - Light: walking
 - Moderate to vigorous: anything more than a walk

Potential Items to Cut:

- Adult Engagement and Supervision 1: #'s 1-4
 - Rationale to cut: Because these ratios do not fit the preschool context, it may be more useful to include the line for the number of students and teachers— then we can determine whether the adult to student ratio is appropriate using the NAEYC scale.

Potential Items to Modify:

- Safety and Structure 5: #4 – “Almost all of the equipment provided is being used as intended and in a safe manner.”
 - How to modify: Leave as worded, but for coding instructions, all of equipment being used as intended would be coded as a 4 (Almost All), if just one piece of equipment was not being used properly, coded as 3 (Most) — unless it was a very short amount of time
 - Question: Does this include children running up a slide backward, even if the teachers don't correct this behavior?
 - Rationale to modify: It is confusing and unclear in how to determine between most and almost all for the context of this question.
- Transitions 1 and Transitions 2: #'s 1-4
 - How to modify: Combine the items
 - % of children that are organized and smooth vs all children
 - leave blank if we don't see it
 - Rationale to modify: Rationale above
- Anything above a walk-

The Great Recess Framework

Development:

- Field notes
- Modifications

GRF-OT Scale Items – Modified for Preschool | Number of teachers: _____ | Number of children: _____

Item	1	2	3	4	Score	NOTES
Hazardous/Unsafe Areas <small>Safety and Structure 1 Training Manual: 1</small>	The play space for outdoor play is unsafe due to hazards not identified as "no play" zones. There are significant safety concerns in almost all of the play spaces	The play space for outdoor play has safety concerns due to hazardous areas on the majority of the playground not identified as "no play" zones	The play space for outdoor play has some safety concerns. There are a few hazardous areas not identified as "no play" zones	The play space for outdoor play has no safety concerns. It is clearly free of hazards and/ or all unsafe areas are identified as "no play" zones		
Clear Boundaries <small>Safety and Structure 2 Training Manual: 2</small>	The play space for outdoor play has no clearly identified boundaries for games (no cones, chalk, paint)	The play space for outdoor play has a few boundaries identified but a large percentage of the play space does not have any game space marked	The play space for outdoor play has many boundaries identified but a small portion of the play space does not have any game space marked	The play space for outdoor play is well marked (cones, chalk, paint) and all game boundaries are clear		
Fixed/Unfixed Equipment <small>Safety and Structure 3</small>	No fixed or unfixed outdoor play equipment is available	Only fixed outdoor play equipment is available OR only non-fixed outdoor play equipment is available	Fixed outdoor play equipment is available and there are limited amounts of non-fixed equipment	More than one fixed and more than one non-fixed outdoor play equipment is available to support multiple games and activities		
			number of organized games are available during recess, but there is variety	A variety of organized games and/or activities are available during outdoor play		
			equipment provided is appropriate but there are instances of inappropriate use	Almost all of the equipment provided is being used as intended and in a safe manner (90%)		
			Adults model positive culture language, getting children reporting conflict resolution more than half	Adults always model positive culture (e.g. positive language, getting children involved, supporting conflict resolution skills, etc.) – all adults		
			Adults are usually positioned to view children in the play space, but some are unsupervised	Supervising adults are always strategically positioned to view children in the outdoor play space		
			Adults are usually playing games and/or engaged with children	Adults always are playing games and engaged with children		
Adult Engagement /Supervision 4 <small>Training Manual: 23</small>	engaged with children – no adults	and/or are engaged with children	are engaged with children			
Child Initiation	Hardly any games are initiated by children (10%)	A few games are initiated by children (11-50%)	Some games are initiated by children (51-89%)	Almost all games are initiated by children (90%)		
Child Behaviors 1 <small>Training Manual: 10</small>						

Adaptations to score sheet

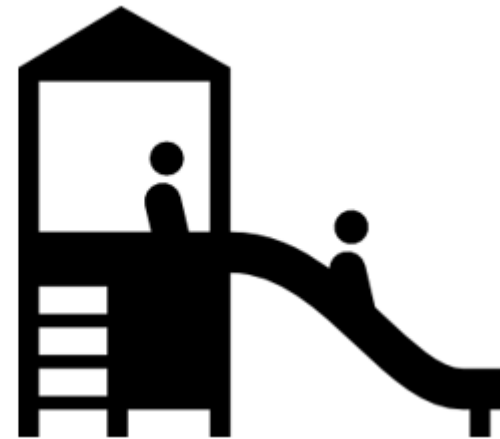
- "Recess" is changed to "outdoor play" throughout the measure
- Physical activity count added to right side
- Adult Engagement 1 – using student ratios specific to elementary school – were removed
- Student Behaviors 1 – Examples provide for games – these numbers not provided in manual
- Safety and Structure 5 – Added percentages from the GRF-OT Training Manual
- Physical Activity – Added percentages from the GRF-OT Training Manual
- Physical Activity – Added instruction from the GRF-OT Training Manual
- Adult Engagement and Supervision 2 – Added examples from the GRF-OT Training Manual
- Added manual numbers

The Great Recess Framework

Development:

- Field notes
- Modifications
- Codebook

Training Manual



The Great Recess Framework
Observational Tool: Adapted for
PreK (GRF-OT-PREK)

Bryant, Finders, & Schmitt, 2019

The Great Recess Framework

Development:

- Field notes
- Modifications
- Codebook

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The Great Recess Framework

Development:

- Field notes
- Modifications
- Codebook
- Training/Reliability
- Coding
- Reflections
- Questions?



Section 4: Reliability Criteria

Observers will be introduced to the items on the GRF-OT-PREK, the updated operational definitions, and trained in the scoring procedures. Each item will be discussed in a series of trainings to allow the observers to ask clarifying questions regarding scoring procedures. Discussions of each GRF-OT-PREK item will be supplemented with information in the hard copy training manual adapted for the GRF-OT-PREK and the original GRF-OT scoring manual available online. These training manuals include each item, operational definitions, and examples for each item, scoring criteria for each item, as well as corresponding photos and videos to enhance the training process.

Prior to training, a team of “master coders” watched 4 videos publicly available on the web and derived master codes with justification that aligned with the GRF-OT-PREK. The master codes were decided by balancing how the observations would fit within the original GRF-OT and making any adjustments so that the concepts were relevant to preschoolers under the adapted GRF-OT-PREK. One video was subsequently dropped from the master coding list because it was decided that the outdoor play activities were not comparable with what would be expected in preschool contexts.

Trained research assistants will be required to score correctly on 75% of the master codes in each of the three videos to be considered reliable coders (e.g., correctly score at least 12 out of 16 items). Additionally, if trained research assistants score any single item more than 1 point away from the master codes it will be reviewed and re-tested in a subsequent session using the exemplar videos (see appendix b). Trained research assistants will be required to report the number of teachers and number of students within 2 points.

The final step of reliability training will involve live coding at a local preschool. Trained research assistants and one master coder will observe an outdoor play session and score items immediately following. Trained research assistants will be required to match the master coder’s scores on 75% of the items to ensure inter-rater reliability was met during live observations.

The Great Recess Framework

Development:

- Field notes
- Modifications
- Codebook
- Training/Reliability
- Coding
- Reflections
- Questions?

	Variable Name	Label	Possible Range
Safety and Structure Items	grfss1	Safety and Structure Item 1 (Hazardous/Unsafe Areas)	1-4
	grfss2	Safety and Structure Item 2 (Clear Boundaries)	1-4
	grfss3	Safety and Structure Item 3 (Fixed/Unfixed Equipment)	1-4
	grfss4	Safety and Structure Item 4 (Organized Activities)	1-4
	grfss5	Safety and Structure Item 5 (Equipment Use)	1-4
Adult Engagement and Supervision Items	grfae2	Adult Engagement and Supervision Item 2 (Positive Culture)	1-4
	grfae3	Adult Engagement and Supervision Item 3 (Positioning)	1-4
	grfae4	Adult Engagement and Supervision Item 4 (Engagement)	1-4
Student Behaviors Items	grfcb1	Child Behaviors Item 1 (Student Initiation)	1-4
	grfcb2	Child Behaviors Item 2 (Physical Altercations)	1-4
	grfcb3	Child Behaviors Item 3 (Positive Communications)	1-4
	grfcb4	Child Behaviors Item 4 (Disagreements)	1-4
	grfcb5	Child Behaviors Item 5 (Conflict Strategies)	1-4
Transitions Items	grftm1	Transition 1 (To Outdoor Time)	1-4
	grftm2	Transition 2 (From Outdoor Time)	1-4
Overall Physical Activity	grfpa	Overall Activity Level	1-4

Spatial and Quantitative Mathematical Language Coding System

- Transcription data
- Future Directions
- Extending an existing system to a different context (i.e., block play)

Examining Causal Connections and Mechanisms Between Block Play and Mathematics

- **Background:** Block Play Intervention

Using block play to enhance preschool children’s mathematics and executive functioning: A randomized controlled trial

Sara A. Schmitt*, Irem Korucu, Amy R. Napoli, Lindsey M. Bryant, David J. Purpura

Human Development and Family Studies, Purdue University, 1202 W. State Street, West Lafayette, IN 47907, United States

Table 1
Description of Intervention Prompts.

Weeks	Description of Prompt	Example Prompt
1–2	Simple prompt	<i>Today, your job is to build a boat together. I can’t wait to see the boat you build!</i>
3–4	Simple prompt with story	<i>I want you to use your imagination today. I want you to imagine that a river is running right through this room. A mama duck and her ducklings are trying to cross the river and they need your help. So, today, your job is to build a bridge that crosses the river so that the mama and her ducklings can cross.</i>
5	Components prompt	<i>Today, your job is to build a house. But, the tricky thing is that the house needs to have some things that other houses have. It needs to have four walls, a roof, a way to get inside like a door, and at least two rooms.</i>
6	Components prompt with pictures	<i>Today, I am going to show you some pictures. I would like you to build the same things you see in the pictures in your structure. Your job is to build two castles. But the castles have to have these three really important things shown in the pictures. They have to be connected by a bridge that looks like one of these (show picture). They both have to have a window that looks like this (show picture), and they each have to have a tunnel that goes underneath that looks like this (show picture). I will put the pictures right here on the ground for you to see.</i>
7	Modeling pictures of complex structure	<i>Today, I am going to show you a picture with a structure that I built on it. Your job is to work together to build the same structure you see in this picture (show picture). I would like you to build the structure exactly as you see it in the picture, okay? I know you can do it! I will put the picture right here so you can look at it as you build.</i>

Examining Causal Connections and Mechanisms Between Block Play and Mathematics

- **Background:** Block Play Intervention

A B S T R A C T

The current study investigated the extent to which a semi-structured block play intervention supported growth in mathematics and executive functioning for preschool children using a randomized controlled design. A secondary aim was to explore whether differential intervention effects emerged for children from various socioeconomic backgrounds, indicated by parental education level. Participants included 59 preschool children. Children ranged in age from 38 to 69 months ($M = 55.20$, $SD = 7.17$), and 56% were female. Results from regression models indicated that, although not statistically significant, children who participated in the intervention demonstrated greater gains in three mathematics skills (numeracy, shape recognition, and mathematical language) and two indicators of executive functioning (cognitive flexibility and a measure of global executive functioning) compared to children in a control group. Further, three significant interactions were found, suggesting that for numeracy, cognitive flexibility, and global executive functioning, children of parents with low educational attainment benefited the most from intervention participation. These findings provide preliminary evidence for the effectiveness of a semi-structured block play intervention for improving children's school readiness and have implications for including intentional instruction using blocks in preschool classrooms.

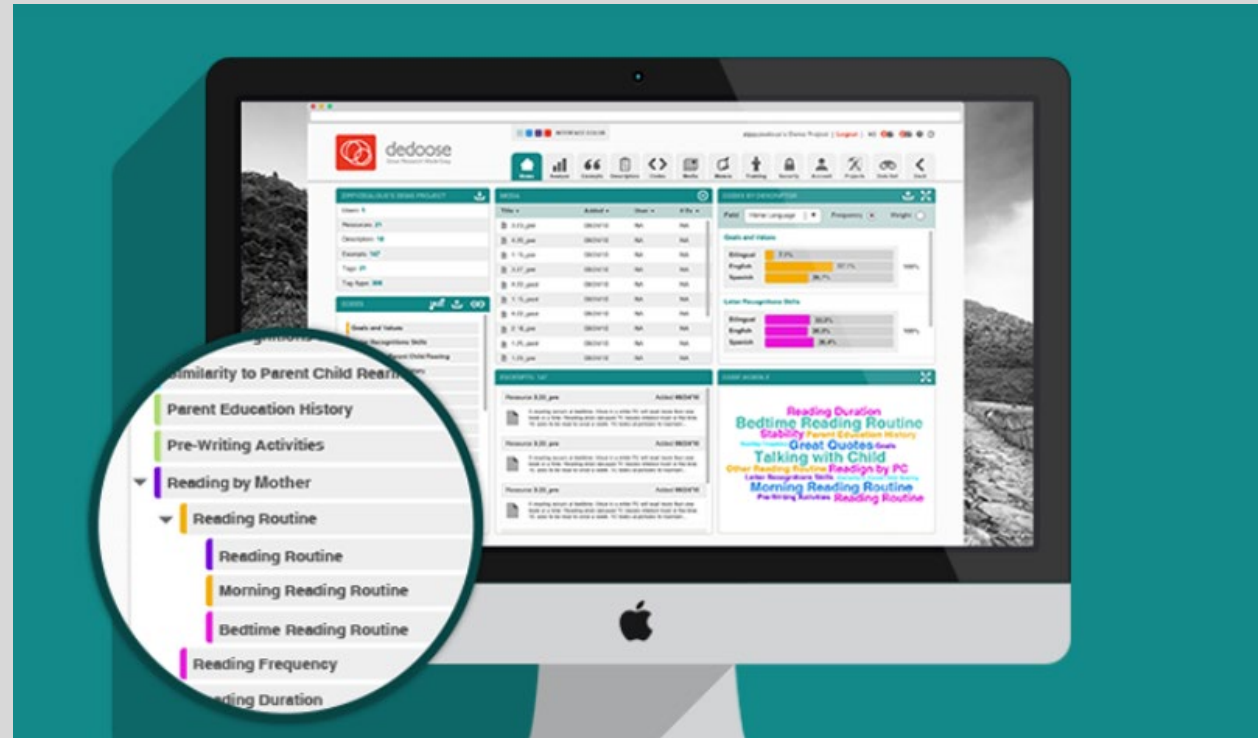
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Examining Causal Connections and Mechanisms Between Block Play and Mathematics

- **Mathematical Language**
 - Quantitative (e.g., more, less)
 - Spatial (e.g., big, small)
- **Spatial and Quantitative Mathematical Language Coding System**
 - Transcribing block play sessions from the pilot study (2016)
 - Issues with accuracy
 - Coding for spatial and quantitative mathematical language during block play
 - Led development effort of expanding an existing coding system
 - Manual
 - Show manual

Examining Causal Connections and Mechanisms Between Block Play and Mathematics

- Spatial and Quantitative Mathematical Language Coding System



Examining Causal Connections and Mechanisms Between Block Play and Mathematics

Future Directions:

- Data science approaches to coding mathematical language
 - How can we more efficiently code this language in our current study?

Examining Causal Connections and Mechanisms Between Block Play and Mathematics

Graduate Research Assistant: August 2020-Present

- Using R to help with coding efforts

	A	B	C	D	E	F	G	H	I
1	id	school_session	sentence_before	sentence	sentence_after	word	prompted_by_exp	category	domain
2	15100	11_1	15102 But this one had smaller things	15100 Okay the little one is at the back at the end Okay No on top of it like that You silly goose	15102 Youre the one whos silly	back	No		
3	15102	11_11	15100 Fire	15102 Ill fix this back here	15100 1 2 3 2 1 2 3 blast off	back	No		
4	15102	11_12	ExperimenterThen youd have to take the whole thing apart	15102 Then like this Let me see the picture Theres a number on the back of it	Experimenter Mmhmm	back	No		
5	15102	11_12	Experimenter Mmhmm	15102 Why does it have a number on the back of it Do you think this looks like this	Experimenter I cant really see from here I think you can do it	back	No		

- Future direction:** using natural language processing (NLP) to help determine codes

Conclusions

Conclusions

Things to consider:

- What are your research questions?
 - How will that inform your approaches to coding
 - In-person, retroactive
 - Do you have existing data that can be re-explored? (Probably!)
 - Individual-level, group-level
- Are there existing measures that you can utilize to inform your coding system?
 - Borrowing or creating something new!
 - Existing approaches (e.g., micro-genetic coding, dyadic, machine learning)
 - Determining reliability of coding, validity of evaluation
- What are some extensions of your existing work that you could use observational coding approaches for?
- The possibilities are endless!

Thank you!

Slides: [Dyadic Data Analysis](#)

Books/Chapters:

DeWalt, K. M., Musante, K., & DeWalt, B. R. (2011). *Participant Observation: A Guide for Fieldworkers 2nd Edition*. Rowman Altamira.

Ostrov, J. M., & Hart, E. J. (2013). Observational Methods 15. *The Oxford Handbook of Quantitative Methods in Psychology, Vol. 1, 1*, 286.

Clarke, V., & Braun, V. (2013). Successful qualitative research: A practical guide for beginners. *Successful Qualitative Research*, 1-400.

Chandra, Y., & Shang, L. (2019). Inductive coding. In *Qualitative research using R: A systematic approach* (pp. 91-106). Springer, Singapore.

Papers:

Bai, J., Swanson, K. M., & Santacroce, S. J. (2018). Observational Coding Systems of Parent-Child Interactions During Painful Procedures: A Systematic Review. *Pain practice : the official journal of World Institute of Pain*, 18(1), 130–145.

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Sullivan, Florence R., and P. Kevin Keith. “Exploring the Potential of Natural Language Processing to Support Microgenetic Analysis of Collaborative Learning Discussions.” *British journal of educational technology* 50.6 (2019): 3047–3063. Web.

Fereday, J., & Muir-Cochrane, E. (2006). Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development. *International journal of qualitative methods*, 5(1), 80-92.

Guajardo, N. R., Petersen, R., & Marshall, T. R. (2013). The Roles of Explanation and Feedback in False Belief Understanding: A Microgenetic Analysis. *The Journal of Genetic Psychology*, 174(3), 225–252. <https://doi.org/10.1080/00221325.2012.682101>

Audette Sylvestre, Mélissa Di Sante, Élise Brassart, & Jean Leblond. (2021). Introducing the Coding Observations of Parent–Child Interactions (COPI): An Observational Measure of the Parental Behaviours That Matter for Language Development. *Canadian Journal of Speech-Language Pathology and Audiology*, 45(2)