



Explain in Science, Grades 9-12: Introduction

Significance of Key Language Use

Explain in science is concerned with locating and substantiating underlying causes for phenomena. Explanations often draw on the unobservable underlying concepts or mechanisms for how things work and require a degree of inference to establish connections between causes and effects. Explanations ask not only about the “what,” but the “how,” thus searching for causal relationships and overarching theories to construct deeper scientific explanations. *Explain* moves beyond a description of the observable natural and designed worlds into a theoretical account of how phenomena unfold. In high school, students are constructing scientific explanations and designing engineering solutions that build on previous K-8 experiences and knowledge and progress to explanations that are supported by multiple and independent sources of evidence consistent with scientific ideas, principles, and theories.

Contributions of Multilingual Learners

This multitalented pool of students bring in new perspectives and resources to the science classroom through their participation and sharing of experience that can benefit their peers. Multilingual learners’ cultural and experiential diversity raise opportunities to share new ideas about scientific explanations. These contributions have the potential to add new dimensions to the ways scientific explanations are addressed through instruction.



All educators are encouraged to work collaboratively to engage multilingual learners by

- Building on the language and experiences that multilingual learners already bring with them, encouraging them to use their full range of resources (including multiple modalities) to explore scientific explanations
- Developing structured opportunities for discussions in various groupings where students can collectively develop understandings about what “counts” as a good scientific explanation.
- Focusing more on how students participate and engage in the scientific practices rather than on grammatical correctness
- Supporting the students’ developing language at the same time that they are learning science
- Providing verbal and visual supports and encourage peer collaboration to create new opportunities for all students to engage in shared knowledge construction



Explain in Science, Grades 9-12: Connecting Content and Language

Definition of Explain in Science: scientific explanations support theories about underlying causes for phenomena using multiple and independent student-generated sources of empirical evidence consistent with scientific ideas, principles, and theories

Common Concepts and Disciplinary Practices Derived from Academic Achievement Standards	Associated Language Features
<ul style="list-style-type: none"> • Evaluation of evidence used to support the explanation of scientific theories • Development of quantitative and/or qualitative claims regarding the relationship between dependent and independent variables • Use of valid and reliable empirical evidence obtained from a variety of sources in a manner that is consistent with scientific ideas, principles, and theories. • Connection of evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion. • Scientific explanations apply: <ul style="list-style-type: none"> • Scientific ideas, principles, reasoning • Mathematical and/or computational representations • Concepts of statistics and probability 	<p>Organizing Information</p> <ul style="list-style-type: none"> • Statements introducing the phenomenon being explained or analyzed • Purpose/type of explanation to orient the audience • Language choices present a neutral stance of authority • Cohesion: linking ideas across larger sections of text • Connectives match purpose of explanation (e.g., causal, sequential, factorial and consequential variables) • Restatement, summary, or conclusion <p>Adding Details, Clarity, and Precision</p> <ul style="list-style-type: none"> • Precise and descriptive details in noun and verb groups, including answers to questions regarding how or why something happens, or how events/concepts are connected • Adverbials and prepositions provide accurate ordering and clear relationships between elements, ideas, representations • Word choices include nominalizations and abstraction, technical terms to increase precision



WIDA ELD Standard 3 – Language of Science. English learners communicate information, ideas and concepts necessary for academic success in the content area of science.

WIDA LANGUAGE EXPECTATIONS

Multilingual learners use language to...

RECEPTIVE (Listening and Reading/Viewing)

ELD.Sci.9-12.Exp.Rec: Interpret explanations by analyzing the precision of empirical evidence and the match of language choices to purpose.

PRODUCTIVE (Speaking and Writing)

ELD.Sci.9-12.Exp.Prod: Develop explanations that support theories about the causes of phenomena using details, purposeful organization, and a neutral stance.



Explain in Science, **Grades 9-12:** Language Expectations and Language Functions

WIDA Language Expectations	Language Functions What students do with language to work toward meeting the WIDA Language Expectations
<p>RECEPTIVE (Listening and Reading/Viewing)</p> <p>ELD.Sci.9-12.Exp.Rec: Interpret explanations by analyzing the precision of empirical evidence and the match of language choices to purpose.</p>	<ul style="list-style-type: none">• Comprehend a scientific explanation expressed through a combination of words and diagrams or graphical displays.• Follow the line of reasoning in explanations.• Distinguish between a description and an explanation.• Determine the topic and purpose of scientific explanations.• Identify points of view or perspectives in explanations of socioscientific phenomena (e.g., climate change).• Identify causal language in science explanations of phenomena.• Select relevant information in a text (oral or written), model, or data set to support a scientific explanation.• Navigate multiple representations and multimodal texts to identify key ideas/information and related details in a scientific explanation.
<p>PRODUCTIVE (Speaking and Writing)</p> <p>ELD.Sci.9-12.Exp.Prod: Develop explanations that support theories about the causes of phenomena using details, purposeful organization, and a neutral stance.</p>	<ul style="list-style-type: none">• Explain logical relationships among claim, evidence, reasoning.• Construct tentative claims.• Construct an explanation based on valid and reliable evidence from multiple sources.• Establish a stance or perspective.• Construct explanations of phenomena that are more than descriptions of what's observable.• Use cohesive devices such as synonyms and text connectives to tie a text together• Signal relationships among ideas.• Organize ideas in ways that support the purpose of explanations.• Describe relationships among claim, evidence, and reasoning in a scientific explanation.• Critique claims, evidence, and reasoning in an explanation.• Explain how information presented in a diagram or data display supports a scientific explanation.• Summarize key information in a scientific explanation.

WIDA Proficiency Level Descriptors for Receptive Language

Listening and Reading/Viewing, Grades 9–12

As they work towards meeting WIDA English Language Development Standards and WIDA Language Expectations, with instructional support, multilingual learners will process...

	End of Level 1 Entering	End of Level 2 Emerging	End of Level 3 Developing	End of Level 4 Expanding	End of Level 5 Bridging	Level 6 Reaching
Discourse Dimension Amount of language Relationships among ideas	<ul style="list-style-type: none"> Connected discourse, with emerging coherence and cohesion Multiple, related ideas with a balance of concrete and new topics and their subcomponents 	<ul style="list-style-type: none"> Connected discourse, organized to heighten coherence and cohesion Multiple, related ideas that extend concrete topics and experiences to abstract themes 	<ul style="list-style-type: none"> Connected discourse that varies in length and order of phrases and clauses Multiple cohesive and organized ideas about complex topics, including varied perspectives 	<ul style="list-style-type: none"> Connected discourse, with many embedded phrases and clauses, that varies in length and order Multiple cohesive and organized ideas about complex topics that tie to overarching/ abstract themes, theses, claims, etc. 	<ul style="list-style-type: none"> Sophisticated, tightly connected discourse that varies in length and order of phrases and clauses Multiple cohesive and organized ideas about complex topics that tie to multiple themes, theses, claims, etc. and their subcomponents 	<ul style="list-style-type: none"> Sophisticated, tightly connected discourse that varies in length and order of phrases and clauses Multiple cohesive and densely organized ideas about complex topics in important human problems and issue
Sentence Dimension Variety of language forms and conventions Language choices characteristic of context	<ul style="list-style-type: none"> A series of compound and some complex sentences (e.g., occasionally beginning with phrases or subordinate clauses) A range of language choices that vary according to social setting and purpose (e.g., persuading, entertaining) 	<ul style="list-style-type: none"> An emerging variety in sentence lengths and parts of speech A range of language choices that vary according to social setting, who's involved (e.g., peer-to-peer vs. peer-to-teacher), and purpose (e.g., persuading, entertaining) 	<ul style="list-style-type: none"> A range of sentence structures with varying complexity, some use of sophisticated connectives to link ideas, events, or reasons A wider range of language choices that vary according to task (e.g., facilitating a science experiment), purpose, social setting, and who's involved 	<ul style="list-style-type: none"> A wide range of sentence structures with varying complexity, sophisticated connectives to link or combine ideas, events, or reason A wider range of language choices that vary according to task (e.g., facilitating a science experiment), purpose, social setting, and who's involved 	<ul style="list-style-type: none"> A wide range of sentence structures with varying complexity, sophisticated connectives to link, combine, or condense ideas, events, or reasons A broad range of language choices that vary according to the context, purpose (e.g., to persuade) and who the listeners/ readers are (e.g., peers, teachers, guest lecturer) 	<ul style="list-style-type: none"> A wide range of sentence structures with varying complexity, sophisticated connectives, including idiomatic and unique sentence patterns to link, combine, or condense ideas, events, or reasons A broad range of language choices that vary according to the task (e.g., research project), context, purpose and who's involved
Word/Phrase Dimension Range of vocabulary Specificity of language to context	<ul style="list-style-type: none"> Some specific language; most general oral language; a range of morphemes (e.g., roots, prefixes, suffixes) Language using more precise or subtle ways to say relatively simple things including idioms and common collocations 	<ul style="list-style-type: none"> Most general and specific language; some technical words/phrases; a wider range of morphemes Language using more precise or subtle ways to say relatively simple things including connotative meanings (i.e., cultural or emotional associations) 	<ul style="list-style-type: none"> Many technical words/phrases Precisely selected language essential to understanding new concepts, clarifying contextual details with multiple meanings (e.g., nuance, connotations, shades of meaning) 	<ul style="list-style-type: none"> Many technical words/phrases Precisely selected language essential to understanding new concepts, using multiple meanings and descriptive, poetic, and figurative language and to clarify contextual details 	<ul style="list-style-type: none"> Many technical words/phrases Precisely selected language essential to understanding new concepts, using a range of meanings and literary devices to connect and clarify basic motifs in literary and informational text types 	<ul style="list-style-type: none"> Most technical language Precisely selected language essential to understanding new concepts, using a range of meanings and literary devices, including irony and satire, to connect and clarify larger themes

WIDA Proficiency Level Descriptors for Productive Language

Speaking and Writing, Grades 9–12

As they work towards meeting WIDA English Language Development Standards and WIDA Language Expectations, with instructional support, multilingual learners will produce...

	End of Level 1 Entering	End of Level 2 Emerging	End of Level 3 Developing	End of Level 4 Expanding	End of Level 5 Bridging	Level 6 Reaching
Discourse Dimension Amount of language Degree of adjustment by genre/topic/task, audience, and format	<ul style="list-style-type: none"> Extended discourse with multiple, related ideas on the same topic Language choices that convey evidence of adjustment for topic and genre 	<ul style="list-style-type: none"> Connected discourse that varies in length and order of phrases and clauses Language choices that convey evidence of adjustment for topic, genre, and audience 	<ul style="list-style-type: none"> Connected discourse that vary in length and order of phrases and clauses to expand ideas or relate multiple ideas through emerging coherence, detail, and clarity Language choices that convey evidence of adjustment for topic, genre, and audience 	<ul style="list-style-type: none"> Connected discourse, with many embedded phrases and clauses, that vary in length and order to expand ideas or relate multiple ideas through emerging coherence, detail, and clarity Language choices that convey evidence of adjustment for topic, genre, and audience 	<ul style="list-style-type: none"> Connected discourse, organized to heighten coherence and cohesion in the expression of ideas Language choices that convey evidence of adjustment for topic, genre, audience, and format (e.g., spoken vs. written mode) 	<ul style="list-style-type: none"> Sophisticated, tightly connected discourse, organized to heighten coherence and cohesion, characterized by confidence, coherence, and precision in the expression of ideas Language choices that convey evidence of adjustment for topic, genre, audience, and format
Sentence Dimension Variety of language forms and conventions in expression Fluency of sustained, focused expression	<ul style="list-style-type: none"> Simple and compound sentences expanded with emerging variation Developing control in making effective language choices, including connectors and cohesive devices, using original language beyond models 	<ul style="list-style-type: none"> A series of compound and some complex sentences (e.g., occasionally beginning with phrases or subordinate clauses) Effective, controlled language choices, including connectors and cohesive devices 	<ul style="list-style-type: none"> A series of compound and complex sentences (e.g., using simple and sophisticated connectives) Effective, controlled language choices, including connectors and cohesive devices 	<ul style="list-style-type: none"> An emerging variety in sentence lengths and parts of speech Effective, controlled language choices, including connectors and cohesive devices 	<ul style="list-style-type: none"> A wide range of sentence structures with varying complexity, sophisticated connectives, including idiomatic and unique sentence patterns Precise, effective language choices, including connectors and cohesive devices 	<ul style="list-style-type: none"> A wide range of sentence structures with varying complexity, sophisticated connectives, including idiomatic and unique sentence patterns Precise, effective language choices, including connectors and cohesive devices
Word/Phrase Dimension Range of vocabulary common to age group Specificity of language to context	<ul style="list-style-type: none"> General language; a few specific words/phrases (i.e., appearing across content areas); close cognates and basic morphemes (e.g., roots, prefixes, suffixes) Language expanded with added details (e.g., longer noun groups and verb groups) 	<ul style="list-style-type: none"> Some specific language; most general oral language; a range of morphemes (e.g., roots, prefixes, suffixes) Language using more precise or subtle ways to say relatively simple things including idioms and common collocations (e.g., words/phrases that co-occur) 	<ul style="list-style-type: none"> Most specific language; some technical words/phrases; a wider range of morphemes Language using more precise or subtle ways to say relatively simple things including connotative meanings (e.g., words with cultural or emotional associations) 	<ul style="list-style-type: none"> Many technical words/phrases Precisely selected language, essential to understanding new concepts, using multiple meanings (e.g., nuance, connotations, shades of meaning) to clarify contextual details 	<ul style="list-style-type: none"> Many technical words/phrases Precisely selected language, essential to understanding new concepts, using multiple meanings and descriptive, poetic, and figurative language to clarify contextual details 	<ul style="list-style-type: none"> Many technical words/phrases Precisely selected language, essential to understanding new concepts, using a range of meanings and literary devices to connect and clarify basic motifs in literary and informational text types