### Big Idea(s)/ Topic(s)

- Students use English language to **inform** and **explain** with precision their mathematical reasoning and solutions, as they develop complex explanations to **inform** and help communicate their mathematical ideas, reasoning, and solutions. ([WIDA English Language Development Standards, p. 227](https://www.wida.us/standards))

- **Instructional Approach:** Using instructional scaffolds, teachers create intentional opportunities for students to **inform** and **explain** mathematical reasoning and solutions while increasing academic language precision. ([Principles of High-Leverage Practices for ELs: Planning for Academic Language and Practicing Academic Language](https://www.wida.us/principles-of-high-leverage-practices-for-els))

### Standard(s) Alignment

MP.6 Attend to precision.

### 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](https://www.gadoe.org) (Composite Proficiency Levels 1-5). 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 Strategies Toolkit to Address Learner Variability for High School](https://www.gadoe.org).
Instructional Design

The K-12 Mathematics Standards set rigorous academic standards for Georgia’s English learners (ELs) students. To help ELs master the K-12 Mathematics Standards, it will be imperative to have resources and scaffolds that more specifically support them in accessing and acquiring grade-level knowledge and skills. It is the expectation and intent for this EL Digital Learning Plan to be used in conjunction with the developed digital Mathematics Learning Plans to better provide students with the best quality content and academic outcome.

Engage

Teachers should create intentional, multiple but brief opportunities for ELs to discuss, rehearse and practice academic discourse in heterogenous (levels of language proficiency) collaborative groups. Students at the emerging levels of proficiency can use their home language to inform and/or explain academic content as they navigate meaning making and production of academic discourse in English supported in cooperative small group strategies, such as: Ask 3 Before Me and Think-Pair-Share. Students can specifically use the language of informing to process and produce mathematics information. According to the WIDA ELD Standards, this language includes:

- Ask and answer questions, explore, model, conjecture, test and prove
- Define and represent concepts
- Engage in problem-solving

As multilingual students inform, explain, and argue their mathematics reasoning, their academic discourse and academic content knowledge improves. The four Key Language Uses – Narrate, Inform, Explain, Argue – help both multilingual learners and educators see that academic language is shaped by the content area or academic discipline, academic topic and purpose and need for using language. Furthermore, the WIDA Key Language Uses should not be considered as disjointed, standalone uses but rather as joint overlays that interact with other Key Language Uses – mainly Explain and Argue. For example: “newfound knowledge can inform the basis for evidence in arguments” (WIDA, 2020, p. 227). When asked to explain the characteristics of a quadratic function, students may need to inform by classifying the key components of a quadratic function in all its forms.

Techniques include “providing writing assignments that are anchored in content and focused on developing academic language as well as writing skills; providing language-based supports to facilitate student’s entry into and continued development of writing; using small groups or pairs to provide opportunities for students to work and talk together on varied aspects of writing; and assessing student’s writing periodically to identify instructional needs and provide positive constructive feedback in response”(Baker et al., p. 6).

For the mathematics discussions to be successful, teachers must actively monitor the collaborative groups and hold the students accountable to produce academic discourse, remembering throughout that the emphasis should be on the process of meaning making rather than solely on the correct answer product. The level of academic discourse produced is contingent on the level of English language proficiency of the student, but it does not mean that students at lower levels of English proficiency are expected to produce less cognitively demanding discourse. Rather, discourse used in meaning making may be simplified and ELs may be provided with the necessary scaffolds to make sense of challenging content, but the rigor and intentional objectives of the K-12 standards should not be diluted.

“Scaffolding learning increases accessibility for multilingual learners, supports and bolsters their opportunities to meaningfully engage in grade-level content learning, and builds toward independence” (WIDA, 2020, p. 209).
Explore

As students transition from computational mathematics knowhow to conceptual mathematics understanding, teachers must set high expectations for the mathematics discourse outcomes of all students, including ELs. Teachers must intentionally model writing and speaking in mathematics. An excellent way to model academic discourse with variable degrees of academic precision is through a daily introductory Three-Act Math Tasks or Open Middle – Challenging math problems worth solving problem of the day. Reminding, monitoring, and modeling to students when they have solved the problem that they are to prove – through mathematics discourse – their answer is correct or reasonable to a determined degree of mathematical precision or explain/argue the correctness or reasonableness of their answer.

Reflection time should be given for individual students to synthesize initial misconceptions, errors and estimates and for whole class discussion in which standards grade-level mathematics and academic vocabulary precision is formally agreed upon.

These activities are not intended to replace content instruction but rather they are intended as alternatives to having students working in isolation and removed from the contextual applications of the content. The focus of these activities is to aid in teaching the key concepts that support understanding and meaning making in the lesson’s content, which then directly support in the eventual mastery of the K-12 mathematics standards.

Apply

Teachers provide opportunities for ELs to use academic discourse to inform and explain understanding of academic content in English. When writing, students can use graphic organizers sentence starters and frames to help deepen their thinking and help them inform and explain their mathematics ideas through accountable discourse. The Key Language Use Inform allows multilingual students to observe, record, and describe informational facts about real world applications occurring around them. Sample genres that lend themselves to writing in English using the Inform Key Language Use include:

<table>
<thead>
<tr>
<th>Sample Genres</th>
<th>Purpose</th>
<th>Sample Classroom Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classifying report</td>
<td>Organize and describe a topic into distinct classes</td>
<td>Function Transformations</td>
</tr>
<tr>
<td>Comparative report</td>
<td>Identify similarities and differences between two or more things</td>
<td>Linear vs. Exponential Functions</td>
</tr>
<tr>
<td>Problem-solution report</td>
<td>Devise a solution to a problem</td>
<td>Solutions report to a Three-Act Math Tasks</td>
</tr>
</tbody>
</table>

Examples:
- I know the answer is correct (that a graph/table represents a function) because…
- I can check (that a graph/table represents a function) my answer by…
- The strategy I used (to determine that a graph/table represents a function) was…
- I discovered that (function graphs/tables) …
- I noticed that (function graphs/tables) …
- I wonder…
- This relates to… (excellent for accessing prior knowledge)

Students can use any recording device or app to record their discourse attempts in student-friendly language and share them collaboratively for feedback - Think-Pair-Share.

Teachers decide and navigate the level of academic accountability and precision allowed for students based on the proficiency of the student measured by the ACCESS for ELLs (CPL levels 1-5).

Toward the end of each language proficiency level, when scaffolded appropriately, multilingual learners will be able to understand and use the language needed to inform in mathematics. See Grades 9-12 WIDA.
Proficiency Level Descriptors for the Interpretive Communication Mode (Listening, Reading, and Viewing) for specific examples.

Reflect

It is important for all students, but especially critical for multilingual learners, to have intentional and structured opportunities to listen, speak, read, and write in mathematics classes, with teachers providing appropriate linguistic academic scaffolds and encouragement. When classroom teachers encourage mathematics classroom discussions in ways that support acquisition of mathematics concepts and language development, student learning increases (Smith & Stein, 2011).

These instructional scaffold strategies can be used by teachers as structured references to modify other tasks and/or lessons. Teachers may also compare and contrast these instructional scaffold strategies in multiple lessons and make collaborative decisions about which level of scaffold may be most beneficial to the student’s language proficiency level in specific classes, as measured by the ACCESS for ELLs.

The goal of these instructional scaffolds is to provide students with strategies and techniques to independently produce academic discourse and greater access for reviewing and meaning making as they develop academic resiliency and independence. Furthermore, Professional Learning Committees (PLCs) and cross content planning is key to outlining the salient academic discourse necessary for standard mastery and reinforcement throughout other academic disciplines.

Evidence of Student Success

To monitor students’ progress towards mastery of Georgia’s K-12 Mathematics Standards, and their development of academic language to reflect this mastery, it is important for teachers to engage in frequent, formative assessment activities. Formative assessments can measure how EL students are increasing in their production and use of English academic discourse with precision when informing and/or explaining their mathematical reasoning/solutions and demonstrating their understanding of mathematics content and concepts. While the focus should be on academic communication that require analysis, interpretation, or information of facts, teachers should encourage and hold multilingual learners accountable for producing discourse, commensurate to their English proficiency levels.

Below are suggested formative assessment activities that can be flexibly used to gain feedback of student understanding.

- Using generic or task specific sentence frames to help ELs justify their answers in mathematics, students at lower English proficiency levels will explain their solution to a classmate or teacher using the relating verb (is). (WIDA English Language Development Standards, Language Features, pp. 92, 118-119, 152-153, 190-191.)
  
  Explain how you arrived at your answer. Example: First, I ___________, Then _________________.
  
  Explain why you chose an operation. Example: I ______________ because _________________.

- Using a graphic organizer, implement error analysis in mathematics by having students analyze their own errors and explain them orally or in writing. Students at lower English proficiency levels will inform and/or explain their mathematical reasoning used to justify their analysis generate own or alternate solutions to a classmate or teacher using the casual connector (because / therefore). (WIDA English Language Development Standards, Language Features, pp. 92, 118-119, 152-153, 190-191.)

- Given an academic vocabulary word bank, students at mid/high English proficiency will produce a writing sample, where students write everything, they know about a culminating mathematics concept/topic for the week. (WIDA English Language Development Standards, Performance Level Descriptors, pp. 334-350)
  
  * Example: Structure a weekly timed reflection, “knowledge writing,” activity.
This activity offers teachers an opportunity to periodically assess students' writing needs and developments. The writing activities are flexible enough that they can be implemented as pre-assessment, mid-unit formative assessment, or as an end of unit summative assessment. The feedback should give students and teachers that serve multilingual students an opportunity to evaluate present and needed instructional supports and additional opportunities for revision, practice, and feedback.

Student Learning Supports

**Note:** Depending on students’ level of English language proficiency (ELP), they may use 1st language (L1) or gestures to clarify tasks orally and 2nd language (L2) to read text and make meaning. Code-switching between 1st and 2nd language may occur in peer interactions.

**Establish mathematics goals to focus learning.**

- Make language visible by modeling formal definitions of mathematical terms and phrases to describe concepts, processes, and purpose.
- Make explicit connections to prior learning and student background and to real life (familiar context, language, family, peers, interests, culture).

**Facilitate meaningful mathematical discourse.**

- Make English language visible through repeated teacher modeling of language connectors to order steps in a mathematical process (*first, next, then*).
- Create multiple opportunities for structured peer interactions or conversations using manipulatives, data graphs/charts, sentence frames, a word bank of mathematical terms.

**Pose purposeful questions.**

- Teacher modeling of observational (*notice, it appears, looks like*) and comparative (different from, similar to, the same) language, by strategic (probing) questioning and references to student work.

**Support productive struggle in learning mathematics.**

- Use of multiple representations (numerical tables, graphs, algebraic expressions or images from a graphing calculator and models) to support sense-making.

Engaging Families

Students can practice using English to inform at home by intentionally using graphic organizers and vocabulary strategies such as: Guess the Meaning, KIM, Knowledge Rating Scale, Making Meaning, Own the Word, Verbal, and Visual Word Association (VVWA), Vocabulary Self-Awareness Chart, - with homework to help students visualize the relationships between words and their possible meanings. Students can additionally practice using English to inform/explain academic knowledge with parents, relatives, siblings and/or friends. Additional resources for empowering families of multilingual students:

- **Georgia Home Classroom** – GBP education and Georgia Department of Education Resource partnership
- **Khan Academy Kids** – 100% Free educational application for children 2 – 7 years old
- **Khan Academy** – 100% Free no subscription educational support platform.

*Families empowered with information are the best advocates for their children.*
References


