

**Making Math Relevant and Meaningful:
Hands-on Activities for Learners with Severe and Multiple Disabilities**

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$1 + 2 = 3$ $2 - 1 = 1$ $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$

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Participant Poll

What is your role?

A. Early Childhood setting?

B. In General education classroom, inclusive setting?

C. As behavior support paraeducator?

D. One-on-one support paraeducator?

E. Significant disabilities program (self-contained setting)?

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Session Focus and Objectives

1 2 3 4 5

- Focus of Session:** Planning and delivering Math area content integrated with functional activities to students with cognitive, communication, motor, and behavior challenges.
- Participants will gain skills in how to address key concepts in Math content area:**
 - To use numbers in a variety of forms to solve problems in daily life.
 - To increase awareness of amount, size, time concepts and the use of measurement tools.
 - To use money in real-life situations and to solve problems using combination of coins and bills.
- Depiction:** multi-sensory, hands-on activities augmented with student-scenarios.
- Applying UDL principles to ensure accessibility and active learner participation**
 - Adjust the task complexity level aided with diverse, adapted teaching tools to facilitate student progress**

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Padmaja's Sarathy' Books and Publications

Early Childhood Transition Guide

Parenting Book

Executive Function

Students with Significant Disabilities

Serving Students Severe & Multiple Disabilities

Autism: Support Strategies & Interventions, Autism Seven Steps of Support, Music CD – Transitions

Behavior Guide (Preventive and Positive Approaches) and Mindfulness Guide

Early Childhood: Transition; Parenting Guide; Executive Function - Early Years; and STEM Teaching Strategies

Paraeducator Training Guide and DVD

Severe and Multiple Disabilities: Significant Disabilities and ESSA

Mindfulness Guide

Autism Spectrum Disorders New- Second Edition

Behavior Guide

STEM Teaching Strategies For Young Learners (Pre-K to Elementary)

POWER TRAINING

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This webinar draws information from the following books:

Serving Students With Severe and Multiple Disabilities: A Guide to Effective Instructional Strategies

Students With Significant Disabilities At the Crossroads of IDEA and ESSA

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An Overview of UDL-Guided Lesson Framework

Curriculum Content Standards
Targeting the big ideas/critical functions of standards at a different level of expectation and achievement

Student Profile
A portrayal of cognitive, communication and social behavioral needs, strengths and preferences

Materials Needed
(Assessing lesson-specific and student support materials and technology (e.g., adapted texts, power point presentations, etc.))

Standards-aligned IEP Objectives
(Checking objectives that address social, behavioral and communication needs leading to desired life goals for the student)

Description of Activity
(A description of how to implement instructional activities tied to content standards)

Student Participation and Learning
(Describing the different ways student can respond and to demonstrate knowledge)

Delivery of Instruction
(Multiple means of presentation to engage and actively student during instruction)

Adaptations and Supports
(Student and course-specific instructional adaptations and supports)

Extending the Lesson
(Additional content-related activities to connect with prior knowledge and available opportunities to practice)

Process Monitoring Data Sheet

Advancing Learning Outcomes for Students with Severe and Multiple Disabilities

Adapted from Sarathy's Book: Students With Significant Disabilities: At the Crossroads of IDEA and ESSA All Rights Reserved

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Begin with the End in Mind!

Consider:

- How will this activity or adaptation and support prepare the student to be more independent and to improve his/her quality of life?
- How can you broaden his/her world?
- How can you build a positive perception about the learner in the eyes of others through this lesson/unit?
- How can this lesson/unit facilitate interactions with typical peers and promote social inclusion?
- What instructional activities will enable the student to gain self-dependence and control over the environment?

"If someone does not expect or is not expected to achieve, then they never will."

If we act as if students can do something, they just might be able to. Develop an expectation of performance however limited they may be.

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Learner Profile: Strengths, Needs and Preferences

Gail is able to:

- Count one to three objects accurately.
- Identify numerals to 5.
- Works at the pre-symbolic communication level (body movements, facial expression, vocalization & touching objects)

Needs:

- Learning to use a few picture symbols.
- Using a wheelchair for mobility.
- Receiving training to use simple AT devices.
- Gets confused and starts to make errors if asked to count groups with more than 3 items.
- Does not consistently demonstrate one-to-one correspondence.
- Treats math representational items sometimes as play objects, picks them up, throws them or moves them around randomly.

Math: Materials Needed

- Objects to Count: concrete items - straws, pencils, balls, forks, spoons, crackers, etc.
- A Graduate Number Line
- Paper cups, bean bags, etc.
- Identifying numerals: clock, calendar, textured number cards, Talking Calculator, etc.
- AT devices & Response tools
- Touch 2 balls.
- A small flashlight to draw attention and focus.

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Math: Preparation and Instructional Delivery

Engage the learner and facilitate response (apply UDL):

- Begin with **student counting 1-5 objects** (to experience success).
- Use student-preferred objects** to obtain attention and to sustain interest.
- Draw attention to counting the objects to place in the cup. Student **places the required number of objects** (touching each object).
Alternative: Eye-gaze board with objects attached
- Student **points to the correct cup with the right number of objects** instead of a verbal response.
- Student **matches numerals to corresponding number of objects**.

Target Objectives - Gail

- Counting skills - Recognize how many in sets of objects - using concrete objects to 10 or higher.
- Identify numerals.
- Use numbers to solve everyday problems.
- Use bells inserted in mini plastic bags, if needed.
- Support with technology.

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Math: Extending the Lesson - Linking the Functional

- Get student to count in a variety of real-life situations.**
 - Use a variety of objects - e.g., lunch and breakfast items to count using functional and preferred objects Help to strengthen number sense and expand vocabulary.
 - Two things you ate for breakfast/lunch (pointing to photos).
 - Count the number of glue bottles (markers, erasers, brushes, etc.) in the basket in the art room.
 - Count the number of people at the table during lunch.
 - Show me two people with a ball in gym.
 - Count the number of people lining up to ride the bus.
- Make sets/packets of objects** for office/cafe/terial/classes.
- Play individual group game** using an AT device. Make a random number selection and gets to toss corresponding number of bean bags.

Play math Bingo game.

All-Turn-It Spinner with number overlay

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Participant Poll

- Identify the adaptations that you routinely use to teach Math concepts to students with significant cognitive, communication and motor needs?**
 - An eye-gaze system for individual students to engage with and respond?
 - A graduated number line attached with concrete items attached to student desk?
 - A math wall with concrete representational items linked to specific math concepts?
 - Textured numeral cards (e.g., adding texture with wiki-stik or puff paint)?
 - An array of answer choices (2 to 4 choices) to select from to respond.

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Delivery of Instruction - Performing Math Operations

Addition and Fraction

- Begin with counting objects (dropping 3 or 5 pennies in cup)
- Introduce "addition" by modeling and creating addition problems and combining it with real-life examples.
- Teach using concrete examples: $+$ symbol (explain it means to "add") and $=$ symbol (explain it stands for "equal to").

Move from Concrete to Representational to Abstract.

Concrete **Representational** **Abstract**

Have student build the number sentence.

Show $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ and whole with cutting a paper plate and an apple.

Jose - Strengths & Needs

- Can count & identify numerals to 10; can create sets up to 8 with modeling

Target Objectives:


- Perform 1 digit addition (1-9).
- Understand fractions are parts of a whole.
- Fractions: Use real objects - paper plate, apple, straw, etc..

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Delivery of Instruction: Money

- Introduce the money concept by pairing real items with their cost.
 - It will offer a language-based experience on real-world math.
- Teach money concepts in the context of a classroom (mock) store. Set it up with a few items to practice money skills (academic and functional element).



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Target Objectives


- Understand that money is used to pay for an item.
- Buy and pay for an item. (Identify \$ bill and coins).
- Exchange right amount for item purchased.
- Make a price comparison: Which is less expensive, a raisin packet for .50¢ or a packet of chips at .75¢ etc.
- Guide student to use the vending machine at school to make price comparisons.
- Develop personal living skills; engage in social communication (at store).

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Instructional Delivery: Measurement Concept & Tools

Ensure Active Engagement & Response at Diverse Levels

- Size:** Order items by size.
- Quantity:** identify quantities of (**Less and More**)
- Weigh and compare the weight of two objects.** Make the tasks less complex. Preselct items to compare - heavy and light .
 - Note and record the weight.
 - Identify which is heavier: A book or a feather? A bag of cotton balls or bag of pennies or chips?
 - Sort items by weight.
 - Place objects to be weighed on the scale.
- Temperature:**
 - Go outside to **check the temperature.**
 - Observe changes in thermometer reading.
 - Mark the thermometer with colored dots.



Adjust task complexity.

Compare the weight: Heavier? Lighter?

A book or a bag of popcorn; banana or apple; metal or plastic spoon.

Compare temperature:

- Indicate understanding of temperature - hot/cold - by making cold lemonade and warm cookie.

Weather and Seasons

- Use concrete props: sunglasses to represent a sunny day or summer; cap/mitten or (fake snow - polymer) for cold day/ winter; umbrella for rainy day.

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
Measurement Activities - Adjust Task Complexity

Adjust task complexity level.

Targeted Objectives

- Associate clock/time with a routine activity.
- Help to set timer for a specific # of minutes.
- Assist measuring time for an activity using a stopwatch (eating lunch).
- Identify the day of the week using adapted calendar.
- Sort items by weight.
- Order by size 3 items.
- Measure 3 different lengths of yarn (longer/shorter?)

- Match measurement tools with their functions** (thermometer, weighing scale, ruler, clock, calendar, measuring cup, etc.).
- Provide an array of answer choices: objects to match with pictures + text.
 - What tool do I use to measure 2 weeks if I am going on a 2-week trip?
 - What tool do I use to measure the bulletin board (cover with cloth)?
 - What measurement tools do I use to make a gallon of lemonade? Have students measure how many spoons of lemonade mix it took to make a cup of lemonade or how many cups of water it took to make the gallon of lemonade.
- Record AM and PM temperature, maintaining a log for a week.** Identify the hottest/coldest day of the week and variations in temperature between AM and PM.
- Target student can input the number into a preprepared chart (computer). Blend it with roleplay, wear sunglasses/mittens for hottest/coldest day. Can hold up the printed temperature charts for the class to see.

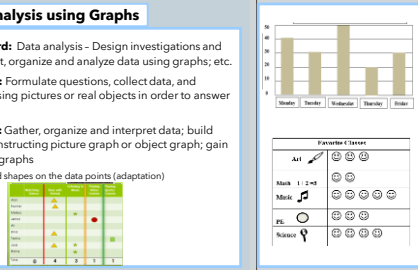


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Math - Data Analysis using Graphs

- Academic Standard:** Data analysis - Design investigations and gather data; Collect, organize and analyze data using graphs; etc.
- Introductory Skill :** Formulate questions, collect data, and construct graphs using pictures or real objects in order to answer questions.
- Target Objectives:** Gather, organize and interpret data; build representations constructing picture graph or object graph; gain familiarity with bar graphs
 - Place Velcro-backed shapes on the data points (adaptation)



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An Adapted Graphing Chart with Representational photos

	Time with Friends	Listening to Music	Playing Video Games	Playing Sports/Games
Alan				
Rachel				
Melissa				
Jerrold				
Ali				
Dina				
Tarsha				
Jose				
Elaine				
Total	2	0	4	3

Data Analysis using Graphs

- Show models of completed graphs to show how data is collected, construct the graph, and conclusion is drawn from interpreting the data.
 - A bar graph; a pictograph and object graph
- Students vote their choices to determine the most-favored leisure activity.
- Some may vote selecting from all 4 (or more) and record the total # of votes per column.
- Answer a # of questions using the data on the graph--draw conclusions from the graph?

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Math - Data Analysis using Graphs

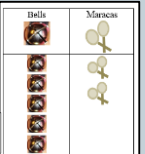
Favorite Leisure Activity: Playing Video Games

Activity	Count
Play Sports	3
Play Video Games	4
Time with Friends	2
Listen to Music	0

Adaptations in task complexity

- Identify his favorite activity given choices to select from.
- Jose can count the number of votes that each of the 4 leisure activities received.
- Identify which leisure activity got more and which one the least number of votes.
- Construct a graph with blocks to compare more/less.
- Construct a graph using real objects, asking her peers to choose between two items.

An Object Graph



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Participant Poll

- Prior to delivering the math lesson, which of the following do you routinely use during the planning stage for students with significant and complex special needs?
 - Consider the specific motor needs of the student in devising the adapted materials?
 - Limit the amount of intrusive hand-over-hand physical prompting during math instruction?
 - Adjust the task demand and complexity level – e.g., the # of objects and the numerals presented at a given time or limit fractions to $\frac{1}{2}$ and $\frac{1}{4}$ to increase the chances of student success?
 - Use several hands-on activities with multi-sensory materials to engage the student and to facilitate understanding of the new concept and associated vocabulary?
 - Integrate math instruction to real-life events routinely for generalization – calendar activities, attendance, counting students in the group/line, the school/classroom store?

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Personalized Response-Participation Supports

- Have student **manipulate objects/pictures**.
- **Gesture toward the right number** (response) or respond with eye gaze at objects attached to a mini-board. (Eye-gaze/mini board)
- Use **'Yes/No'** cards (or like/dislike) paired with photos.
- **Select from answer choices** (begin with 2 choices - correct & incorrect response. Gradually, increase the challenge-
- **Activate an AT device** to gain a voice (auditory)


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Adaptations & Supports

Math Wall



Adapted Calendar



A small flashlight to draw and sustain attention.

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Extending the Lesson: Generalization

Provide students with multiple opportunities to generalize skills in a variety of settings and functional situations.

- **Measurement:**
 - Measure height/width of bulletin board, desk, cabinet, etc.
 - Practice measurement during cooking activities
 - Look for items to measure around the school.
 - Measure the length, height, or width of a box. Given 2 sheets of paper, determine which of the 2 is the right size to wrap the box.
- **Money skills** - Determine the items they can purchase in the school/classroom store given a collection of quarters and dimes with a total value a dollar.

Consider the interests and preferences of student to make math activities accessible, engaging and meaningful.

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Extending the Activities

- Offer stimulating folder activities for independent practice with Velcroed representational items.

Count

Addition

Money

- Challenge at a higher complexity level: Introduce the terminology – **mean, median and mode** – to describe the set of data after student has fully mastered gathering and interpreting data.

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Monitor Progress - Math Objectives

A few examples:

- Match set of objects with corresponding numeral on a number line.
- Select the answer choice for addition problems given 3 choices.
- Identify the corresponding fraction symbol ($\frac{1}{4}$, $\frac{1}{2}$ or $\frac{3}{4}$) given visual representations.
- Construct a graph given a set of data (e.g., favorite ice-cream) and compare two different flavors by gluing pictures (or Velcroing representational objects or shapes).

Opportunity 1: (3 answer choices to select from)

Response: ☐ Correct ☐ Incorrect

Prompts Used: V ___ G ___ P ___ R ___

- Use anecdotal record to gather additional data in a variety of settings.

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Use a 'Data Collection Form' to document progress.

Task: Addition

- ☐ Opportunity 1
- ☐ Correct ☐ Incorrect
- ☐ Opportunity 2
- ☐ Opportunity 3

Prompts used:

- Verbal (V) ___;
- Gestures, pointing (G) ___;
- Physical (P) ___;
- No Response (R) ___

Re-teach?
Modify strategies?
Adapt materials?

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Serving Students with Significant Disabilities

Key Take-Aways

Reteach Skills:
academic & functional objectives.

Ensure consistent use of personalized adaptations.

Deliver systematic instruction with effective use of prompts and cues.

Minimize intrusive support & maximize discreet support.

Enable and advance student self-dependence.

Monitor student progress using regular data probes



Guide paraeducators to deliver optimal, not intrusive support.

Have positive perceptions with high expectations for students and pursue them intensively.

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The Main Resources

Students With Significant Disabilities: At the Crossroads of IDEA and ESSA: LRP Publications. (www.lrp.com)

- The book includes Q&As providing guidance on new requirements for serving students with significant disabilities, plus the latest research on how to make learning more accessible and engaging, and to enable students to demonstrate what they have learned.

Serving students with severe and multiple disabilities: A guide to strategies for successful learning. (Second Edition) LRP Publications.

A Step-by-step guide to planning and delivering a vibrant learning environment that promotes active learner engagement

A new updated edition to be released soon.

(www.lrp.com)

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Resources for Significant Disabilities


- *Serving Students with Severe and Multiple Disabilities: A Guide to Strategies for Successful Learning*. Sarathy, P. (Updated New Edition to be released shortly, 2021. LRP Publications, PA. (www.lrp.com))
- *Students with Significant Disabilities: At the Crossroads of IDEA and ESSA*. Aligning Standards-based Instruction, Alternate Assessments, and IEPs with UDL-Based Instructional Techniques and Technology. Sarathy, P. (2017). LRP Publications.
- *Paraprofessional Power Training DVD and Trainee Manual*. Sarathy, P. (2012). Ed311, Austin, TX. Website: <http://www.ed311.com/>.
- *Positive Behavior Intervention for Students with Autism* (Second Edition, 2021): A Practical Guide to Avoiding the Legal Risks of Seclusion and Restraint. Horsham, PA: LRP Publications.
- *Autism Spectrum Disorders: Seven Steps of Support* - a laminated guide., Sarathy, P. (2015). NPR, Inc.

Websites:

- CEEDER Center: <https://ceeder.education.ufl.edu/>
- UDL Guidelines (CAST): <https://udlguidelines.cast.org/>

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THANKS.

A special thanks to AbleNet University
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Upcoming Webinars:

- ❑ **Thursday, January 20th, 2022:** Children with ASD: Understanding and Responding to the Communication, Behavioral and Social Characteristics
- ❑ **Tuesday, February 22nd, 2022:** Setting and Student-specific Personalized Interventions and Supports for Children with ASD
- ❑ **Tuesday, March 29th, 2022:** Transform Transition Meltdown to Calm-down: Seven Support Strategies for Children with ASD

Thanks.

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