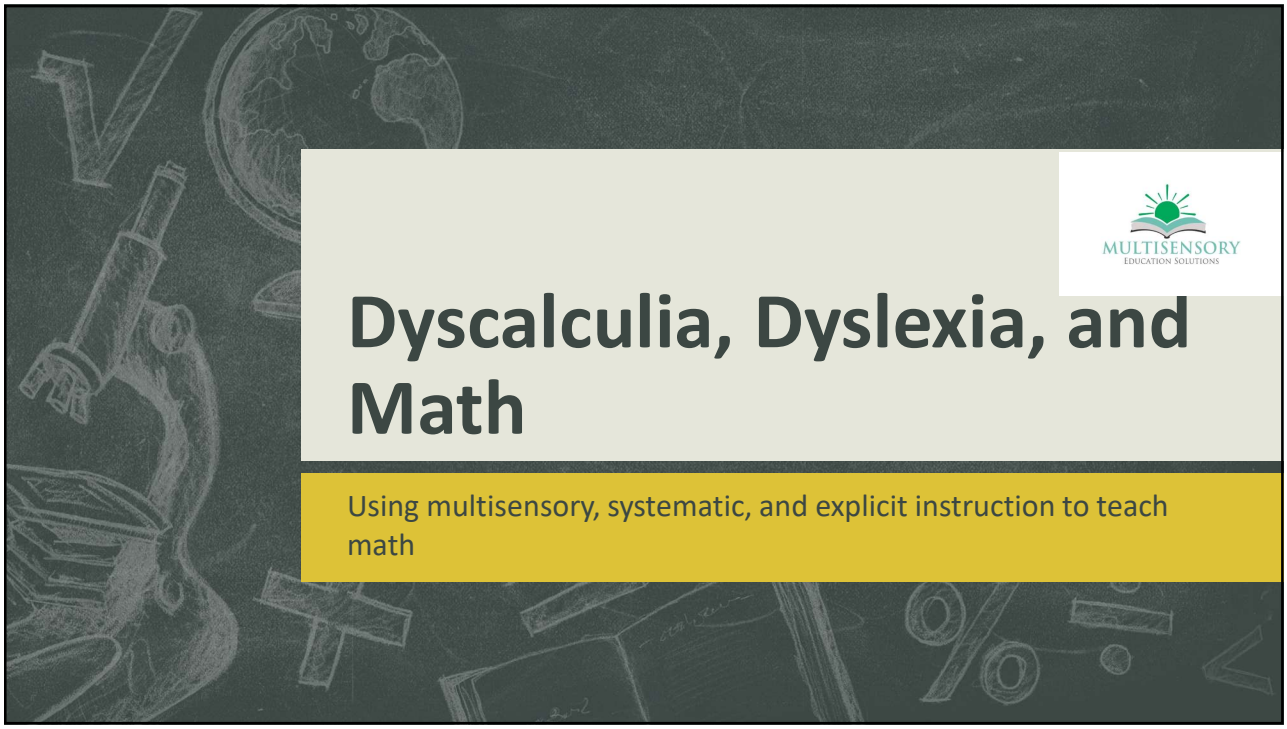


LAURA WILLIAMS
EDUCATION DIRECTOR

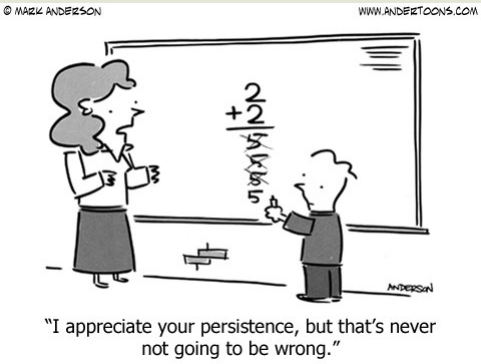
MULTISENSORY
EDUCATION SOLUTIONS

Degree in Elementary Education from Ball State University

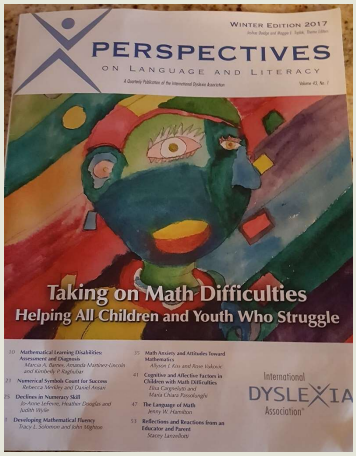
Education Specialist with the Dyslexia Institute of Indiana from 2006-2015.

Advanced Orton Gillingham
Multisensory Math
Structured Word Inquiry
Framing your Thoughts
Visualizing/Verbalizing
RAVEO

Have you ever seen a student totally overwhelmed by math? They just clearly don't get it.



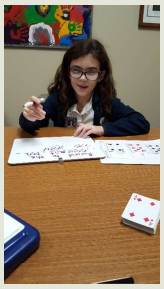
Dyscalculia

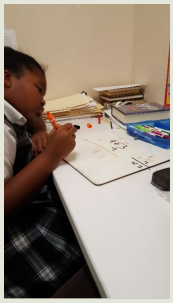


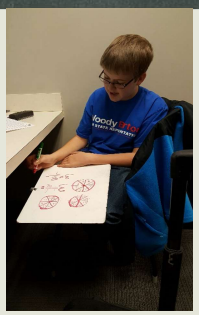
- 50% of students with dyslexia also have a math learning disability and vise versa
- The efficiency (i.e. speed and accuracy) of university students ability to solve problems such as 34+17 or 456 x 3 has declined by 25-40% over the last 20 years
- Students are not spending the time mastering numeracy skills
- Weak recall of facts places added stress on the working memory of students- taking away focus from the deeper or conceptual aspects of the math to be learned

There are different and often coexisting conditions that cause students to struggle with math.

- Dyscalculia
- Dyslexia
- Dysgraphia
- ADD, ADHD
- Processing Speed

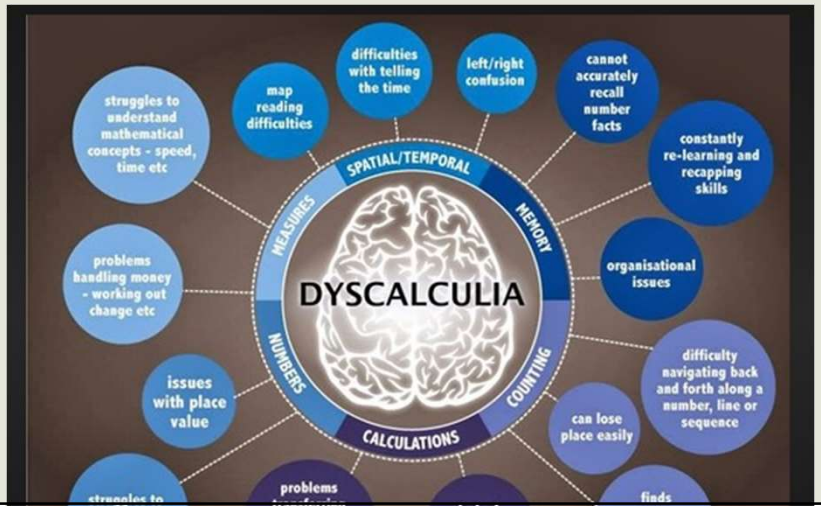






Some common struggles:
Math facts, vocabulary, number sense, steps to solve problems, inaccurate conceptual understanding, trouble keeping track of math problems- lining up numbers

What is dyscalculia?



Signs of Dyscalculia- Preschool-K

Signs of Dyscalculia in Preschool

- ☐ Has trouble learning to count and skips over numbers long after kids the same age can remember numbers in the right order.
- ☐ Doesn't seem to understand the meaning of counting. For example, when you ask for five blocks, he just hands you a large group of blocks, rather than counting them out.
- ☐ Struggles to recognize patterns, like smallest to largest or tallest to shortest.
- ☐ Has trouble understanding number symbols, like making the connection between "7" and the word *seven*.
- ☐ Struggles to connect a number to an object, such as knowing that "3" applies to groups of things like 3 cookies, 3 cars, or 3 kids.

Signs of Dyscalculia in Elementary

Signs of Dyscalculia in Grade School

- ☐ Has difficulty learning and recalling basic math facts, such as 2 + 4 = 6.
- ☐ Still uses fingers to count instead of using more advanced strategies (like mental math).
- ☐ Struggles to identify math signs like + and – and to use them correctly.
- ☐ Has a tough time understanding math phrases, like ***greater than*** and ***less than***.
- ☐ Has trouble with place value, often putting numbers in the wrong column.

Signs of Dyscalculia in Middle School

Signs of Dyscalculia in Middle School

- ☐ Struggles with math concepts like commutativity (3 + 5 is the same as 5 + 3) and inversion (being able to solve 3 + 26 – 26 without calculating).
- ☐ Has a tough time understanding math language and coming up with a plan to solve a math problem.
- ☐ Has trouble keeping score in sports games and gym activities.
- ☐ Has difficulty figuring out the total cost of things and often runs out of money on his lunch account.
- ☐ May avoid situations that require understanding numbers, like playing games that involve math.

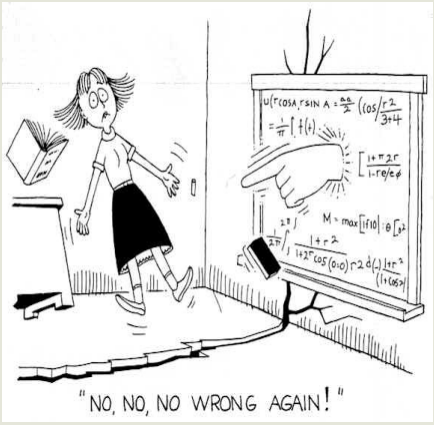
Signs of Dyscalculia in High School

Signs of Dyscalculia in High School

- ☐ Struggles to understand information on charts and graphs.
- ☐ Has trouble applying math concepts to money, such as making exact change and figuring out a tip.
- ☐ Has trouble measuring things like ingredients in a simple recipe or liquids in a bottle.
- ☐ Lacks confidence in activities that require understanding speed, distance and directions, and may get lost easily.
- ☐ Has trouble finding different approaches to a math problem, such as adding the length and width of a rectangle and doubling the answer to solve for the perimeter (rather than adding all the sides).

Understood

Math Anxiety

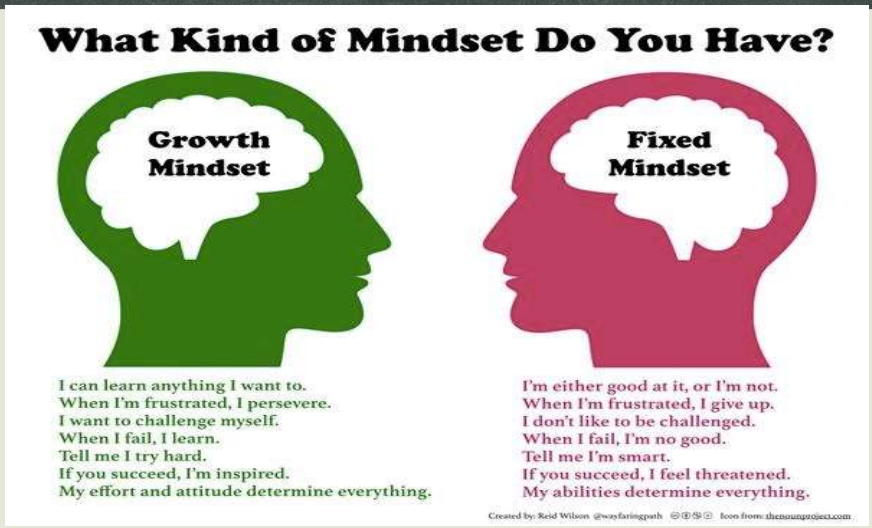


Struggling math students often develop **math anxiety**. This can be compounded by adults who have weak math skills and are anxious about helping kids with math. In addition, since math is cumulative, and so many areas are covered many students develop phobias about math or certain areas in math.

Growth Mindset and the power of yet….

It is possible to remediate math.

Early intervention- staying in touch and catching difficulties early.

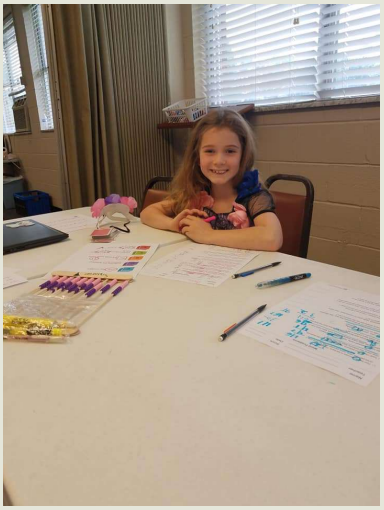


What Can I do- Number Sense

A early warning sign for future continued struggles in math is difficulty with number sense and struggles with conceptual understanding.

Intervene! Provide multisensory teaching and work to build number sense.

Building number sense with manipulatives



Multisensory Math Concept

Growth Mindset- The power of yet…

Explicit instruction and modeling

Tie to the big picture and the known

Multisensory- seeing, saying and doing

Cumulative and repetitive

Diagnostic and prescriptive- you are a student of your student

Process of introduction of a new skill in math

Concrete-Representational (Pictorial)-Abstract
https://www.youtube.com/watch?v=weCPBlJVSrI

Essentials for Multisensory Math

Growth Mindset- The power of yet…

Explicit instruction and modeling

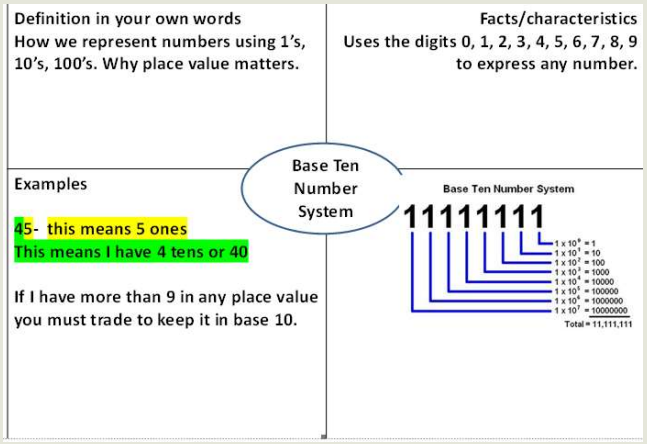
Tie to the big picture and the known

Multisensory- seeing, saying and doing

Cumulative and repetitive

Diagnostic and prescriptive- you are a student of your student

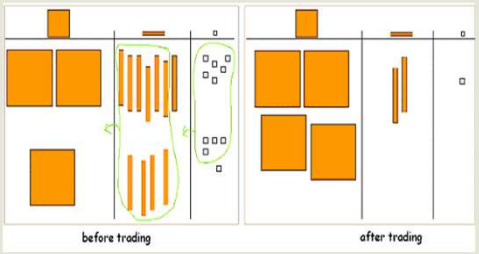
Activate Prior Knowledge



Concrete

Introduce concretely

Addition with regrouping- Physical base 10 blocks



Start by modeling the concept and verbalizing each step as you go.
Then do some together asking the student to explain and correcting any misunderstandings and filling in any vocabulary they may need help with.
Finally, have the student independently do problems concretely while they verbalize the steps.

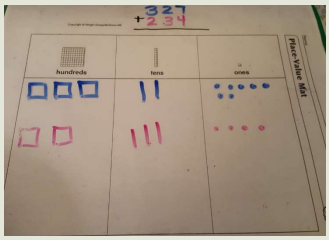
Prerequisite vocabulary

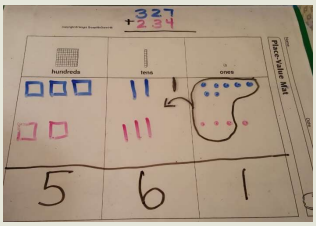
Teach vocabulary and create vocabulary cards at this point

Representational (Pictorial)

Once the student has shown that they are able to successfully solve the problems with manipulatives, follow the same steps to introduce solving problems using a representation.

1. Model
2. Do some together asking them to verbalize and correct any misunderstandings
3. Students solve problems independently with a representation and are able to verbalize each step

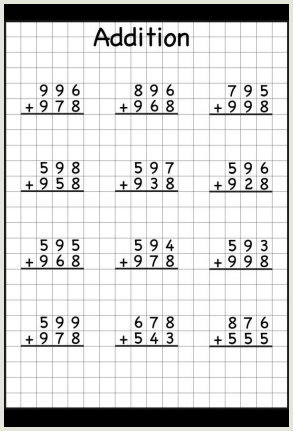




Abstract

Students only move to this level once they have a solid understanding of the concept

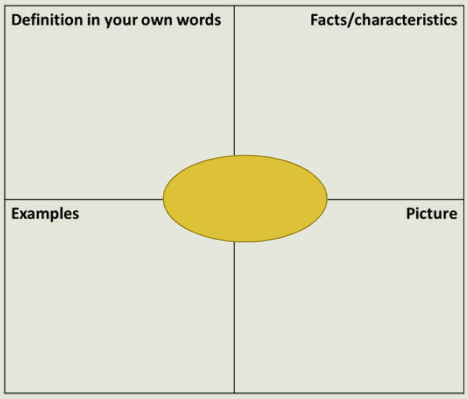
If errors are made, have them go back and draw a picture to help them figure out what they did wrong



Adding Fractions with unlike denominators

Vocabulary- Activate Prior Knowledge

- Addition
- Multiplication
- Fraction- numerator/denominator



Concrete

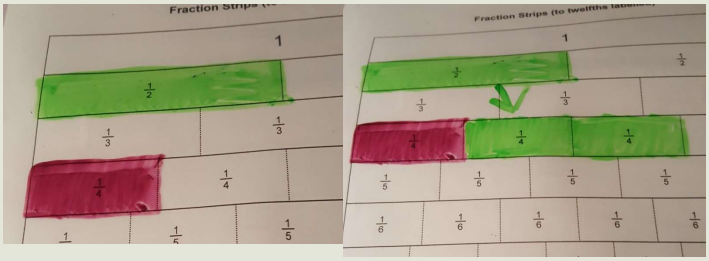
Addition of fractions with unlike denominators

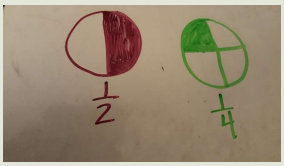
2/3 +1/6

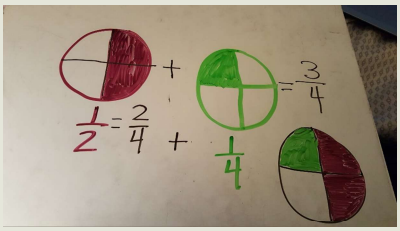
Prerequisite skills-addition facts, multiplication facts

Representational (Pictorial)

¼ + ½=







Abstract

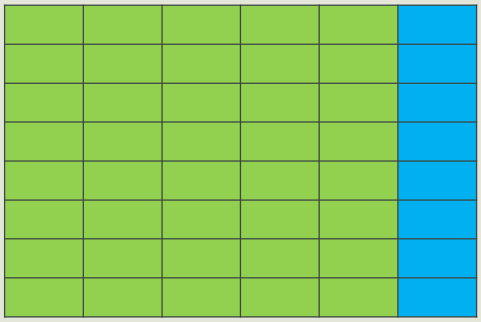
Many students should still see, say and do at this stage.

$\frac{7}{10} + \frac{1}{5} =$

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

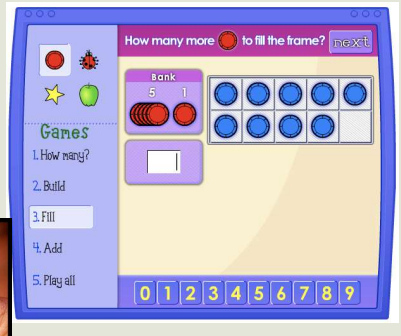
Intervention tips- Math Facts

- Directly teach strategies to aid in figuring math facts
- We can use our knowledge of x5 to help us figure out x6
- To figure 8x6: we know that 5 groups of 8=40 if we add another group of 8 (40+8)we will have 6 groups of 8 so 6x8=48
- Targeted practice with each strategy



What can I do- Math Facts

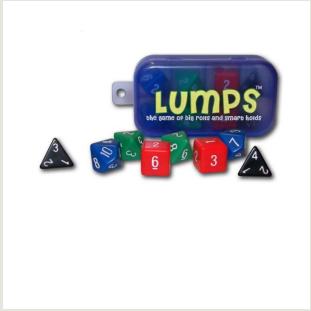
- Keep building strong numeracy- 10 minutes of practice a day with targeted practice and mixed review practice



Targeted Practice

https://quizlet.com/_5c2iac

https://illuminations.nctm.org/
https://www.ixl.com/



What Can I do- Vocabulary

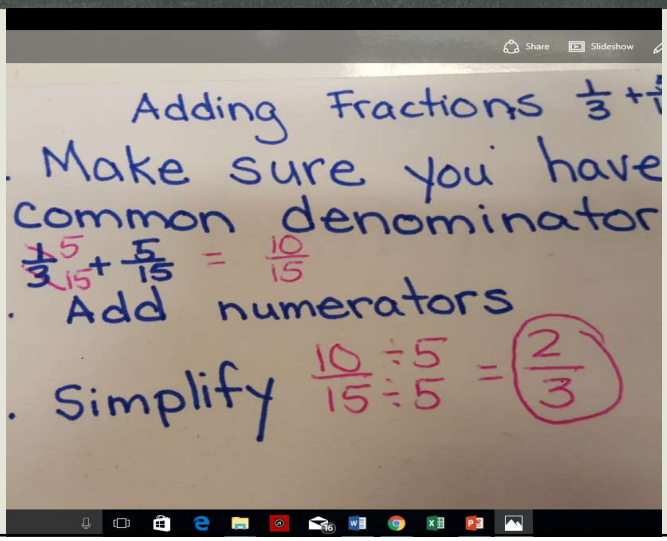
- Math has specific vocabulary that can be confusing for students
- Make sure to directly teach and define relevant vocabulary
- Create visual vocabulary cards- file as a resource for students to pull out as a reminder
- Review necessary old vocabulary when you need it to learn something new.

What Can I do- Trouble with Steps

Once a student understands the concept, they still may struggle with the multi-step processes involved in math.

As you teach, create a card with steps for solving- file and pull out as you review. Include plenty of spaced practice.

Once they become more automatic, have them state the steps without the card.



Filing my Learning

Number Sense
- Counting
- Place value
- Comparing numbers

Computation and Algebraic Thinking
- Addition and subtraction
- Solving word problems involving addition, subtraction
- Arrays for multiplication

Geometry
- Shapes
- Position words
- Fractions
- Drawing shapes
- Attributes

Measurement
- Time
- Money
- Weight
- Length
- Temperature

Filing my Learning

Data and Statistics

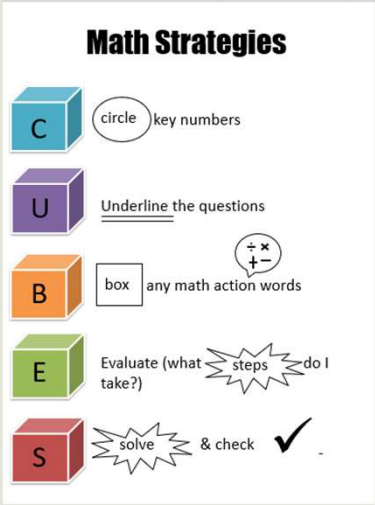
- Organizing and graphing information
- Interpreting and analyzing information from graphs.

The skills that children learn at each grade level can be found at http://www.doe.in.gov/standards/mathematics

What about story problems?

Give students a framework to begin to solve a story problem.

Make sure that they student can read the problem.



File concept and use in reviews for practice- Frequent review is needed until concept is overlearned and "easy"

- Allow for practice at all levels
- Use tools when necessary
- Students need a growth mindset
- Learn to embrace mistakes as growth opportunities
- Set realistic goals where success is experienced frequently

Sources

Indiana Department of Education-State Standards

http://www.doe.in.gov/standards/mathematics

Mathematics Instruction for Students with Learning Disabilities or Difficulty Learning Mathematics
http://www.centeroninstruction.org/mathematics-instruction-for-students-with-learning-disabilities-or-difficulty-learning-mathematics-a-guide-for-teachers

Concrete-Representational (Pictorial)-Abstract
https://www.youtube.com/watch?v=weCPBlJVSrI

Vocabulary cards
https://fransmentorportfolio.wikispaces.com/file/detail/Math+Vocabulary+Posters+-Visual+Tricks+to+Remember+(2).pdf

Understood
www.understood.org

Additude Magazine
www.additudemag.com

Want to know more?

MULTISENSORY
EDUCATION SOLUTIONS

Keep in touch:

Laura Williams

Education Director

Multisensory Education Solutions

Website: multisensoryed.com

Email: multisensoryed@gmail.com