What Teachers Need to Know to Assist ELLs in Math

Anita Bright, Ph.D., Fairfax County Public Schools, VA
and
Ms. Alexandra Dominguez, Region 20, TX
Welcome to the second Webinar of the school year on “What Teachers Need to Know to Assist ELLs in Math.” Today’s webinar is hosted by the National Clearinghouse for English Language Acquisition, NCELA, located at the Graduate School of Education and Human Development at The George Washington University, funded through a contract with the U.S. Department of Education's Office of English Language Acquisition.

NCELA's mission is to provide technical assistance information to state and local educational agencies on issues pertaining to English language learners.

My name is Kathia Flemens, Ph.D., a Research Associate at NCELA and your Webinar facilitator.
Today our presenters are:

- Anita Bright, Ph.D., is the Secondary ESOL Mathematics Instructional Support Teacher in the FASTMath program at Fairfax County Public Schools in Virginia. Dr. Bright works with approximately 100 secondary teachers in about 60 schools in the region of Northern Virginia. Dr. Bright will be presenting an overview of the FASTMath program.

- Ms. Alex Dominguez is an Educational Specialist and member of the Mathematics Achievement = Success (MAS) Content Advisory Team. She works directly with Region 20 districts in Texas implementing MAS in the summer and will also present an overview of her program.
FAST Math
in Fairfax County Public Schools,
Virginia
Focus on Achieving Standards in Teaching Mathematics
What is FAST Math?

- Mathematics program for certain ELLs

- Includes a dual focus on English language acquisition and mathematics

- Tailored to unique needs of each learner
The context of Fairfax County Public Schools
Our FAST Math students

- Enrolled in grades 7 – 12
- Beginning level of English language proficiency
- At least two years below grade level in mathematics
All newly arriving Language Minority students are assessed with the Entry Assessment Mathematics Evaluation (called the “EAME”)
The EAME

- Administered in heritage language if available
  (we have approximately 35 translations)

- Covers mathematics content from grades 1 through 8

- Based on Virginia state standards
If students qualify, they are scheduled for FAST Math

- Designed to be taught by *either* a mathematics or an ESOL certified teacher
The big ideas

- Goal is to prepare students for Algebra as quickly as possible
- Includes a dual focus on ENGLISH and MATHEMATICS
- Interactive and manipulative-based
Everything is aligned to the Virginia Grade 7 Mathematics Standards of Learning
# Middle School FAST Math Year at a Glance

<table>
<thead>
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<th>Quarter 1</th>
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<tr>
<td><strong>Topic</strong></td>
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<td><strong>Statistics</strong> 3 weeks</td>
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<td><strong>Integers</strong> 3 weeks</td>
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<td><strong>Number Systems and Properties</strong> 1 week</td>
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| Quarter 2 |
All students are working TOWARDS the Grade Level Standard
But… students in FAST Math are missing foundational skills
| Standard | MTH.G7.16  
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<td>SOLVE PROBLEMS INVOLVING MEASURES OF CENTRAL TENDENCY AND RANGE</td>
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| Benchmarks |
|-----------------|---------------------------------------------------------|
| MTH.G7.16.a.1  | Examine the range to understand the spread or dispersion of the data |
| MTH.G7.16.a.2  | Describe the three measures of central tendency (mean/median/mode) |
| MTH.G7.16.a.3  | Solve problems by finding the mean of a set of data |
| MTH.G7.16.a.4  | Solve problems by finding the median of a set of data |
| MTH.G7.16.a.5  | Solve problems by finding the mode of a set of data |
| MTH.G7.16.a.6  | Identify the mode in a set of data |
| MTH.G7.16.a.7  | Solve problems by finding the range of a set of data |
| MTH.G7.16.a.8  | Solve problems for which the median is the best descriptor |
| MTH.G7.16.a.9  | Solve problems for which the mean is the best descriptor |
| MTH.G7.16.a.10 | Solve problems for which the mode is the best descriptor |
| MTH.G7.16.b.1  | Determine values for extremes, quartiles, and ranges of data sets |

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<th>Prerequisite/Foundational Skills</th>
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Essential Understandings
All students should:
- Understand and appropriately use measures of central tendency for a data set.
- Understand that range indicates how data is spread out or dispersed.

FAST Math lessons
- 6.5, 6.6
- 5.3
- 4.2
- 3.1, 3.8, 3.9, 3.10
- 2.1, 2.6, 2.7
- 1.1

State notes:
1. Measures of central tendency are types of averages for a data set. They represent numbers that describe a data set. Mean, median, and mode are measures of central tendency that are useful for describing the average for different situations.
2. Mean works well for sets of data with no very high or low numbers.
3. Median is a good choice when data sets have a couple of values much higher or lower than most of the others.
4. Mode is a good descriptor to use when the set of data has some identical values.
5. The mean of a set of numbers is the sum of the set of numbers divided by the number of numbers in the set.
6. The median is the middle number of a set of data when the numbers are arranged from least to greatest, the mean of the two middle numbers when the set has two middle numbers.
7. The mode is the number that appears most frequently in a set of data. There may be one, more than one, or none.
8. The range is the difference between the greatest number and the least number in a set of data.
9. Range indicates how data is spread out.
10. For any given problem situation involving a set of data, the analysis is likely to include examination of measures of central tendency and dispersion of this data.

Essential New Mathematics Vocabulary:
Data, mean, median, mode, range, measures of central tendency, line plot, frequency distribution, histogram, interval, stem-and-leaf, box-and-whisker plot, lower extreme, lower (1st) quartile, upper (3rd) quartile, upper extreme, interquartile range, outlier, scatterplot (scattergram)

Essential English Vocabulary:
Solve, add, count, divide, compare, order, first, last, greatest, smallest, least, value
But what should be taught?
We created pre-assessments for each Grade 7 standard.

1. Using the following set of data 11, 13, 1, 3, 21, 33, 22, 10, 20
   Count the numbers. How many?
   ____________

2. $41 + 51 + 17 = $
   ____________

3. $3{,}348$
   ____________

4. What is the median (middle number)?
   17, 21, 22, 30, 35
   ____________

5. 19
SOL 1.1: Count, read, represent numbers with place value materials, group, regroup numbers to 100.

Vocabulary

- eleven, twelve, thirteen
- fourteen, fifteen, sixteen
- seventeen, eighteen, nineteen
- twenty, thirty, forty, fifty, sixty
- seventy, eighty, ninety
- one hundred
- group
- regroup
- unit
- rod
- flat
- column

Materials

- wall-mounted Number Line 1-100
- base 10 blocks (3 rods and 25 units)
- chart paper
- Tens Number Cards
- labeled 1 ten to 10 tens (teacher-made)
- cubes, counters or other small objects

Language Foundation

1. The new vocabulary will be introduced using manipulatives in steps 1-3 in the math component. A daily review of numbers and number words would facilitate students’ use of these terms.

2. The number 13 and 30 are “close confusers,” as are the other pairs such as 14 and 40, 15 and 50, etc. At the beginning, students have difficulty hearing the difference in the two words and making the distinction. Take time to pronounce them distinctly and write them as you say them to help students build the ability to hear the difference. This is a listening skill that may take more than a year to develop.

3. Throughout the year as you work with the base ten blocks, you will need to decide if you will call the small cube a “one” or a “unit.” Either is fine, but at the beginning be consistent when you name them for the student and when you refer to them. The same applies for the “rod” or “ten” and the “hundred” or “flat.”

4. As the students work in pairs on these activities, encourage them to talk in order to build math language. Encourage the use of English, especially with you, but do not discourage the use of first language.
Mathematics Component

**Warmup:** Since this may be the students’ first experience using base ten blocks, provide some time for them to explore with the manipulatives before starting the lesson. After they have had time to explore, introduce the names of each of the base ten blocks (unit, rod, and flat). Put a **flat**, a **rod**, and a **unit** on the overhead and lead the students to notice that a **rod** is equal to 10 **units** and a **flat** is equal to 10 **rods**. (Some students may discover the relationship among the blocks on their own.)

1. Give each student a **Hundreds Board (TR)** and a bag of base ten blocks. Put up the **Hundreds Board** transparency. Ask students to put a unit on the number 1 as you model and say, “**one**.” Continue placing units on each number through 10, counting out loud as students do the same. Remove the units from the hundreds board and put a rod next to the number 10 and have students do the same as you say, “a rod is equal to 10 units.”

2. Put the **Tens Number Cards** in numerical order on the chalkboard tray. Write the number 10 on the blackboard above the card labeled 1 ten. Repeat this procedure with the remaining cards naming and writing the corresponding number above each card. (10, 20, 30...) Introduce the word names for each card, writing these above the numbers on the board. (ten, twenty, thirty...) Have the students count by 10s as you point to each number and show the appropriate number of rods. Ask students to work with a partner to **count by 10s to 100 as they point to the numbers on the hundreds boards**.
Questions?
Working Together to Make Mathematics Achievement = Success (MAS)
What is MAS?
Project SMART and MAS

Project SMART

2004: Project MATEMATICA CIG
2006: Math Plus CIG
2008: MAS CIG
MAS Consortium States

Texas, Lead State
Arkansas
Illinois
Montana
New York
Wisconsin
Missouri
Colorado
The goal of MAS is to increase migrant student achievement in mathematics through a multi-state consortium that provides high quality K-12 curriculum, instruction, assessment, innovative uses of technology, professional development, and parent involvement through interstate and intrastate collaboration.
A majority of our migrant students are English Language Learners.

An approach to learning mathematics that incorporates techniques shared in common by Balanced Literacy, Sheltered Instruction and Cognitively Guided Instruction.
Core Principles of Math Instruction

—Streamline the mathematics curriculum in grades PreK-8
—Emphasize a well defined set of the most critical in the early grades
• Focus on the Critical Foundations for Algebra
  • Proficiency with Whole Numbers
  • Proficiency with Fractions
  • Particular Aspects of Geometry and Measurement
Five Dimensions of Mathematical Proficiency

- Conceptual Understanding
- Procedural Fluency
- Strategic Competency
- Productive Disposition
- Adaptive Reasoning

ESC 20
Serving the Educational Community
Curriculum Components

- Sheltered Instruction
- Balanced Literacy
- Cognitively Guided Instruction
What is Sheltered Instruction

• A research-based approach to lesson planning which has proven effective with English Language Learners (ELLs) throughout the United States
• A lesson delivery system that allows teachers to deliver lessons that...
  – incorporate strategies consistently
  – considers the unique academic needs of students learning English
  – allows students to learn English while acquiring grade level content
  – assist students as they develop language skills (listening, speaking, reading, writing)
Sheltered instruction Components

- Lesson Preparation
- Building Background
- Comprehensible Input
- Strategies
- Interaction
- Practice/Application
- Lesson Delivery
- Review Assessment
Cognitively Guided Instruction

- Children enter school with a great deal of informal or intuitive knowledge of mathematics.
- Without formal or direct instruction children can construct viable solutions to a variety of problems.
Balanced Literacy

• No longer “whole language v. phonics”
• No longer “child-centered v. curriculum-centered”

“Balance requires teachers to choose from numerous instructional strategies to provide a balance that is appropriate for each child.”

David Denton, 1999
What is balanced literacy?

A balanced approach to literacy development is a decision-making approach through which the teacher makes thoughtful choices each day about the best way to help each child become a better reader and writer ... it is an approach that requires and frees a teacher to be a reflective decision maker and to fine tune and modify what he or she is doing each day in order to meet the needs of each child.

Dixie Lee Spiegel, October 1998
MAS: Balanced Literacy

Extensions

• What was considered
  – Before, during, after
  – Reading, writing, listening, speaking, thinking
  – Five components of literacy
  – Flexible grouping
  – Components of Balanced literacy
  – 6 + 1 traits of writing

• What is included
  – Ideas for promoting comprehension
  – Teaching points for mini-lessons with small groups
  – Vocabulary to consider
  – Literacy extension activities
  – Opportunities for writing
Daily Routine
Review Problem

Use base ten blocks to show:

66  27

3 \times 8 = \phantom{000}

Fraction Action

Pick a domino and make that fraction.

\[ \frac{2}{3} \quad \frac{3}{5} \]
Welcome to MAS Space! ¡Bienvenidos a MAS Space!

Hola, amigos. My name is Osito MAS. We are going to practice lots of math this summer. If you have a question for me, click on "Ask Osito MAS." If you'd like to ask Mrs. Bazaldua a question, please click on "Ask Mrs. Bazaldua."
This is a SEPARATE problem. Mauricio cut 20 pieces of apples. Saul put all the apples in a bowl of peanut butter. Doivon took 10 apples out of the peanut butter bowl. How many apples are left in the bowl?

Please write back and tell us how old you are. We are 6, 7, and 7 years old. Thanks!!

Re: Pregunta
by Osito Mas - Friday, 19 June 2009, 11:44 AM

I will ask Mrs. Bazaldua to send you the buttons today. You are a good typist! (It’s really hard for me to type with paws :3)

I’m getting pretty good at JOIN problems but SEPARATE problems are still hard for me and those are really big numbers. Let know how I do! I’m going to use the smiley faces to help me...

JOIN: 🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎🍎않

Re: Pregunta
by Stephanie Tomchesson - Friday, 19 June 2009, 01:11 PM

You can do big numbers Osti! We love your idea of using smiley faces to solve your problem. You lined up the smileys just right!!! Saul is going to use smiley faces and we want you to write the number sentence. We know you can do it!!!

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We will send you back a fact family for your number sentence.

😊😊😊
Have you ever been to an apple orchard or a farm? What was it like? Was it like the story Apple Farmer Annie?

¿Has visitado un manzanal alguna vez? ¿Cómo fue? ¿Se pareció al manzanal del cuento?
Unit 3
Let’s train hard for math!

- Math Maniac Puzzle of the Week
- Unit 3 Challenge
- Literature Corner
- Technology Links Unit 3

Exercise Your Brain!
Watch as Math Maniac measures a wrestling ring:
Measuring Wrestling Ring

- NM’s Wrestling Ring Measurement Blog
- MAS Vocabulary

Unit 4
Take me out to the ballpark, let me practice some math!
Dear Math Maniac,

We found fractions on the highway!! The first fraction that we found was in the street. The lanes of traffic are split into fourths. If one car is driving in one of the lanes, then that car is driving in 1/4 of the road. We see that the roads are split into thirds and then back into one highway.

We hope you agree with us, and send us a letter back. We want some more of these math problems! 😊

From:
Miss Dilbeck's 4-5 class in Hoopeston, IL

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Re: Math...
by Math Maniac - Monday, 13 July 2009, 11:13 AM

Hola Ninos en Senorita Dilbek's clase!
This is an excellent example of fractions on the highway! You are doing very well understanding fractional portions of a whole. How about this one...
In Senorita Dilbek's class what fractional portion of the students are 4th grade? 5th grade? Boys? Girls?
MM 😊

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Re: Math...
by Brianne Dilbeck - Tuesday, 14 July 2009, 08:32 AM

Good morning,

In our class, there are 6 students. There are 5/6 students are 4th graders. That means that 1/6 are fifth graders. Also, 3/6 or 1/2 of the students are boys. The other half are girls.

Have a great day!

Orlando, Juan, Raul, Emii, Victoria, and Viviana
I'm Cassie Boatwright, the television teacher for grades 4-5. We've been busy with the televised classes and have incorporated some exciting changes this year, including our new helper Math Maniac!

Please encourage your students to participate in student online community. It will give them an opportunity to interact with me, Math Maniac and other MAS students around the country. I hope you will enjoy our teacher online community, as well. You'll find all of the technology links, parent videos, and discussion questions as well as anything else you'd like to add.

If you have any questions or suggestions, please email me. Click on the "Compose" link in the Email list block to the right. Choose my name from the list of contacts and click "To" next to my name. For more detailed instructions, watch the short video at the top of the page. You may also leave a message for me at 1-866-231-5049. Please leave your telephone number and a good time to reach you and I'll call you back as soon as possible. See you in class!
MAS Online

• Mathematical Thinking (New!)
• Balanced Literacy
• Sheltered Instruction
• Cognitively Guided Instruction
Resources

• Math Plus and MATEMATICA, visit MERC website at: http://mercweb.org

• More Information regarding MAS visit http://projectsmart.esc20.net/
Questions?
Thank you for having participated in today’s webinar on “What Teachers Need to Know to Assist ELLs in Math” presented by Anita Bright, Ph.D., and Ms. Alexandra Dominguez; hosted by National Clearinghouse for English Language Acquisition, NCELA, located at the Graduate School of Education and Human Development at The George Washington University.

- For more information or if you have additional questions contact:
  FASTMath: Dr. Anita Bright at anita.bright@fcps.edu
  MAS: Ms. Alex Dominguez at Alexandra.Dominguez@esc20.net
  or

- If you have additional questions regarding the webinar contact Kathia Flemens at kflemens@gwu.edu.

This webinar will be archived on NCELA’s website. To view archived webinars, please visit http://www.ncela.gwu.edu/webinars/