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Language Interactions as Intervention: Best Practice Approaches to Engage and Motivate Neurodiverse Learners

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Foundational Terminology

The Journal of Child Psychology and Psychiatry

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Annual Research Review: Shifting from 'normal science' to neurodiversity in autism science

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Since its initial description, the concept of autism has been firmly rooted within the conventional medical paradigm of child psychiatry. Increasingly, there have been calls from the autistic community and, more recently, nonautistic researchers, to rethink the way in which autism science is framed and conducted. Neurodiversity, where autism is seen as one form of variation within a diversity of minds, has been proposed as a potential alternative paradigm. In this review, we concentrate on three major challenges to the conventional medical paradigm – an overfocus on deficits, an emphasis on the individual as opposed to their broader context and a narrowness of perspective – each of which necessarily constrains what we can know about autism and how we are able to know it. We then outline the ways in which fundamental elements of the neurodiversity paradigm can potentially help researchers respond to the medical model's limitations. We conclude by considering the implications of a shift towards the neurodiversity paradigm for autism science. **Keywords:** Autism; ethics; medical model; neurodiversity; social model of disability.

Introduction

Science is not static. As Thomas Kuhn (1962) explained, science progresses through a series of phases from what Kuhn called 'normal science' – the accepted orthodoxy of the moment – to periods of crisis, when scientists begin to contest the hitherto-accepted paradigm itself. This period ends, ultimately, in a shift from one paradigm to another. In the field of autism science, the conventional medical paradigm is – and has long been – the accepted

researchers could be on the brink of thinking about autism in a fundamentally different way. Doing so could radically change how we approach knowledge construction within autism science and the way that we support autistic people and their families in our practice.

In what follows below, we proceed in two major sections. First, we outline the major ways in which the conventional medical paradigm is being called into question. Second, we outline the fundamental

Disability / Neurodiversity

Box 1 Terminology

Neurodiversity: The range of natural diversity that exists in human neurodevelopment.
Neurotypical: A person or people whose neurodevelopment falls within the range usually considered to constitute 'typical' development.
Neurodivergent: A person or people whose neurodevelopment falls outside of (or 'diverges' from) the range usually considered to constitute 'typical' development (e.g. a group of autistic people is a group of 'neurodivergent' people).
Neurodiverse: A collective term for groups including mixed neurodevelopment (e.g. a group of autistic and nonautistic people is a 'neurodiverse' group).

Neurodiversity Perspective

- **Neurodiversity:** The **broad diversity** that exists in human neurodevelopment, from divergent to typical
- Typical neurodevelopment is **neither superior or inferior** to divergent neurodevelopment
- Neurological differences are viewed as a **natural and beneficial** aspect of human diversity
- **Asset-based.** "Neurodivergent students have unique ways of experiencing the world that enhance the classroom, bringing different perspectives, ideas, and understandings."

  Lambert et al., 2020

Identify-First Language

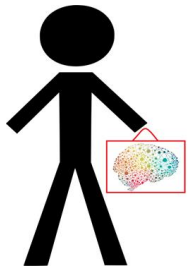
"Saying 'person with autism' suggests that autism is something bad, so bad that it isn't even consistent with being a person. Nobody objects to using adjectives to refer to characteristics of a person that are considered positive or neutral. We talk about left-handed people, not people with left-handedness..." (Sinclair, 2013)

Recommendation: **Use identity-first language** to talk about disabled and neurodivergent people, unless they tell you otherwise.

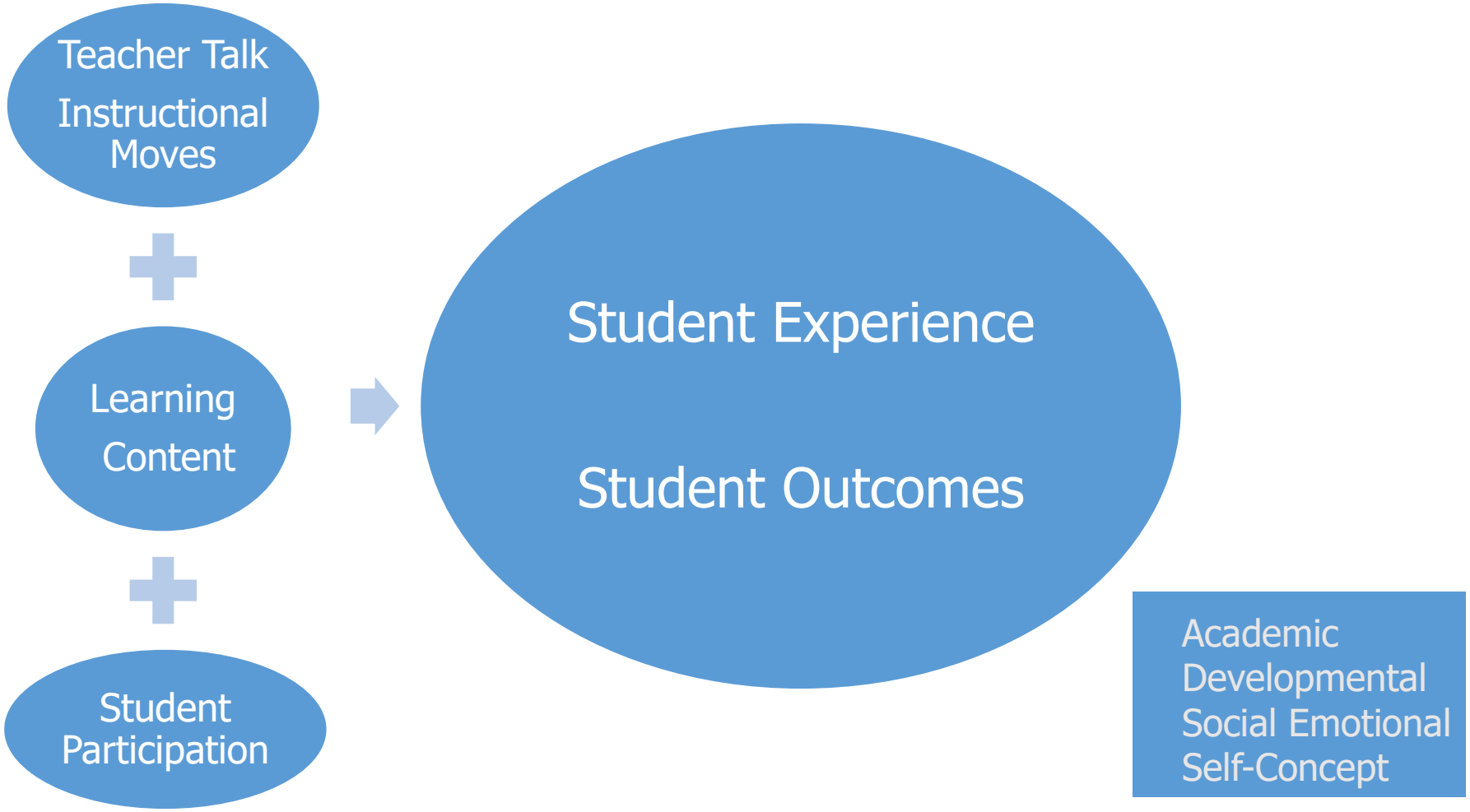
- Consider how a person self-identifies & avoid terms that the disability community as coined as "patronizing" such as "special needs"

"For myself, I am autistic. I'm an autistic person. Autism is not baggage I'm forced to carry at arm's length to distance from my core, it's literally the foundation of my mind and shapes every facet of my human experience in this world. It is a core part of my identity that I embrace toward my authentic self. "

-- **Nathalie Dominique Moriarty, Autistic Self-Advocate (identifies as 'an AuDHD')**



Examining Classroom Interactions



Example: 1st Grade Mathematics Activity

Context: Whole class

Location: Carpet

Time: Last 20 minutes of the day

Task: Writing equations for word problems & solving equation

*requires high cognitive demand

Method: Everyone has a whiteboard

*1 way to solve the problem / 1 right answer

Teacher: We're going to do one more and then we're going to do word problems.
Student: When are we going to go home?
Teacher: Ready?

Student: When are we going to go home?
Student: No word problems. *(leans head down).*
Teacher: S, I don't like your attitude. Not in here.

Teacher: Okay, ready? Last one and then word problems.
Student: Can we do 1 word problem?
Teacher: Are we getting bigger or smaller? *(shows students the equation)*

Choral response from class: "Smaller." (students solve equation on whiteboards)

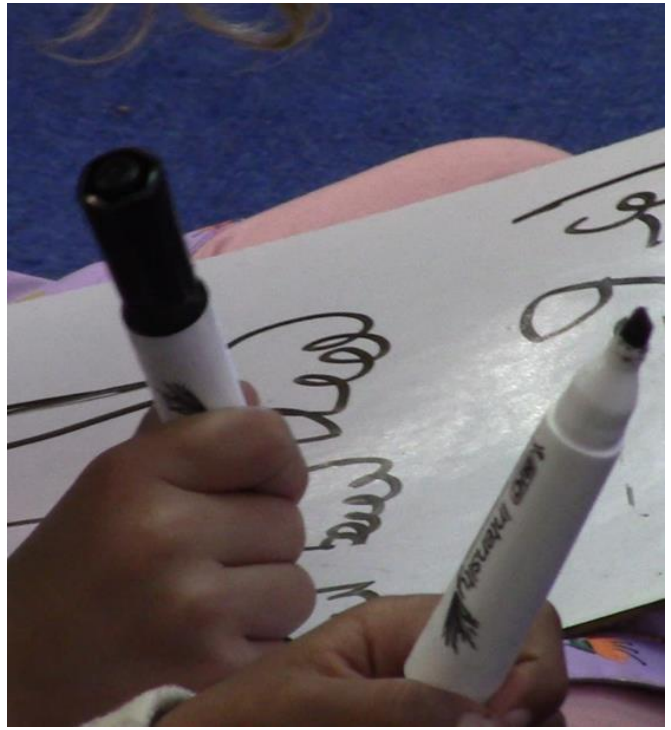
Student: Who's Succulent? *(looks at the word problem on projector)*
Student: It's easy. I knew it. I knew it *(writes out 13 – 6 = 7 & then looks up at the teacher. Begins drawing hands to demonstrate 13 - 6 = 7)*

Peer: S. *(pause)* S. *(pause)* S.*(trying to get her attention)*
Peer: There's no time for drawing
Student: I'm not (directed at peer)
Peer: There' no time for drawing
Student: I'm not! (*says loudly & with emotion*)

Teacher: S. Go to your desk. Go take a break.
(Sad faced with tears, student leaves activity)

Interactions Matter

Math Activity / Whole Class
Math is at the end of day
S is autistic & ADHD



13 - 6 = 7
(S draws out 13 fingers)

Misinterpreting communication as 'problematic behavior'

Moves = ignore 'off-topic' initiations & redirect

Peer & teacher = same moves

Teacher: We're going to do one more and then we're going to do word problems.
Student: When are we going to go home?
Teacher: Ready?

Communicative Initiation: Seeking Predictability
No Response

Student: When are we going to go home?
Student: No word problems. *(leans head down).*

Communicative Initiation: Seeking Predictability & Protest
No Response

Teacher: S, I don't like your attitude. Not in here.

Redirect Behavior

Teacher: Okay, ready? Last one and then word problems.
Student: Can we do 1 word problem?
Teacher: Are we getting bigger or smaller?

Communicative Initiation: Seeking Predictability
No Response

Choral response from class: "Smaller."

Student: Who's Succulent?

Communicative Initiation: Seeking Information
No Response

Student: It's easy. I knew it. I knew it *(writes out 13 – 6 = 7 & then looks up at the teacher. Begins drawing hands to demonstrate 13 - 6 = 7)*

Communicative Initiation: Showing
No Response

Gain Attention

Redirect Behavior

Peer: S. *(pause)* S. *(pause)* S.*(trying to get her attention)*
Peer: There's no time for drawing
Student: I'm not (directed at peer)

Communication Initiation: Repair Strategy

Redirect Behavior

Peer: There' no time for drawing
Student: I'm not! (*says loudly*)

Communication Initiation: Repair Strategy

Teacher: S. Go to your desk. Go take a break.
(Student leaves activity)

Redirect Behavior

Reflection

Teachers have so much **discretion** with how they run their classrooms

- "What they say, how they say it, how they react, and who they punish, whose ideas they see as valuable, and whose they don't" Ball, 2018

Are S's contributions seen as valuable? Are her ideas welcomed?

What "message" might these interactions be sending to S about who she is as learner?

How might S's peers 'see' her in this community?

What might she be known for?

Understanding & Navigating Discretionary Spaces

"Minute-by-minute **interactions** between teachers and students—moments that a teacher may never remember—can determine whether a student walks away **feeling seen or invisible."**

Jasmine Landry, Director of School Leader Development, Teach for America Greater Philadelphia: Discretionary spaces are like "sliding door" moments; they are the seconds between an event/action and your response/reaction to it. We don't often think about our reactions as choices, and without awareness our habits, implicit biases, and cultural training kick in. Discussing discretionary spaces increases our awareness, and with awareness we are more likely to notice these moments and make more deliberate choices.

"Notice" negative patterns within interactions and disrupt them

Small moments have lasting consequences

Navigating Discretionary Spaces

Teaching is Powerful - The Shorty Awards

Notice & Disrupt Negative Interaction Patterns

Supporting neurodivergent learners within classrooms is often **nuanced** and entails subtle **instructional 'moves'** that are embedded in moment-by-moment interactions

Positive or negative interactions send messages to students that they **do or do not belong**

Interactions **send signals to peers** about acceptance or rejection of others

Peers are likely to **hold inherent biases** about neurodivergent students if their teachers do

Aube et al., 2021; Ball, 2018; Acevedo & Nusbaum, 2020; Lambert et al., 2020

Notice & Disrupt Negative Interaction Patterns

Student: When are we going to go home?
Student: No word problems.
Teacher: S, I don't like your attitude…..

"Sliding door moment"
Think about one instructional 'move' that could change this situation?

Positive or negative interactions send messages to students that they **do or do not belong**

Interactions **send signals to peers** about acceptance or rejection of others

Peers are likely to **hold inherent biases** about neurodivergent students if their teachers do

Teacher-Student Interactions:

Powerful Resource & Intervention Target

- Central to **teaching & learning**
- Foundational to **relationship development**
- Linked with **student outcomes**
  - Student participation
  - Academic achievement
  - Communication & language development
  - Social emotional development
  - Self-concepts

Crosnoe et al., 2010; Losh et al., 2022; Connor et al., 2020; Lee & Kinzie, 2012; Murphy et al., 2009; Pianta, 2016

Examining Interactions Provides a Lens

Snapshot of **students' experiences**

Notice **patterns that communicate** competence & position students

Notice & disrupt **negative patterns**

- Change patterns, shape learning

*Insight into **inclusion as a sense** of community

- Reciprocity within interactions
- **Features** of teacher talk

2 Features of Teacher Talk

Responsive Language: *Immediate, verbal and non-verbal responses that follow students' communication*

- Proposed as a **'key' language** feature in the classroom
- Linked with **social-emotional development**
- **Decreased problematic** behavior
- **Increased communication**

Open-Ended Language: *Questions and open-ended comments that encourage students to generate their own ideas*

Connor, Kelsey, Sparapani, et al., 2020; Sparapani, Solari et al., 2020; ; Milburn et al., 2014

Snapshot of the Classroom Language Environment: *Experiences of Students on the Autism Spectrum*

Autistic students

Preschool – 3rd special & general education classrooms

Advances in Neurodevelopmental Disorders
https://doi.org/10.1007/s41252-024-00397-y

ORIGINAL PAPER

Measuring Teacher Talk and the Behavior of Autistic Students in Preschool Through Third-Grade Special Education Mathematics Activities

Nicole Sparapani[1,2] · Sandy Birkeneder[1,2] · Laurel Towers[1,2] · Johanna Vega Garcia[1,2] · Cindy Parks[1,2] · Nancy Tseng[1] · Helen Fann[3] · Jennifer Bullen[2] · Amanda Dimachkie Nunnally[2]

Accepted: 18 March 2024

Abstract

Objectives Teacher talk provides the medium for teaching and learning. However, there has been little emphasis on conceptualizing and measuring teacher talk within specific contexts and populations or the influence that child behavior has on teacher talk. We described and investigated varying models of teacher talk directed individually toward autistic students within 96 special education mathematics activities drawn from larger mathematics lessons. We also examined child behavior within mathematics contexts measured through observation and via teacher report.

Journal of Autism and Developmental Disorders (2022) 52:2284–2299
https://doi.org/10.1007/s10803-021-05115-4

ORIGINAL PAPER

Evaluating Teacher Language Within General and Special Education Classrooms Serving Elementary Students with Autism

Nicole Sparapani[1,3] · Vanessa P. Reinhardt[2,3] · Jessica L. Hooker[3] · Lindee Morgan[3,4] · Christopher Schatschneider[5] · Amy M. Wetherby[3]

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Abstract

This study examined how teachers and paraprofessionals in 126 kindergarten-second grade general and special education classrooms talked with their 194 students with autism, and further, how individual student characteristics in language, autism symptoms, and social abilities influenced this talk. Using systematic observational methods and factor analysis, we identified a unidimensional model of teacher language for general and special education classrooms yet observed differences between the settings, with more language observed in special education classrooms—much of which included directives and close-ended questions. Students' receptive vocabulary explained a significant amount of variance in teacher language beyond its shared covariance with social impairment and problem behavior in general education classrooms but was non-significant within special education classrooms. Research implications are discussed.

Keywords Autism spectrum disorder · Autism · Teacher language · Measurement invariance · Student characteristics

Introduction

Teacher language is considered a unique and powerful resource for classroom learning, because interactive patterns directly impact student outcomes (Downer et al., 2010; Pianta, 2016). Studies have documented predictive associations between teacher language and student outcomes (e.g., Connor et al., 2020; Howes et al., 2008; Mashburn et al., 2008), with high quality interactions linked to academic growth (Curby et al., 2009; Hamre & Pianta, 2005), social competence (Mashburn et al., 2008; Wilson et al., 2007), and fewer problem behaviors (National Institute of Child Health and Human Development Early Child Care Research Network, 2003). Specific features of talk, including teachers' use of open-ended questions, have also been associated with academic achievement and communication and language development (e.g., Burchinal et al., 2008; Milburn et al., 2014; Walsh, 2002). However, there has yet to be a thorough investigation of teacher language in elementary classrooms serving students with autism spectrum disorder (autism).

Similar Features of Teacher Talk Across Studies & Settings

Responsive Language

Non-Task Related Directives

Close-Ended Questions

Instructional Comments

Open-Ended Questions

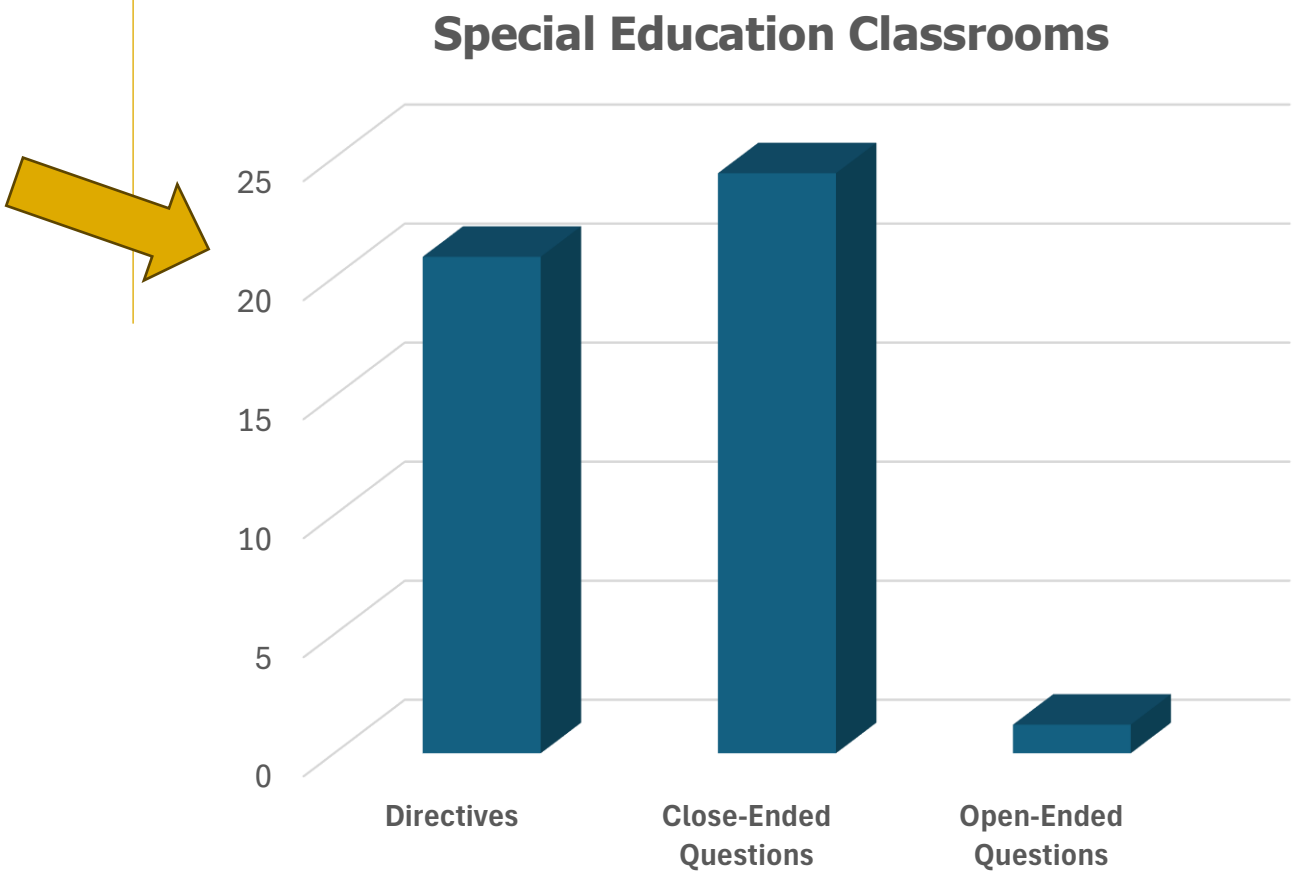
Variability overall

Range in teacher responsive language (16% of activities = 0)

Mostly directives and close-ended questions

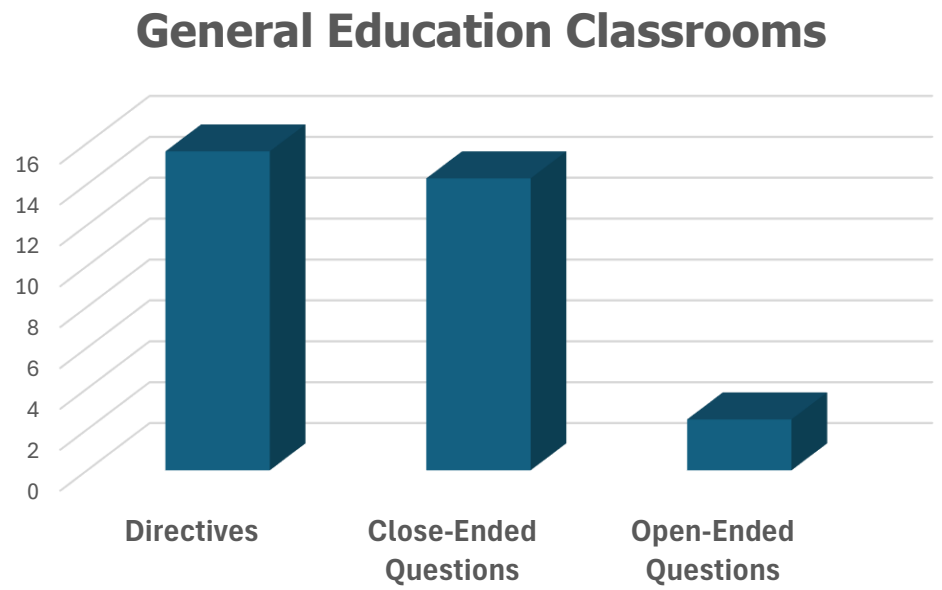
Fewer instructional comments & open-ended questions (<2 on average)

Similar Features of Talk Across Settings



12-Minute Sample Academic Activities

- High frequency of talk in special education classrooms
- Competing verbal bids
  - Teachers & paraeducators
- Close-ended talk (69%)
  - Directives
  - Close-ended questions

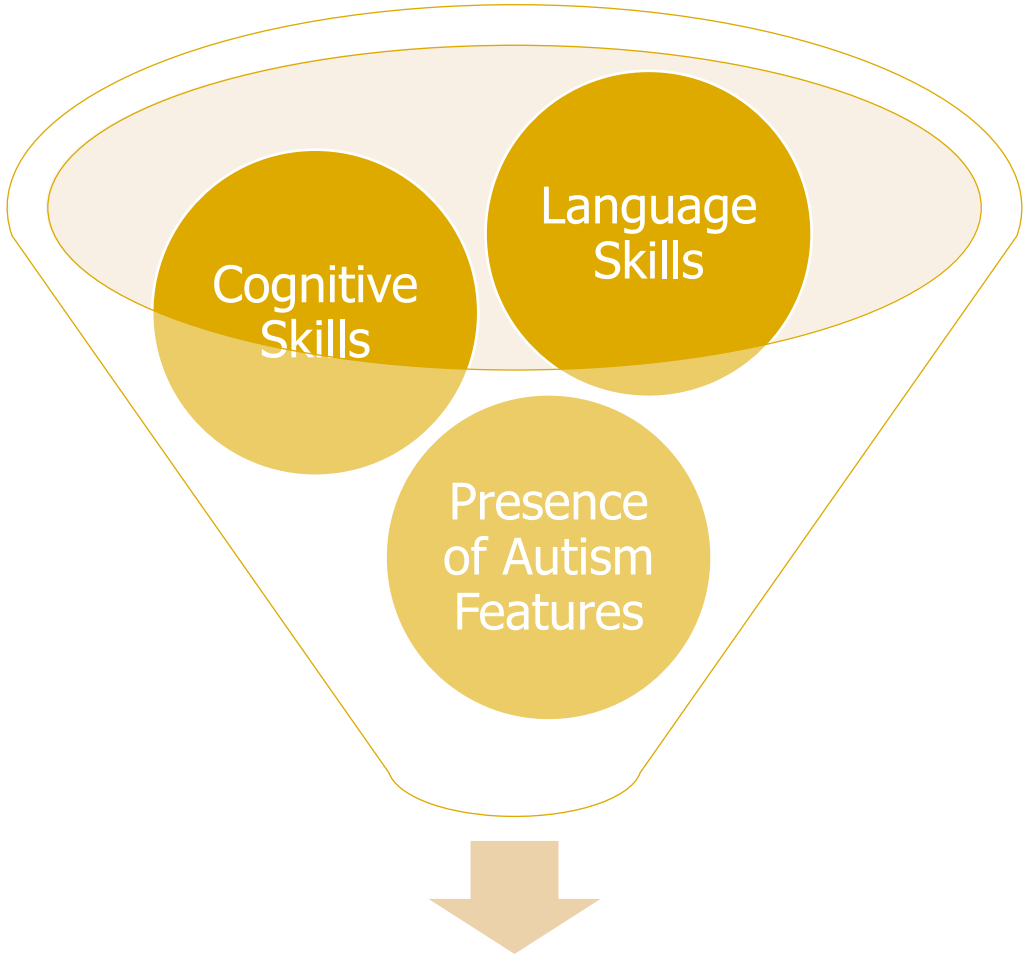


What drives teachers' decisions about the types of talk they use with their autistic students?

More **close-ended & directives** with students who exhibit **more need**

More **responsive language** with students who exhibit **stronger language skills**

More **open-ended questions** with students who exhibit **fewer autism features**



Features of Teachers' Talk

Dobbs et al., 2009; Dykstra et al., 2013; Klibanoff et al., 2006; Sparapani et al., 2022; 2024; de Kruif et al., 2000; Qian et al., 2018

Perceived Behavior Problems, Directive Language & Student Emotion Regulation

How students are perceived in classrooms impacts their language environment

Perceived behavior problems are linked with teachers' use of directive language

Number of teacher directives are linked with student dysregulation

Mathematics & Neurodiversity

Teacher talk is also linked with mathematical learning opportunities

Noticing & interpreting students' observable behavior as meaningful

Mathematics Instruction for Neurodivergent Students
Simplifying Cognitive Demand

- Instruction often represents a **narrow set of mathematical** skills centered on procedural learning
  - **Rote memorization** and practice
  - Practicing predetermined steps to solve basic algorithms

- **Limited opportunities** for critical thinking
  - Tasks require low-level cognitive demand

- **Limited opportunities for "high quality" mathematics that promotes conceptual understanding

Franke et al., 2015; Franke, Lambert 2020; Hiebert & Grouws, 2007; Stein, Smith, Henningsen & Silver, 2000

Range of math learning opportunities presented to autistic students

Teacher talk linked with math learning **opportunities**

Language & opportunity are linked with **active engagement**

***Responsive language & math-related talk**

Contents lists available at ScienceDirect

Research in Autism Spectrum Disorders

journal homepage: www.elsevier.com/locate/rasd

Factors associated with classroom participation in preschool through third grade learners on the autism spectrum

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ARTICLE INFO

Keywords:
Autism
Instructional opportunities
Mathematical tasks
Teacher language
Active engagement
Spontaneous communication

ABSTRACT

Background: Access to mathematics instruction that involves opportunities for critical thinking and procedural fluency promotes mathematics learning. Studies have outlined effective strategies for teaching mathematics to children on the autism spectrum, however, the focus of these interventions often represent a narrow set of mathematical skills and concepts centered on procedural learning without linking ideas to underlying concepts.

Methods: This study utilized classroom video observations to evaluate the variability in and nature of mathematical learning opportunities presented to 76 autistic students within 49 preschool–3rd grade general and special education learning contexts. We examined teacher in-

Extending Mathematical Framework Based on Cognitive Demand to Autistic Learners

What types of math learning opportunities do teachers offer learners on the autism spectrum?

Doing math

Reasoning & critical thinking

Procedures with connections

Making connections to math concepts

Procedures without connections

Follow practiced algorithms without – no links to concepts

Memorization

Recall previously learned facts and rules

Stein & Lane, 1996

Limited Access

Autistic learners were primarily presented with opportunities requiring **low cognitive demand**

Procedures without connections

Follow practiced algorithms without – no links to concepts

Memorization

Recall previously learned facts and rules

Stein & Lane, 1996

Simplified Mathematics Learning Opportunities:
Memorization – Low Cognitive Demand

T: *Holding flashcards in hand*. What is 3 x 6?

Student 1: 19?

T shakes head.

Student 1: 18?

T gives her a block for getting the right answer.

T. Ok, ready? 3 x 10.

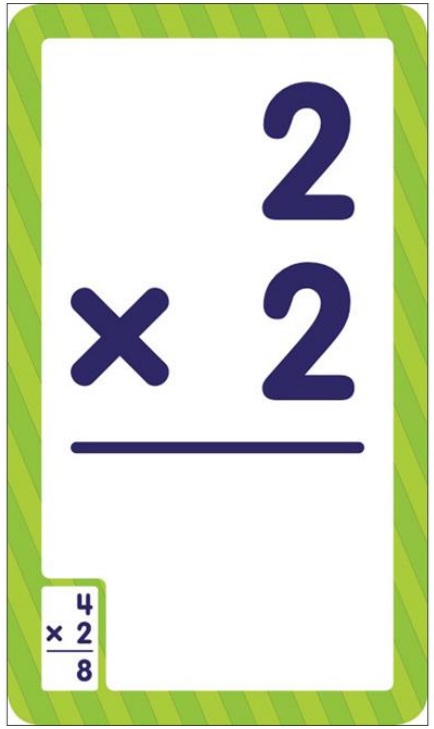
Student 2: 32. *Pauses*. What?

T. 3 x 10.

Student 1: 30.

T: Good job. *Gives her a block to hold as a reward.*

Interactions continue in this same manner for 16 minutes with a few breaks in between.

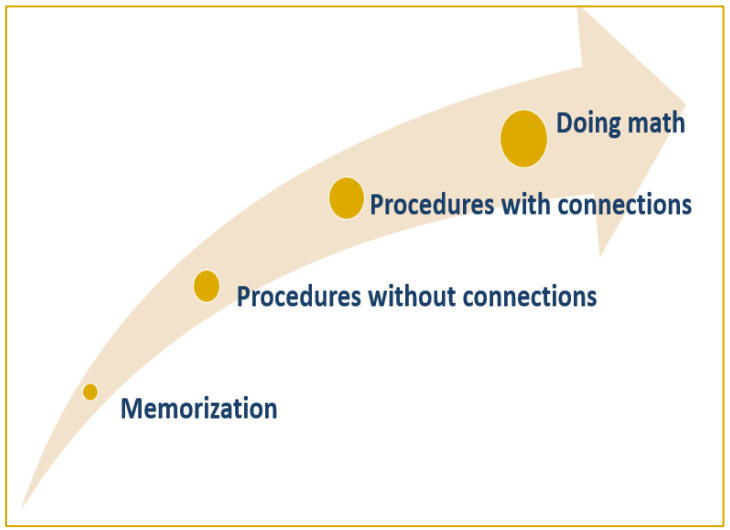


Task & talk are simplified

- Close-ended talk

Blocks are used as reinforcement rather than tools to support learning

Mathematics Task and Teacher Talk Go Hand-in-Hand



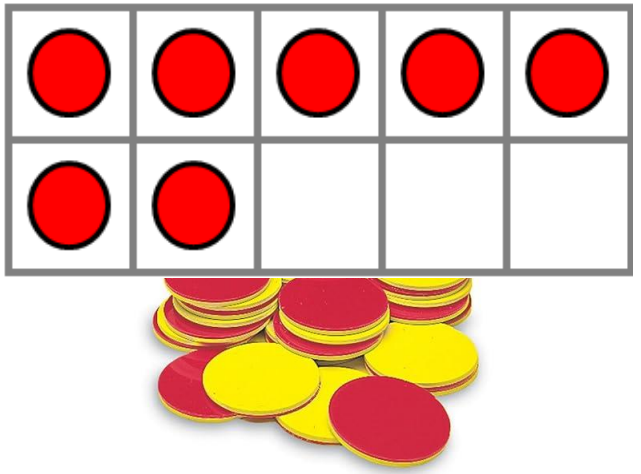
More Cognitive Demand

Open-ended questions	Non-task related directives
Close-ended questions	
Responsive language	
Math-related talk	Behavior-related goals
Student participation & communication	Less communication Less participation

Less Cognitive Demand

Conceptual Mathematics Learning Opportunities
Procedures with Connections – High Cognitive Demand

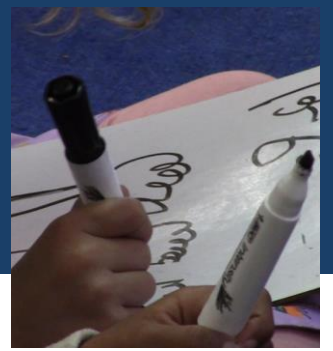
T: OK everybody gets a 10-frame. Are you ready *(hands everyone a 10-frame)*?
T: *(takes out a bag of red plastic counters)* How many counters do you need to fill your 10-frames?
Ss: *(no responses)*
T: Lets count! How many do you need to fill it?
T: *(directed toward S1)* How many do you need to make 10 on here *(points to 10-frame)*? How many do you need?
S1: 1!
T: You just need 1 *(gives S1 1 counter)?*
S2: 2!
T: You just need 2 *(gives S1 another counter)?* How many do you need to FILL your grid?
S1: 10!
T: Ah. There's the magic number. How many do we need to fill our 10 grid?
S1: 10!
T: 10 *(reaches into the bag of red counters)*. 1, 2, …*(places counters on 10-frame)*
S1: *(takes and places 10 counters on 10-frame)*



Open-ended questions
Close-ended questions
Responsive language
Math-related talk

Students demonstrate their thinking using counters

Giving students opportunities to express, communicate, and explain their thinking in different ways helps develop deep understanding of mathematical concepts



Teacher gives student glue, a book, and a basket of paper fish. Book goes in order from 1 to 5.

T: What do you see?

S: Fish.

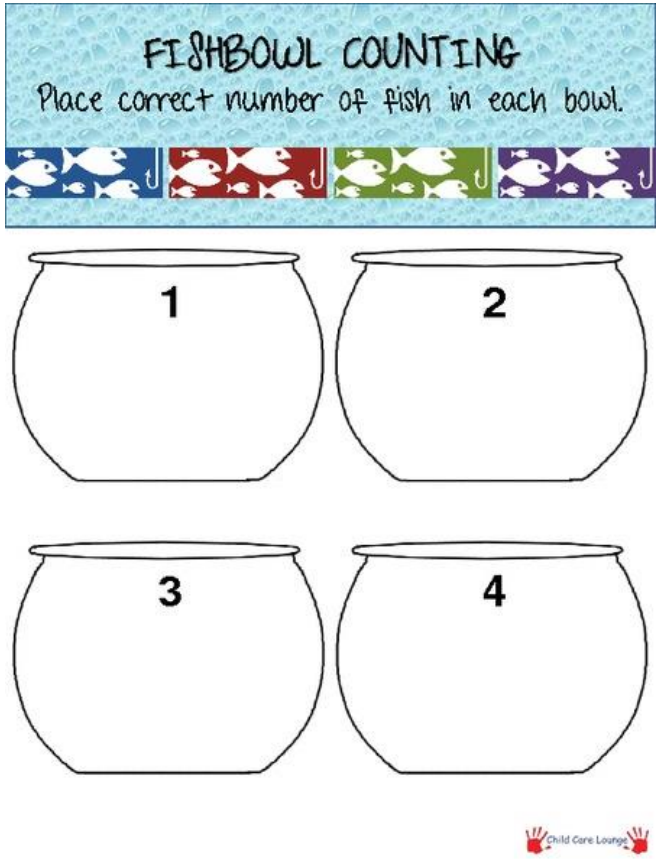
T: Fish tank.

S: What number is on top? (*Waits 3 to 4 seconds*). What number is that? (*Points to number*).

S: 1.

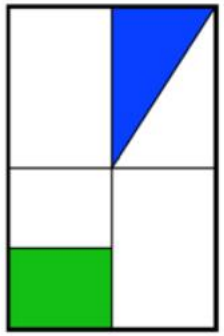
T: We're going to put 1 fish in the tank with our glue stick.

T gives student the bowl. S picks up glue and glues fish in bowl.



Conceptual Mathematics Learning Opportunities
Doing Math – High Cognitive Demand

Understanding Fractions as Part-Whole Relationships



- What fraction of the big rectangle is shaded blue?
- What fraction of the big rectangle is shaded green?

- What **fraction concepts** do students need to have an understanding of to solve these problems?
- What is a **common misconception** that a student might make?

https://deepblue.lib.umich.edu/handle/2027.42/78024

Context: Whole class, 5th grade

Task: Understanding fractions *requires high cognitive demand

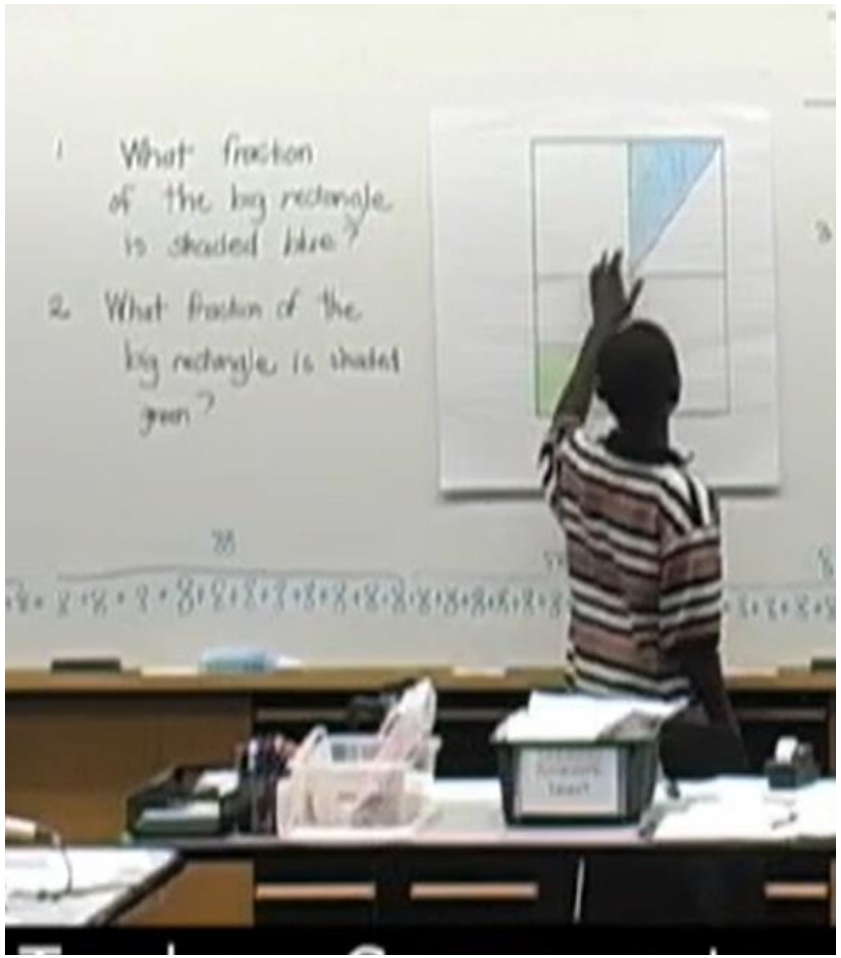
Method: Individual materials, discussion, visual demonstration

*multiple ways to solve

*multiple 'right' answers

Mathematics Teaching and Learning to Teach, University of Michigan. (2010). In Mamadou-Half-Rectangle [Online]. Available: http://hdl.handle.net/2027.42/78024

Reflection



What **features of talk** did you notice?

- Responsive language?
- Open-ended & close-ended questions?
- Math-related talk?

What **positive patterns** did you notice in the interaction?

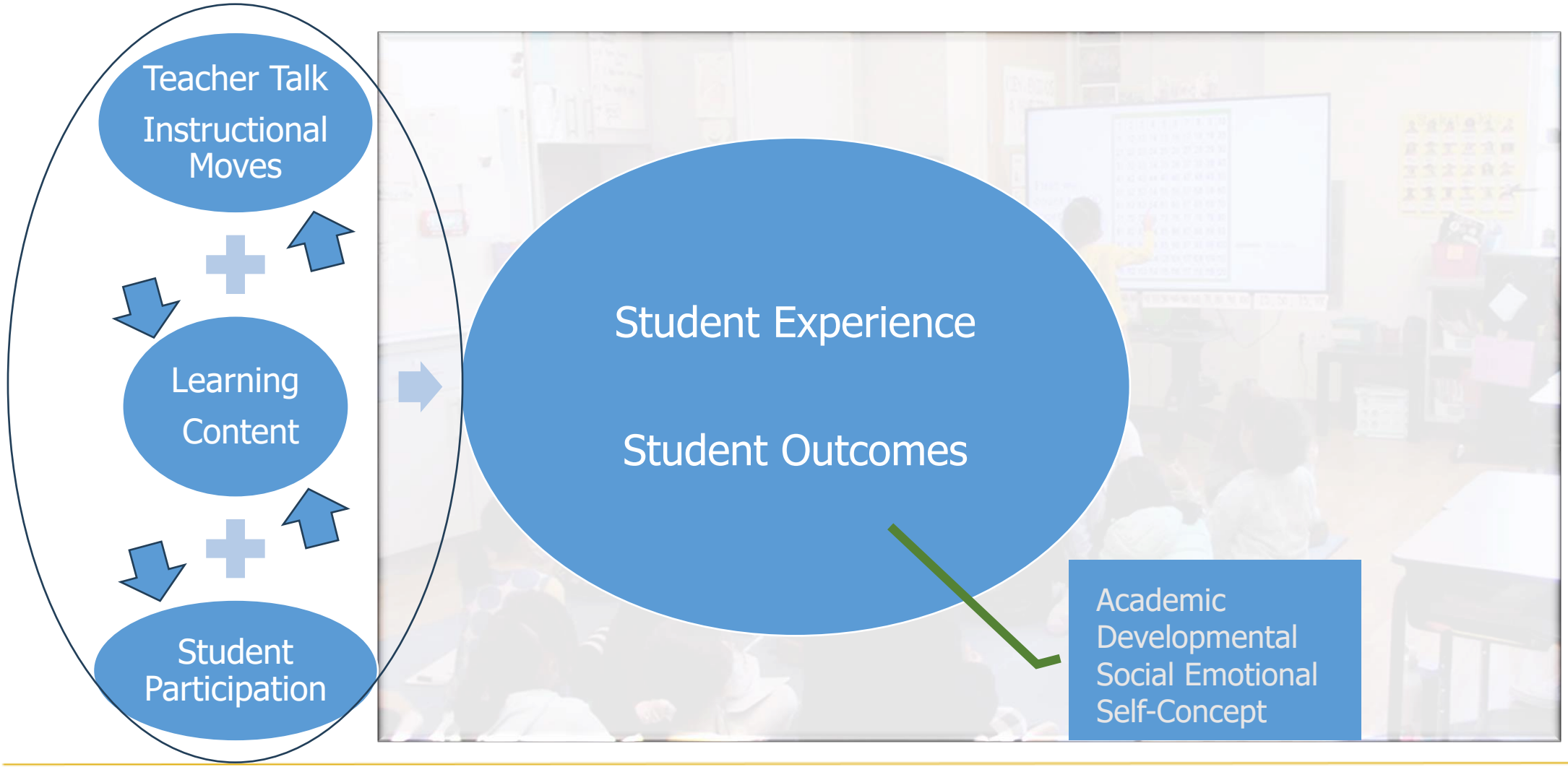
- Are Mamadou's ideas welcomed?
- Are Mamadou's contributions seen as valuable?

How does the teacher position Mamadou as a **capable & competent** member of the community?

What "message" might this interaction be sending to Mamadou about **who he is as learner**?

How is Mamadou 'seen' in his **community**?

Teacher Talk + Learning Content + Student Engagement



Universally Design Learning Opportunities

*Ensure neurodivergent students **have access** to the learning opportunity*

- Choose **learning materials** carefully
  - Learning content is linked with teacher talk & student participation
- Provide opportunities for students to demonstrate & express their thinking in **different ways**
  - Give students multiple learning materials to make their thinking visible (e.g., manipulatives)
  - Allow for multiple ways to solve problems & multiple 'right answers'
- Maintain rigor & cognitive demand
  - Include **accommodations, scaffolds, & materials** to help students access opportunities

Consider Interactions

Build in **open-ended questions** to allow students to share their unique ideas

- Verbal & nonverbally

Be **responsive** to what students are saying, doing, and showing

- Students have different ways of expressing themselves

Presume competence

- View learners **as capable** problem-solvers with strengths and competencies

Leverage students' **strengths**

Universal Design for Learning (UDL)

Thank You!

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