Making Language Visible for English Learners in Mathematics

Best Practices for School & District Leaders!

January 12, 2022
12-1:00 P.M.
Today’s Presenters

Dr. Lya Snell, Program Manager

Dr. Karla Cwetna, Program Specialist Mathematics Secondary

Michael Wiernicki, Program Specialist Mathematics Elementary

Isa Sanchez, Program Specialist Mathematics ESOL

Jenise Sexton, Program Specialist Mathematics Special Education
Today’s Menu:

Appetizer
- Access to core curriculum: The language of mathematics

Main Course
1. Mathematics as ESOL
2. How can content teachers make language visible?
3. How can ESOL teachers make language visible?

Dessert
- Resources for teachers
ESOL Language Program – LEAs’ Legal Obligations

Title VI of the Civil Rights Act of 1964 and EEOA

1. Monitor and evaluate EL students’ progress in English and academic grade-level knowledge;
2. Exit them when they are proficient in English; and
3. Monitor exited students to ensure they were not prematurely exited.

Provide EL students with an educationally sound and successful ESOL Program.

Provide prepared and trained ESOL teachers and staff.

Ensure English learners have equal opportunities to participate meaningfully in curricular and extra curricular activities.

Meet the needs of EL students whose parents opt them out of ESOL.

Ensure meaningful communication with EL parents.

Avoid unnecessary segregation of EL students (i.e. Sheltered & Pull-out Models).

Evaluate the effectiveness of the LEA’s ESOL Program to ensure EL students acquire English and that the program is reasonably calculated to allow ELs to attain parity of participation in the standard instructional program with a reasonable time period.

Ensure that EL students who have or are suspected of having a disability under IDEA or Section 504 are identified, located, and evaluated in a timely manner and that their language needs are considered in evaluations and services.

ACCESS to Core Curriculum: Mathematics

DOJ/OCR January 2015 Dear Colleague Letter: English Learner Students and Limited English Proficiency Parents
Making Language Visible: Mathematics Courses as ESOL Language Instruction

Teaching the academic English associated with Georgia’s Standards of Excellence for Mathematics, K-12
Mathematics Standards & Courses

Resources to support Fall 2023 implementation of newly adopted mathematics standards.
What ESOL delivery models could we use to develop academic English in mathematics?

<table>
<thead>
<tr>
<th></th>
<th>Push-In to Mathematics (Collaborative)</th>
<th>Sheltered Mathematics (and at a Newcomer Program)</th>
<th>Scheduled ESOL with Mathematics Focus (and at a Newcomer Program)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course Number</strong></td>
<td>27.xxxxxx</td>
<td>27.xxxxxx</td>
<td>55.xxxxxx (Elective)</td>
</tr>
<tr>
<td><strong>Teacher</strong></td>
<td>Mathematics &amp; ESOL teacher</td>
<td>Only ESOL endorsed content teacher</td>
<td>Only ESOL teacher</td>
</tr>
<tr>
<td><strong>Students</strong></td>
<td>Both ELs and Non-ELs</td>
<td>Only ELs</td>
<td>Only ELs</td>
</tr>
<tr>
<td><strong>Standards</strong></td>
<td>GSE Mathematics &amp; WIDA ELDS Mathematics</td>
<td>GSE Mathematics &amp; WIDA ELDS Mathematics</td>
<td>GSE Mathematics &amp; WIDA ELDS Mathematics</td>
</tr>
<tr>
<td><strong>Common Reporting Errors</strong></td>
<td>Reported as a 55.XXX course or without the additional teacher</td>
<td>Reported as a 55.XX course</td>
<td>Reported as a 45.xxxx course</td>
</tr>
</tbody>
</table>
### Number of English Learners Scheduled in a Mathematics course with an ESOL Delivery Model, October 2021

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Total Number of ELs</th>
<th>ELs Scheduled in Mathematics as ESOL</th>
<th>Percent of ELs in Mathematics as ESOL</th>
<th>Percent of ELs in Social Studies as ESOL</th>
<th>Percent of ELs in Science as ESOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>K–5 Elementary</td>
<td>84,655</td>
<td>5389</td>
<td>6%</td>
<td>16%</td>
<td>11%</td>
</tr>
<tr>
<td>6-8 Middle</td>
<td>26,445</td>
<td>4793</td>
<td>18%</td>
<td>15%</td>
<td>18%</td>
</tr>
<tr>
<td>9-12 High</td>
<td>22,655</td>
<td>6924</td>
<td>31%</td>
<td>40%</td>
<td>39%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>133,755</strong></td>
<td><strong>17,106</strong></td>
<td><strong>13%</strong></td>
<td><strong>20%</strong></td>
<td><strong>17%</strong></td>
</tr>
</tbody>
</table>
Number of ELs Scheduled in Gr. K-5 Mathematics by ESOL Delivery Model, October 2021

<table>
<thead>
<tr>
<th>Delivery Model</th>
<th>Number of ELs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push-In/Collaborative (2)</td>
<td>2359</td>
</tr>
<tr>
<td>Innovative (6)</td>
<td>2330</td>
</tr>
<tr>
<td>Pull-Out (1)</td>
<td>261</td>
</tr>
<tr>
<td>Dual Language Immersion (9)</td>
<td>239</td>
</tr>
<tr>
<td>Sheltered Content at Newcomer (8)</td>
<td>131</td>
</tr>
<tr>
<td>Sheltered Content (8)</td>
<td>68</td>
</tr>
</tbody>
</table>

Gr K-5 Math ESOL Segments by Delivery Model (Oct 2021 FTE Count)
Number of ELs Scheduled in Gr. 6-8 Mathematics by ESOL Delivery Model, October 2021

Gr 6-8 Mathematics ESOL Segments by Delivery Model, October 2021

- Innovative (6): 2571
- Sheltered Content at Newcomer Cntr (B): 1171
- Push-In/Collaborative (2): 722
- Sheltered Content (8): 68
- Pull-Out (1): 53
## High School (9-12) Mathematics / ESOL Courses with ELs, October 2021

<table>
<thead>
<tr>
<th>Mathematics/ESOL Course</th>
<th>Total ELs</th>
<th>Push-In/ Collaborative (2)</th>
<th>Scheduled Language Acquisition (5)</th>
<th>Scheduled Language Acquisition at a Newcomer Center (A)</th>
<th>Innovative (6)</th>
<th>Sheltered Mathematics (8)</th>
<th>Sheltered Mathematics at a Newcomer Center (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations of Algebra</td>
<td>2027</td>
<td>103</td>
<td></td>
<td></td>
<td>196</td>
<td>250</td>
<td>102</td>
</tr>
<tr>
<td>Algebra I &amp; II, Coordinate Algebra (GSE)</td>
<td>8747</td>
<td>645</td>
<td></td>
<td></td>
<td>1462</td>
<td>765</td>
<td>10</td>
</tr>
<tr>
<td>Geometry, Analytic Geometry (GSE)</td>
<td>4179</td>
<td>372</td>
<td></td>
<td></td>
<td>728</td>
<td>316</td>
<td></td>
</tr>
<tr>
<td>Comm. Skills in Math, Academic Language of Science &amp; Math</td>
<td>643</td>
<td>137</td>
<td>132</td>
<td>310</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Math Courses</td>
<td>4742</td>
<td>145</td>
<td>74</td>
<td>113</td>
<td>295</td>
<td>575</td>
<td></td>
</tr>
</tbody>
</table>

Smaller numbers of English learners are also enrolled in AP Calculus, AP Statistics, Accelerated Math, Dual Enrollment Math, and Math Support Courses.
ESOL Mathematics for Newcomers, Grades 9-12

Communication Skills in Mathematics (55.02110)

- **Standards:** WIDA English Language Development Standards for Mathematics, Grade Cluster 9-12 and Georgia Standards of Excellence for Mathematics, Grades 9-12

- **Description:** Prepare English learners (ELs) for high school mathematics courses by introducing them to the listening, speaking, reading, writing, and viewing skills necessary to learn foundational mathematics concepts and the 8 Standards for Mathematical Practice associated with the GSE for mathematics, 9-12. The course is individualized based on ELs’ prior learning and experiences in mathematics.

  - **Purpose:** Teach ELs how to inform, explain and argue in English while learning to understand and communicate foundational mathematics concepts, make sense of problems, reason abstractly, and quantitatively, construct viable arguments, and critique the reasoning of others.

  - **Focus:** WIDA’s Key Language Uses (narrate, inform, explain, and argue) for communicating mathematical concepts, Language Expectations for interpreting and expressing mathematical processes, and Language Features as resources to carry out Language Functions in the context of mathematics.

- **Suggested ELP Levels:** WIDA Overall Composite Proficiency Level (CPL) 1-2

- **Credit:** Elective

- **Effective Date:** 3/5/2008 - **Updated:** 7/1/2021
ESOL Math and Science for 2nd Yr. ELs, Grades 9-12

Academic Language of Science and Math (55.02700)

• Standards: WIDA English Language Development Standards for Science and Math, Grade Cluster 9-12 and Georgia Standards of Excellence for Science and Mathematics, Grades 9-12

• Description: Supports high school science and mathematics courses by teaching English learners (ELs) the interpretive and expressive language skills needed to decode the specialized vocabulary, symbols, and text outlined in each course of the GSE for science and mathematics, 9-12
  • Purpose: Develop ELs’ academic English necessary for using the science and engineering practices as well as the mathematical standards of practice
  • Focus: ELs’ use of high school scientific and mathematical terminology when speaking and writing to inform, explain, and argue scientific crosscutting concepts, anchoring phenomenon, and core ideas, as well as mathematical concepts and processes.

• Suggested EPL Levels: WIDA’s Overall Composite Proficiency Level (CPL) 2-3

• Credit: Elective

• Effective Date: 3/5/2008 - Updated: 7/1/2021

ESOL State-funded Courses and Descriptions, Sept 2021
Mathematics Instruction to Make English Visible

Teaching English learners how to engage in the disciplinary literacies of mathematics

GADOE Mathematics Team
Mathematics is AWESOME!
Resources to Support English Learners

www.gadoe.org/mathematics

Welcome to the Georgia Department of Education Mathematics Page!
The image is interactive.
Click on one of the titles for more information.

Curriculum Frameworks
- Academic Standards
- Professional Learning
- Family & Community Communication
- Mathematics Testing & Assessment Resources
- GEORGIA MATHEMATICS
- High School Graduation Guidance
- Math Team Contacts
- Regional Support

The Benefits of Hands-on, Relevant Learning Experiences in Mathematics: Supporting English Learners

Overview of GA Mathematics Resources:
- The Georgia DOE Office of Mathematics has a wide variety of resources to support students, teachers, and leaders throughout the state. These resources offer the tools and support resources needed to meet the individualized learning needs of all students. These resources include standards, curriculum maps, comprehensive grade level/course curriculum overviews, instructional unit frameworks, parent letters, videos, support materials, and intervention resources. All of these resources provide strategies for teaching and learning that can be used to support all learners, including English Learners (ELs). These resources can be found on GDOE using the following link: (https://www.georgiadepartmentofeducation.org/Georgia-Standards/Stages/Math.aspx) and in the Teacher Resource Link within the state-wide Student Longitudinal Data System (SLDS).
- The Georgia Instructional Practices Guide for Mathematics provides instructional strategies that accommodate the individual learning needs of each learner, including English Learners. This resource can be found here: https://www.georgiadepartmentofeducation.org/Georgia-Standards/Documents/GSE-Effective-Instructional-Practices-Guide.pdf

Evidence-Based Instructional Strategies:
- Using Visuals and Concrete Representations of Mathematics
  - Especially for language learners, visual representations of the mathematics are important. Visual representations and visual models used instructionally reduce the language demand to assist with the accessibility of the mathematics content. This is an important skill because higher-level mathematics and science courses increasingly draw on visualization and spatial reasoning skills to solve problems (Zhang, Ding, Stigall, & Mo, 2012). Using visuals is an important strategy to help learners, especially English Learners as they learn to investigate the best way to answer a problem in mathematics. In a ground-breaking study, Joookoo Park and Elizabeth Brannon (2013) found that the most powerful learning occurs when learners use different areas of the brain. When students work with symbols, such as numbers, they are using a different area of the brain than when they work with visual and spatial information, such as an array of dots. The researchers found that mathematics learning and performance was optimized when the two areas of

Georgia Department of Education
Resources to Support English Learners

Georgia Mathematics Strategies Toolkit to Address Learner Variability for Grades K - 5

Georgia Mathematics Strategies Toolkit to Address Learner Variability for Grades 6 - 8

Georgia Mathematics Strategies Toolkit to Address Learner Variability for High School

www.gadoe.org/mathematics
Mathematics Digital Learning Plans

Content experts at the Georgia Department of Education have developed Digital Learning Plans for teachers and parents. These Georgia Standards of Excellence-based plans were specifically designed for use during these uncertain times as support for school districts, administrators, teachers, and parents who are working tirelessly to provide students with quality content.

The plans are easy-to-use and include both “plugged and unplugged” activities. Check back for more Digital Learning Plans in each content area as they are updated weekly.

Back to all digital learning plans

NEW! English Learner Supports

Big Idea/Topic: Students use academic English to produce a viable mathematical argument, to defend the validity of their mathematical reasoning, and to critique reasoning of others.

Click to download.

Big Idea/Topic: Students use English language with precision to explain their mathematical reasoning and solutions. Click to download.

www.gpb.org/education/learn/k-12-learning-plans/math
Grades K-12

Mathematics Learning Plan – Language Scaffolds for English Learners

Big Idea(s)/ Topic(s)
- Students use academic English to produce a viable mathematical argument, to defend the validity of their mathematical reasoning, and to critique reasoning of others. (GSE English Language Development Standards, p. 233)
- Instructional Approach: Using instructional scaffolds, teachers create intentional opportunities for students to use academic English and mathematical discourse when arguing mathematical reasoning and solutions. (Principles of High-Leverage Practices for ELLs: Planning for Academic Language and Practicing Academic Language)

Standard(s) Alignment
MP.3 Construct viable arguments and critique the reasoning of others.

Diagnostic Assessment
Students use their emerging, developing, or expanding English proficiency to make meaning and engage with mathematics understanding. The instructional scaffolds presented here will concentrate on students at the emerging, developing, and expanding levels of English language proficiency (ELP) as measured by the ACCESS for ELLs (Consolidated Proficiency Levels, CRL 2, 3, and 4). It is expected that teachers will identify each student's level of English proficiency to establish language goals and select the appropriate instructional scaffolds. Emerging, Developing, or Expanding ELP Levels: Observations, teacher actions, student actions and supported resources are found in Georgia Mathematics Standards Toolkit to Address Learner Varability for High School.

NEW
“I Notice, I Wonder”
“I Notice, I Wonder”
Which One Doesn’t Belong? is an effective visual learning tool that teachers can incorporate into the classroom to help English learners master the mathematics context and develop critical thinking skills and make sense of the mathematics at a high level.

Additional prompts can be found at this website: wodb.ca
Which One Doesn’t Belong?

Which One Doesn’t Belong? prompts can be used as an instructional tool incorporated in all classrooms K-12. These are excellent mathematical conversation starters for all grade levels where there are multiple correct answers and multiple perspectives should be accepted and explored.

Additional prompts can be found at this website: [wodb.ca](http://wodb.ca)
Visual Patterns
(low entry, high ceiling)

These prompts can be used in all mathematics classrooms to promote deep thinking, productive collaborative discourse, and patient problem solving necessary for mastery of the mathematics content at high levels.

www.visualpatterns.org
Open Middle Problems

openmiddle.com

These prompts can be used in all mathematics classrooms to promote deep thinking, productive collaborative discourse, and patient problem solving necessary for mastery of the mathematics content at high levels.
3-Act Tasks
3-Act Tasks

Act One

Dan Meyer
How long will it take the dog to pop all of the balloons?

1. What's a number of seconds that's too low?
2. What's a number of seconds that's too high?

Teacher note: A version of this activity exists on Desmos: https://teacher.desmos.com...

Act Two

Image: Time for 25 balloons

Link: The previous world record.

3. Given this information, how long will it take Twinkie to pop all 100 balloons?
4. Will she beat the old world record?

Teacher note: Before students finalize their answers, ask them to consider why their mathematical answers may not match the answer in the world. If they're going to adjust their answer, should they adjust it down or up? Once they have their final answer, show them the answer.

Act Three

Video: Answer
3-Act Tasks – Big Reveal
Hey, students!

Go to student.desmos.com and type in:

**R3V TFQ**

You can also share this invitation link with your students:

[https://student.desmos.com/join/R3VTFQ](https://student.desmos.com/join/R3VTFQ)
Frayer Model

Algebra I - Functions

Definitions or Engaging Question
Is the domain the set of all the inputs or output values of a function?

Characteristics

Personal Association or
\[ f(x) \]

The independent variable.

Domain

Examples

\[
\begin{array}{|c|c|}
\hline
m & 30 + .30m \\
\hline
-2 & 29.4 \\
-1 & 29.7 \\
0 & 30 \\
1 & 30.3 \\
2 & 30.6 \\
\hline
\end{array}
\]

Non-Examples

\[
\begin{array}{|c|c|}
\hline
m & 30 + .30m \\
\hline
-3 & 29.4 \\
-1 & 29.7 \\
0 & 30 \\
1 & 30.3 \\
2 & 30.6 \\
\hline
\end{array}
\]
Making Language Visible using WIDA ELDS Framework Resources

Collaborating with content teachers to teach the disciplinary literacies of mathematics
Rolling out the WIDA ELD Standards Framework, 2020 Edition

**Year 1**
- **2020-2021**
  - Become familiar with the ELD Standards Framework, 2020 Edition

**Year 2**
- **2021-2022**
  - Initial implementation of standards framework
  - Local Roll-out Plans

**Year 3**
- **2022-2023**
  - Expanding implementation and refining practice
Self-paced eWorkshop, resources, and a Study Guide for Professional Learning Communities (PLC)s

Developing Language for Learning in Mathematics

This eWorkshop will focus on recognizing and designing mathematics instruction that simultaneously strengthens both mathematical reasoning and language development for multilingual learners.

Course Details  Course Resources

Equity-Focused Professional Learning Communities: A Resource Guide and Study Guides

The information provided in this microlearning is designed to guide educators who want to come together in an equity-focused PLC that positions educators as learners to impact their daily classroom practice in service of equitable education for multilingual learners.

Course Details  Course Resources  Enter Course
Language Expectations

WIDA Language Expectations:

- Are most like what educators see in an academic content standard
- Add specificity to English Language Development (ELD) Standards Statements and Key Language Uses

Example Reference Code for a Language Expectation:

- Mode of Communication: Expressive
- Key Language Use: Narrate
- ELD Standard: Language for Language Arts
- Multilingual learners construct language arts narratives that orient audience to context
Within Language Expectations: Language Functions and Language Features

Language expectations - GOALS for content-driven language instruction

Language Expectations - Interpretive or Expressive

Language Functions –
Common patterns of language use associated with Key Language Uses

Narrate
Argue
Inform
Explain

Types of sentences, clauses, phrases, and words needed to carry out Language Function

WIDA™

Richard Woods, Georgia’s School Superintendent | Georgia Department of Education | Educating Georgia’s Future
Sample: Mathematics.1st Grade.Inform (p. 70)

GSE for Mathematics - Understanding Shapes and Fractions. Reason with shapes and their attributes.

MGSE1.G.1
• Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size)
• Build and draw shapes to possess defining attributes.

WIDA Language Expectation: Functions and Features

ELD-MA.1.Inform.Expressive
Language Expectation: Construct mathematical informational texts that...

Define or classify concept through...
1. Generalized nouns to identify class of things (shapes)
2. Relating verbs (be, have) to define, describe, or classify (Rectangles have four sides. This is a closed shape.)

Describe a content or entity through...
1. Expanded noun groups to add specificity (This shape has three equal sides)
2. Conditional clauses (if / then) to demonstrate relationships (If I put these shapes together, then I can make a rectangle).
Resources for Teachers

Today’s Dessert: Raspado de tamarindo!
New Mathematics Standards

www.gadoe.org/standards

K-12 Mathematics Standards

**K-12 Mathematics Standards**

- K-8 Mathematics Standards
- High School – Algebra
- High School – Advanced Algebra
- High School – Advanced Financial Algebra
- High School – Linear Algebra with Computer Science Applications
- High School – Geometry
- High School – Advanced Finite Mathematics
- High School – Advanced Mathematical Decision Making
- High School – Precalculus
- High School – Calculus
- High School – Multivariable Calculus
- High School – Differential Equations
- High School – Engineering Calculus
- High School – College Readiness Mathematics
- High School – Mathematics of Industry and Government
- High School – Statistical Reasoning
- High School – History of Mathematics

**Math Standards Adoption**

On August 26, 2021, the State Board of Education approved Superintendent Woods' recommendation to adopt the new K-12 Mathematics Standards.

*NOTE*: Courses such as Technical College Readiness Math and Foundations of Algebra that are not listed here have *not* been eliminated – they are not listed as there were not changes/updates to those standards.
Professional Learning

170 professional learning sessions hosted with 1,940+ participants in attendance live.
- Over 900+ educators attended MathCON for Teachers each day of the 4-day conference
- Fall MathCON Encore conferences hosted around 400 educators for 2 days
- Mathematics Virtual Specialists hosted 27 live sessions
- Professional learning sessions conducted by GaDOE Mathematics Team to support building teacher capacity for over 640 participants

Guidance

- A New Enhanced Mathematics Pathways Guidance Released
- 25 New Curriculum Maps Developed
- 25 Comprehensive Grade-Level and Course Overviews

Notable

Managed over 200 teacher leaders to develop resources and professional learning for teachers

Key Takeaways

- 10 Make Mathematics Count, GA! Parent Videos
- 2 multi-day virtual conferences MathCON for Teachers and MathCON Encore

Resource Development

441 resources developed.

These resources include:
- K-12 resources aligned to the newly adopted standards
- Recorded professional learning sessions and the associated presentations and session resources
- Resources to support English language learners
Upcoming Professional Learning Events
Additional Mathematics Professional Learning

- Mathematics Virtual Specialist Professional Learning Sessions
- SSIP FY 2022 Professional Learning Series: Integrating Mathematics Content for Secondary Students with Disabilities
- Effective Mathematics Teaching Practices PLC Meeting with the State Schools
State Mathematics Contact Information
YOUR GADOE MATHEMATICS TEAM IS HERE TO SERVE YOU!

Follow us: @GaDOEMath

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• Jenise Sexton Mathematics Content Integration Specialist
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Important Websites to Obtain Additional Information
• [www.gadoe.org/mathematics](http://www.gadoe.org/mathematics) Georgia Mathematics Program Updates
• [https://community.gadoe.org](https://community.gadoe.org) Professional Learning Communities
• [www.georgiastandards.org](http://www.georgiastandards.org) Curriculum Resources
• [www.gadoe.org/mathcon](http://www.gadoe.org/mathcon) Professional Learning Conferences