

edTPA: Understanding Academic Language in Mathematics

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Overview

- ▶ Review - definition of academic language.
- ▶ Examine the specific edTPA requirements for academic language in mathematics.
- ▶ Explore examples – Rubric 4
 - ▶ Determine Language Demands
 - ▶ General Supports versus Targeted Supports
- ▶ Explore examples – Rubric 14

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Section 1:

REVIEW: What is academic language?

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Academic Language

► School is where you go to learn a **secret language** but they don't tell you that it's there. You have to figure it out on your own. It's like an initiation to a secret club (Maya, 8th grade).



Student Voices

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Academic Language

► Language is the **primary vehicle** for learning, instruction, and overall intellectual development. It is not only a means for communicating information, it is also a vehicle for deepening their understanding of important ideas. Kersaint, Thompsom, & Petkova, 2009, p. 46.)



Research Voices

Kersaint, G., Thompsom, D. R., & Petkova, M. (2009). Teaching mathematics to English language learners. New York: Rutledge.

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Academic Language as a Means of Participation

Academic language is the **oral, visual, and written** language that students need in order to

- › understand (read, listen, think)
- › communicate (listen, speak, write, connect)
- › perform (think, read, write, listen, speak, create)

Academic Language is necessary to **participate** in the content

- › think
- › reason
- › question
- › represent
- › talk
- › learn

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Disciplines have **different** ways of **writing** and **speaking** about the world. And because of this, **discipline experts** approach text with sets of **expectations, reading strategies, and understandings** that are **firmly grounded in disciplinary knowledge**. (C. Shanahan, 2012, p. 71)

Research Voices

Shanahan, C. (2012). How disciplinary experts read. In T. L. Jetton and C. Shanahan (Eds.), *Adolescent literacy in the academic disciplines: General principles and practical strategies* (pp. 69-90). New York: Guilford.

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Disciplinary literacy is based on the premise that students can develop **deep conceptual knowledge** in a discipline **only** by using the **habits of reading, writing, talking, and thinking** which that **discipline values and uses**. (McConachie, Hall, Resnick, Raci, Bill, Bintz, Taylor, 2006)

Research Voices

McConachie, S., Hall, M., Resnick, L., Ravi, A.K., Bill, V.L., Bintz, J., & Taylor, J.A. (2006). *Task, text, and talk: Literacy for all subjects. Educational Leadership, 64(2), 8-14.*

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Disciplinary Language Questions

- ▶ What does **writing** look like in mathematics? What are the writing skills students need to be successful?
- ▶ What does **reading** look like in mathematics? What are the reading skills students need to be successful?
- ▶ What does **speaking/listening/performing** look like in mathematics? What are the speaking/listening/performing skills students need to be successful?

Directions:

1. Review the handout with different disciplinary examples of language.
2. Then, list examples of the writing that are part of mathematics. What are the characteristics? What are the expectations?
2. List examples of the "texts" students read in mathematics? What are strategies that are needed to understand the texts?
3. List examples of the types of performances, demonstrations, or discussions that are part of mathematics? What are the expectations for speaking? For listening?

Examples

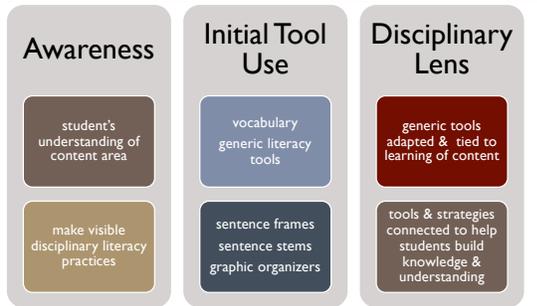
Discipline	Writing	Reading	Speaking/Listening/Performing
English/Language Arts	essays, poems, memoirs, letters, etc.	novels, poetry, textbooks, plays, film, ads, etc.	speeches, read alouds, scenes, book talks, presentations, etc.
Visual Arts	critique, artist statements, how tos, process pieces, etc.	images, textbooks, art pieces, pottery, commentary, etc.	painting, sketching, drawing, making pottery, critique, showcase, etc.
Physical Education	game plans, game analysis, plays, routines, etc.	Texts, books, game plans, plays, game or practice video review, demonstrations, etc.	game play, practice, demonstrations, drills, etc.
Mathematics			

participation

Examples

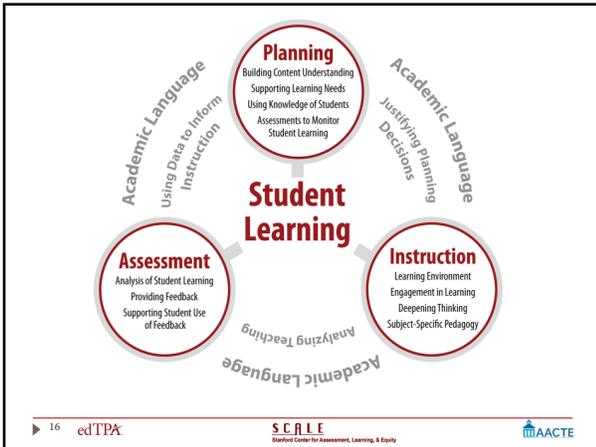
Discipline	Writing	Reading	Speaking/ Listening/ Performing
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Visual Arts	critique, artist statements, how tos, process pieces, etc.	images, textbooks, art pieces, pottery, commentary, etc.	painting, sketching, drawing, making pottery, critique, showcase, etc.
Physical Education	game plans, game analysis, plays, routines, etc.	Texts, books, game plans, plays, game or practice video review, demonstrations, etc.	game play, practice, demonstrations, drills, etc.
Mathematics	Explanation, graphs, tables	Graphs, tables, word problems, Venn Diagrams	Oral explanation of solutions, problem-solving strategies

Candidate Journey to Academic Language



Section 2:

Academic Language in edTPA



Teacher Candidates are asked to:

- ▶ Select **one** key **language function** essential for students to learn within the central focus.
- ▶ Identify a key learning task from plans that provide students **opportunities to practice** using the **language function**.
- ▶ **Language Demands** (consider language function & task) describe the language demands (written or oral) students need to understand and/or use.
 - ▶ **Vocabulary and/or symbols**
 - ▶ **Precision**
 - ▶ **Syntax**
 - ▶ **Discourse**
- ▶ **Language Supports:** Describe **instructional supports** that will help students understand and use **language function & additional language demands**.

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Language Function & Components

- ▶ Language Functions—What will students **DO** with language in the lesson?
- ▶ **Vocabulary and/or symbols, Precision, Discourse, and Syntax (LANGUAGE COMPONENTS)** – What components will students use as they practice the language function?
- ▶ What **supports** will the students need in order to use language (function, vocabulary, discourse, syntax)?

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Language Functions

- ▶ Language functions are the
 - ▶ WORK language will do in the lesson
 - ▶ Purposes for using language
- ▶ The content and language focus of the learning task are represented by the active verbs within the learning outcomes.

Common Language Function in Mathematics

- ▶ Compare/Contrast
- ▶ Describe
- ▶ Explain
- ▶ Justify
- ▶ Prove

Language Function Example

- ▶ “The language function essential for student learning within my central focus is compare and contrast.”
- ▶ TASK: Students will need to be able to compare and contrast rates and ratios in order to determine the proper concept to use when working with real-world problems in lesson 3.

Language Function & Components

- ▶ Language Functions—What will students DO with language in the lesson?
- ▶ Vocabulary and/or symbols, Precision, Discourse and Syntax (LANGUAGE COMPONENTS) – What components will students use as they practice the language function?
- ▶ What supports will students need in order to use language (function, vocabulary and/or symbols, discourse, syntax)?

Vocabulary Examples in Mathematics

- ▶ Includes words and phrases that are used within disciplines including:
 - ▶ (1) words and phrases with subject-specific meanings that differ from meanings used in everyday life (e.g., table);
 - ▶ (2) general academic vocabulary used across disciplines (e.g., compare, analyze, evaluate); and
 - ▶ (3) subject-specific words defined for use in the discipline (e.g., rate, ratio, proportion)

Precision in Mathematics

- ▶ The discipline of mathematics has an additional language demand of precision.
- ▶ Mathematical precision (e.g., using clear definitions, labeling axes, specifying units of measure, stating meaning of symbols), appropriate to the students' mathematical and language development.

Syntax

- ▶ The set of conventions for organizing symbols, words, and phrases together into structures (e.g., sentences, graphs, tables). **In mathematics, numbers and symbols are organized into problems and solutions.**



Examples of Syntax in Mathematics

Academic Features of Syntax	Examples
Long noun phrases	Write an inequality that, when solved, will give the amount of sales Mandy needs to cover her planned expenses. (math)
Symbols used in formulas, equations	Area of a triangle: $A = L \times W$
Conditional Sentences	If you have the lengths for two sides of a triangle, then you can find out the length of the third side.
Long, Complex Sentences	Few studies have examined the nutritional makeup of lunches that students bring from home (8,9) or whether bringing lunch from home is associated with better or worse dietary behaviors compared with getting lunch from other sources.

Discourse

- ▶ Discourse includes the structures of written and oral language, as well as how members of the discipline talk, write, and participate in knowledge construction.
- ▶ Discipline-specific discourse has distinctive features or ways of structuring oral or written language (text structures) that provide useful ways for the content to be communicated.
- ▶ Represents how students will construct knowledge within the lesson

Discourse: Mathematics

- ▶ In mathematics, language structures include symbolic representations such as two-column proofs (which can be translated into words), graphic representations, such as tables and graphs (which are shorthand language for summarizing complex sets of data), and narratives (e.g., explanations of problem solutions, descriptions). If the language function is to prove, then appropriate language structures include formal two-column proofs as well as explanations that begin with a statement of the problem and known information, followed by a series of statements such as “And then, I know _____ because _____,” ending with what is to be proved.

Discourse Examples

Essential Question for Candidates to Consider

- ▶ How will language be structured so that students can participate in the learning segment?

Examples of Discourse

- ▶ Explanations – written and/or ORAL explanations of problem solutions
- ▶ Making and supporting a conjecture
- ▶ Making and interpreting graphs or tables

Language Function & Components

- ▶ Language Functions—What will students DO with language in the lesson?
- ▶ Vocabulary, Precision, Discourse, and Syntax (LANGUAGE COMPONENTS) – What components will students use as they practice the language function?
- ▶ What **supports** will students need in order to use language (function, vocabulary and/or symbols, precision, discourse, syntax)?

Language Supports

- ▶ Strategies that are used to build students' academic language within a learning task.
- ▶ Strategies involve both modeling the appropriate language for the students to use in a learning task as well as opportunities for guided practice.
 - ▶ Structured Think-Pair-Share
 - ▶ Choral response in appropriate contexts
 - ▶ Word walls
 - ▶ Modeling
 - ▶ Graphic organizers

Directions:

1. List some language supports that are useful in mathematics.
2. Share.

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Examples of Language Supports in Mathematics

- ▶ Examples of language supports:
 - ▶ Sentence Frames
 - ▶ Modeling Math Talk
 - ▶ Graphic organizers
 - ▶ Visual representations – examples with labels

Section 3:

Candidate Sample Demonstrating Language Supports

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Looking at Rubric 4

Rubric 4: Identifying and Supporting Language Demands

How does the candidate identify and support language demands associated with a key mathematics learning task?

Level 1	Level 2	Level 3	Level 4	Level 5
Language demands identified by the candidate are not consistent with the selected language functions OR task. OR Language supports are missing or are not aligned with the language demand(s) for the learning task.	Language supports primarily address one language demand (vocabulary and/or symbols, function, mathematical precision, discourse, syntax).	General language supports address use of two or more language demands (vocabulary and/or symbols, function, mathematical precision, discourse, syntax).	Targeted language supports address use of - vocabulary and/or symbols, language function, AND - one or more additional language demands (mathematical precision, discourse, syntax).	Level 4 plus: Language supports are designed to meet the needs of students with different levels of language learning.

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Difference Between Level 3 & 4

▶ **At Level 3: General language supports are**

- ▶ planned and described, though **not in specific detail**
- ▶ **Lack focus specific to content** of lesson or learning segment

▶ **At Level 4: Targeted language supports are**

- ▶ **Specific language supports** that are planned to **directly address an identified language demand** (vocabulary, language function, syntax, and/or discourse).
- ▶ **Structured or scaffolded** to ensure that students are able to understand and use or begin to use the identified language in a **meaningful context** or way in relation to content

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What are the characteristics of general supports?

What are the characteristics of targeted supports?

Example Language Supports – General and Targeted

You have been given a sample Middle School Mathematics edTPA planning commentary. We will use this candidate response to determine evidence for Rubric 4: planned language supports for identified language demands.

Directions:

1. Read the sample response to planning prompt 4 for Middle School Mathematics in the handout packet.
2. Underline/Highlight the identified language function and any additional identified language demand (vocabulary, precision, discourse, syntax).
3. Circle the language supports in the commentary.
4. Complete the chart matching the language demands to the planned language supports.
5. Examine evidence you found and map it to Rubric 4 language – what level/s do you think it represents?

An Opportunity to Practice with a Candidate Sample Example 1 – Middle Childhood Mathematics

Language Demand	Identified Language Demands (Task)	General Language Supports	Targeted Language Supports
Function:			
Vocabulary:			
Precision:			
Syntax:			
Discourse:			

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Language Demand	Identified Language Demands (Task)	General Language Supports	Targeted Language Supports
Function:	<ul style="list-style-type: none"> explain 	<ul style="list-style-type: none"> Modeling of explanation for how to factor 	
Vocabulary:	<ul style="list-style-type: none"> Factor, trinomials, binomials, product, sum coefficient and term 	<ul style="list-style-type: none"> Models appropriate use of vocabulary in explanation Asks students to provide definitions of vocabulary terms 	
Precision:			
Syntax:			
Discourse:	<ul style="list-style-type: none"> Oral Explanation – Students will explain how to factor trinomials at board in front of peers 	<ul style="list-style-type: none"> Worked (written) example in guided notes packet 	

Example 2: Secondary Mathematics (AL)

- Directions:**
1. Read the sample response to planning prompt 4 for Secondary Mathematics in the handout packet.
 2. Underline/Highlight the identified language function and any additional identified language demand (vocabulary, precision, discourse, syntax).
 3. Circle the language supports in the commentary.
 4. Complete the chart matching the language demands to the planned language supports.
 5. Examine evidence you found and map it to Rubric 4 language – what level/s do you think it represents?

An Opportunity to Practice with a Candidate Sample
Example 2 – Secondary Mathematics

Language Demand	Identified Language Demands (Task)	General Language Supports	Targeted Language Supports
Function:			
Vocabulary:			
Precision:			
Syntax:			
Discourse:			

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Language Demand	Identified Language Demands (Task)	General Language Supports	Targeted Language Supports
Function:	<ul style="list-style-type: none"> apply 	<ul style="list-style-type: none"> Models for class – applying Pythagorean Theorem and ratios for special right triangles 	<ul style="list-style-type: none"> Sentence frames and/or guiding questions provided for students to reason through ‘application’ when struggling, for example, “I can apply the Pythagorean Theorem, if and only if, the figure is a triangle that has an angle that measures _____.”
Vocabulary:	<ul style="list-style-type: none"> Leg, hypotenuse, altitude, ratio, Pythagorean Theorem 	<ul style="list-style-type: none"> Candidate/teacher labels diagram in notes with vocabulary terms; draws picture of new vocabulary “inside” 	<ul style="list-style-type: none"> Guided notes – vocabulary fill-in blanks Students draw new vocabulary terms and label them (i.e., 45-45-90 triangle and 30-60-90 triangle)
Precision:	<ul style="list-style-type: none"> Definition (labels) for 45-45-90 and 30-60-90 triangle, ratios for correct type of special triangles Using a ruler to measure 	<ul style="list-style-type: none"> Reminded to use correct units Labeling triangle with correct ratios 	
Syntax:			
Discourse:	<ul style="list-style-type: none"> Poster Board – Explanation for how to solve for a missing side of triangle Oral Explanation – Working with peer to explain only how to solve for a missing side of triangle 	<ul style="list-style-type: none"> Sample problem for inclusion on poster board Students brainstorm how to complete problem Candidate/teacher acknowledge correct language used in the poster or oral conversation 	<ul style="list-style-type: none"> Sample problem includes “sentence starters” for writing about their solutions. For example, “For a given triangle, if one angle is 90 and the other two sides are the same, then I know I have a _____ right triangle. If I have a _____ right triangle, then I can apply this ratio _____ from the Pythagorean Theorem to solve for the missing side.”

▶

Section 4:

Evidence of students use of AL

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Rubric 14: Evidence of Academic Language Use

- Assessment Commentary Prompt 3
 - What do candidates need to emphasize in their written response? How is this similar Planning Prompt 4?
- What do you notice about the differences in candidate performance between levels?
- What do candidates provide as evidence at Level 3? Level 4?

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Rubric 14

Rubric 14: Analyzing Students' Language Use and Mathematics Learning
 How does the candidate analyze students' use of language to develop content understanding?

Level 1	Level 2	Level 3	Level 4	Level 5
Candidate identifies student language use that is superficially related or unrelated to the language demands (function, vocabulary and/or symbols, and additional demands). OR Candidate's description or explanation of language use is not consistent with the evidence submitted.	Candidate describes how students use only one language demand (vocabulary and/or symbols, function, mathematical precision, discourse, syntax).	Candidate explains and provides evidence of students' use of <ul style="list-style-type: none"> • the language function AND • one or more additional language demands (vocabulary and/or symbols, mathematical precision, discourse, syntax). 	Candidate explains and provides evidence of students' use of <ul style="list-style-type: none"> • the language function, • vocabulary and/or symbols, AND • additional language demands (mathematical precision, discourse, syntax) in ways that develop content understandings.	Candidate explains and provides evidence of language use and content learning for students with varied needs.

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¹ The selected language function is the verb identified in the Planning Commentary Prompt 4a (conjecture, explain, etc.).

² These are the additional language demands identified in the Planning Commentary Prompt 4c (vocabulary and/or symbols, mathematical precision, plus syntax or discourse).

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Example Secondary Mathematics

► Directions:

1. Read the sample commentary and student work samples to the analyzing students' use of academic language, prompt 3 – task 3 (rubric 14), for Secondary Mathematics
2. Underline/highlight the evidence the candidate provides for students' use of the language demand
3. Examine the evidence you found and map it to Rubric 14. What level of evidence do you think it represents?

Closing and Summary Activity

- What is it that you know now that you didn't know previously about academic language, in particular language supports?

Reminder Resources Available

Language Function – NOT Functions in Math

- ▶ "solving a problem"

- ▶ "simplifying an expression"

- ▶ "modeling how to solve the problems"
