

TEXES
Texas Examinations of Educator Standards

Field 111: Generalist 4–8
Test Framework

Domain	Range of Competencies
I. English Language Arts and Reading	001–009
II. Mathematics	010–028
III. Social Studies	029–035
IV. Science	036–058

TEST FRAMEWORK FOR FIELD 111: GENERALIST 4–8

Domain I English Language Arts and Reading (approximately 31% of the test)

Standards Assessed:

English Language Arts and Reading (4-8) Standards I–VIII:

Oral Language: Teachers of students in grades 4–8 understand the importance of oral language, know the developmental processes of oral language, and provide a variety of instructional opportunities for students to develop listening and speaking skills.

Foundations of Reading: Teachers of students in grades 4–8 understand the foundations of reading and early literacy development.

Word Analysis Skills and Reading Fluency: Teachers understand the importance of word analysis skills (including decoding, blending, structural analysis, sight word vocabulary) and reading fluency and provide many opportunities for students to practice and improve their word analysis skills and reading fluency.

Reading Comprehension: Teachers understand the importance of reading for understanding, know the components of comprehension, and teach students strategies for improving their comprehension.

Written Language: Teachers understand that writing is a developmental process and provide instruction that helps students develop competence in written communication.

Study and Inquiry Skills: Teachers understand the importance of study and inquiry skills as tools for learning and promote students' development in applying study and inquiry skills.

Viewing and Representing: Teachers understand how to interpret, analyze, evaluate, and produce visual images and messages in various media and to provide students with opportunities to develop skills in this area.

Assessment of Developing Literacy: Teachers understand the basic principles of assessment and use a variety of literacy assessment practices to plan and implement instruction.

Domain II Mathematics (approximately 23% of the test)

Standards Assessed:

Mathematics Standards I–VIII:

Number Concepts: The mathematics teacher understands and uses numbers, number systems and their structure, operations and algorithms, quantitative reasoning, and technology appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in order to prepare students to use mathematics.

Patterns and Algebra: The mathematics teacher understands and uses patterns, relations, functions, algebraic reasoning, analysis, and technology appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in order to prepare students to use mathematics.

Geometry and Measurement: The mathematics teacher understands and uses geometry, spatial reasoning, measurement concepts and principles, and technology appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in order to prepare students to use mathematics.

Probability and Statistics: The mathematics teacher understands and uses probability and statistics, their applications, and technology appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in order to prepare students to use mathematics.

Mathematical Processes: The mathematics teacher understands and uses mathematical processes to reason mathematically, to solve mathematical problems, to make mathematical connections within and outside of mathematics, and to communicate mathematically.

Mathematical Perspectives: The mathematics teacher understands the historical development of mathematical ideas, the interrelationship between society and mathematics, the structure of mathematics, and the evolving nature of mathematics and mathematical knowledge.

Mathematical Learning and Instruction: The mathematics teacher understands how children learn and develop mathematical skills, procedures, and concepts, knows typical errors students make, and uses this knowledge to plan, organize, and implement instruction; to meet curriculum goals; and to teach all students to understand and use mathematics.

Mathematical Assessment: The mathematics teacher understands assessment and uses a variety of formal and informal assessment techniques appropriate to the learner on an ongoing basis to monitor and guide instruction and to evaluate and report student progress.

Domain III Social Studies (approximately 23% of the test)

Standards Assessed:

Social Studies Standards I–X:

The social studies teacher has a comprehensive knowledge of the social sciences and recognizes the value of the social sciences.

The social studies teacher effectively integrates the various social science disciplines.

The social studies teacher uses knowledge and skills of social studies, as defined by the Texas Essential Knowledge and Skills (TEKS), to plan and implement effective curriculum, instruction, assessment, and evaluation.

History: The social studies teacher applies knowledge of significant historical events and developments, as well as of multiple historical interpretations and ideas, in order to facilitate student understanding of relationships between the past, the present, and the future.

Geography: The social studies teacher applies knowledge of people, places, and environments to facilitate students' understanding of geographic relationships in Texas, the United States, and the world.

Economics: The social studies teacher knows how people organize economic systems to produce, distribute, and consume goods and services, and uses this knowledge to enable students to understand economic systems and make informed economic decisions.

Government: The social studies teacher knows how governments and structures of power function, provide order, and allocate resources, and uses this knowledge to facilitate student understanding of how individuals and groups achieve their goals through political systems.

Citizenship: The social studies teacher understands citizenship in the United States and other societies, and uses this knowledge to prepare students to participate in our society through an understanding of democratic principles and citizenship practices.

Culture: The social studies teacher understands cultures and how they develop and adapt, and uses this knowledge to enable students to appreciate and respect cultural diversity in Texas, the United States, and the world.

Science, Technology, and Society: The social studies teacher understands developments in science and technology, and uses this knowledge to facilitate student understanding of the social and environmental consequences of scientific discovery and technological innovation.

Domain IV Science (approximately 23% of the test)

Standards Assessed:

Science Standards I–XI:

The science teacher manages classroom, field, and laboratory activities to ensure the safety of all students and the ethical care and treatment of organisms and specimens.

The science teacher understands the correct use of tools, materials, equipment, and technologies.

The science teacher understands the process of scientific inquiry and its role in science instruction.

The science teacher has theoretical and practical knowledge about teaching science and about how students learn science.

The science teacher knows the varied and appropriate assessments and assessment practices to monitor science learning.

The science teacher understands the history and nature of science.

The science teacher understands how science affects the daily lives of students and how science interacts with and influences personal and societal decisions.

The science teacher knows and understands the science content appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in physical science.

The science teacher knows and understands the science content appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in life science.

The science teacher knows and understands the science content appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in Earth and space science.

The science teacher knows unifying concepts and processes that are common to all sciences.

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DOMAIN I—ENGLISH LANGUAGE ARTS AND READING

Competency 001 (Oral Language)

The teacher understands the importance of oral language, knows the developmental processes of oral language, and provides a variety of instructional opportunities for students to develop listening and speaking skills.

The beginning teacher:

- Knows basic linguistic concepts (e.g., phonemes, segmentation) and developmental stages in acquiring oral language, including stages in phonology, semantics, syntax, and pragmatics, and recognizes that individual variations occur.
- Knows characteristics and uses of informal and formal oral language assessments and uses multiple, ongoing assessments to monitor and evaluate students' oral language skills.
- Provides language instruction that acknowledges students' current oral language skills and that builds on these skills to increase students' oral language proficiency.
- Plans, implements, and adapts instruction that is based on informal and formal assessment of students' progress in oral language development and that addresses the needs, strengths, and interests of individual students, including English Language Learners.
- Recognizes when oral language delays or differences warrant in-depth evaluation and additional help or intervention.
- Knows how to provide explicit, systematic oral language instruction and supports students' learning and use of oral language through meaningful and purposeful activities implemented one-to-one and in a group.
- Selects and uses instructional materials and strategies that promote students' oral language development; that respond to students' individual strengths, needs, and interests; that reflect cultural diversity; and that build on students' cultural, linguistic, and home backgrounds to enhance their oral language development.
- Understands relationships between the development of oral language and the development of reading and provides instruction that interrelates oral and written language to promote students' reading proficiency and learning (e.g., preview-review, discussion, questioning).

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- Knows similarities and differences between oral and written language and how to promote students' awareness of these similarities and differences.
- Selects and uses instructional strategies, materials, activities, and models to strengthen students' oral vocabulary and narrative skills in spoken language and teaches students to connect spoken and printed language.
- Selects and uses instructional strategies, materials, activities, and models to teach students skills for speaking to different audiences for various purposes and for adapting spoken language for various audiences, purposes, and occasions.
- Selects and uses instructional strategies, materials, activities, and models to teach students listening skills for various purposes (e.g., critical listening to evaluate a speaker's message, listening to enjoy and appreciate spoken language) and provides students with opportunities to engage in active, purposeful listening in a variety of contexts.
- Selects and uses instructional strategies, materials, activities, and models to teach students to evaluate the content and effectiveness of their own spoken messages and the messages of others.
- Knows how to promote students' development of oral communication skills through the use of technology.

Competency 002 (Early Literacy Development)

The teacher understands the foundations of early literacy development.

The beginning teacher:

- Understands the significance of phonological and phonemic awareness for reading and typical patterns in the development of phonological and phonemic awareness and recognizes that individual variations occur.
- Understands elements of the alphabetic principle (e.g., letter names, graphophonemic knowledge, the relationship of the letters in printed words to spoken language) and typical patterns of students' alphabetic skills development, and recognizes that individual variations occur.
- Understands that comprehension is an integral part of early literacy.
- Understands that not all written languages are alphabetic and that many alphabetic languages are more phonetically regular than English and knows the significance of this for students' literacy development in English.
- Understands that literacy acquisition generally develops in a predictable pattern from prereading (emergent literacy) to conventional literacy and recognizes that individual variations occur.
- Understands that literacy development occurs in multiple contexts through reading, writing, and the use of oral language.

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- Knows characteristics of informal and formal literacy assessments (e.g., screening devices, criterion-referenced state tests, curriculum-based reading assessments, informal reading inventories, norm-referenced tests).
- Knows how to select, administer, and use results from informal and formal assessments of literacy acquisition.
- Knows how to use ongoing assessment to determine when a student needs additional help or intervention to bring the student's performance to grade level, based on state content and performance standards for reading in the Texas Essential Knowledge and Skills (TEKS).
- Analyzes students' errors in reading and responds to individual students' needs by providing focused instruction to promote literacy acquisition.
- Selects and uses instructional materials that build on the current language skills of individual students, including English Language Learners, to promote development from emergent literacy to conventional literacy.

Competency 003 (Word Identification Skills and Reading Fluency)

The teacher understands the importance of word identification skills (including decoding, blending, structural analysis, and sight word vocabulary) and reading fluency and provides many opportunities for students to practice and improve word identification skills and reading fluency.

The beginning teacher:

- Understands that many students develop word analysis skills and reading fluency in a predictable sequence and recognizes that individual variations occur.
- Understands differences in students' development of word identification skills and reading fluency and knows instructional practices for meeting students' individual needs in these areas.
- Understands the connection of word identification skills and reading fluency to reading comprehension.
- Knows the continuum of word analysis skills in the statewide curriculum and grade-level expectations for attainment of these skills.
- Knows how students develop fluency in oral and silent reading.
- Understands that fluency involves rate, accuracy, and intonation and knows the norms for reading fluency that have been established in the Texas Essential Knowledge and Skills (TEKS) for various age and grade levels.
- Knows factors affecting students' word identification skills and reading fluency (e.g., home language, vocabulary development, learning disability).

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- Understands important phonetic elements and conventions of the English language.
- Knows a variety of informal and formal procedures for assessing students' word identification skills and reading fluency on an ongoing basis and uses appropriate assessments to monitor students' performance in these areas and to plan instruction for individual students, including English Language Learners.
- Analyzes students' errors in word analysis and uses the results of this analysis to inform future instruction.
- Applies norms and expectations for word identification skills and reading fluency, as specified in the Texas Essential Knowledge and Skills (TEKS), to evaluate students' reading performance.
- Knows how to use ongoing assessment of word identification skills and reading fluency to determine when a student needs additional help or intervention to bring the student's performance to grade level, based on state content and performance standards for reading in the Texas Essential Knowledge and Skills (TEKS).
- Knows strategies for decoding increasingly complex words, including using the alphabetic principle, structural cues (e.g., prefixes, suffixes, roots), and syllables, and for using syntax and semantics to support word identification and confirm word meaning.
- Selects and uses instructional strategies, materials, activities, and models to teach students to recognize high-frequency irregular words, to promote students' ability to decode increasingly complex words, and to enhance word identification skills for students reading at different levels.
- Selects and uses appropriate instructional strategies, materials, activities, and models to improve reading fluency for students reading at different levels (e.g., having students read independent-level texts, engage in repeated reading activities, use self-correction).

Competency 004 (Reading Comprehension and Assessment)

The teacher understands the importance of reading for understanding, knows components and processes of reading comprehension, and teaches students strategies for improving their comprehension.

The beginning teacher:

- Understands reading comprehension as an active process of constructing meaning.
- Understands the continuum of reading comprehension skills in the statewide curriculum and grade-level expectations for these skills.
- Understands factors affecting students' reading comprehension (e.g., oral language development, word analysis skills, prior knowledge, language background, previous reading experiences, fluency, vocabulary development, ability to monitor understanding, characteristics of specific texts).

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- Knows characteristics of informal and formal reading comprehension assessments (e.g., criterion-referenced state tests, curriculum-based reading assessments, informal reading inventories, norm-referenced tests).
- Selects and uses appropriate informal and formal assessments to monitor and evaluate students' reading comprehension.
- Analyzes student errors and provides focused instruction in reading comprehension based on the strengths and needs of individual students, including English Language Learners.
- Knows how to use ongoing assessment to determine when a student needs additional help or intervention to bring the student's performance to grade level, based on state content and performance standards for reading in the Texas Essential Knowledge and Skills (TEKS).
- Understands metacognitive skills, including self-evaluation and self-monitoring skills, and teaches students to use these skills to enhance their own reading comprehension.
- Knows how to determine students' independent, instructional, and frustration reading levels and uses this information to select and adapt reading materials for individual students, as well as to guide their selection of independent reading materials.
- Uses various instructional strategies to enhance students' reading comprehension (e.g., linking text content to students' lives and prior knowledge, connecting related ideas across different texts, engaging students in guided and independent reading, guiding students to generate questions and apply knowledge of text topics).
- Knows how to provide students with direct, explicit instruction in the use of strategies to improve their reading comprehension (e.g., previewing, self-monitoring, visualizing, retelling).
- Uses various communication modes (e.g., written, oral) to promote students' reading comprehension.
- Understands levels of reading comprehension and how to model and teach literal, inferential, and evaluative comprehension skills.
- Knows how to provide instruction to help students increase their reading vocabulary.
- Understands reading comprehension issues for students with different needs and knows effective reading strategies for those students.
- Knows the difference between guided and independent practice in reading and provides students with frequent opportunities for both.
- Knows how to promote students' development of an extensive reading and writing vocabulary by providing them with many opportunities to read and write.

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Competency 005 (Reading Applications)

The teacher understands reading skills and strategies appropriate for various types of texts and contexts and teaches students to apply these skills and strategies to enhance their reading proficiency.

The beginning teacher:

- Understands skills and strategies for understanding, interpreting, and evaluating different types of written materials, including narratives, expository texts, technical writing, and content-area textbooks.
- Understands different purposes for reading and related reading strategies.
- Knows and teaches strategies to facilitate comprehension of different types of text before, during, and after reading (e.g., previewing, making predictions, questioning, self-monitoring, rereading, mapping, using reading journals, discussing texts).
- Provides instruction in comprehension skills that support students' transition from "learning to read" to "reading to learn" (e.g., matching comprehension strategies to different types of text and different purposes for reading).
- Understands the importance of reading as a skill in all content areas.
- Understands the value of using dictionaries, glossaries, and other sources to determine the meanings, pronunciations, and derivations of unfamiliar words and teaches students to use these sources.
- Knows how to teach students to interpret information presented in various formats (e.g., maps, tables, graphs) and how to locate, retrieve, and retain information from a range of texts and technologies.
- Knows how to help students comprehend abstract content and ideas in written materials (e.g., by using manipulatives, examples, diagrams).
- Knows literary genres (e.g., historical fiction, poetry, myths, fables) and their characteristics.
- Recognizes a wide range of literature and other texts appropriate for students.
- Provides multiple opportunities for students to listen and respond to a wide variety of children's and young people's literature, both fiction and nonfiction, and to recognize characteristics of various types of narrative and expository texts.
- Understands and promotes students' development of literary response and analysis, including teaching students elements of literary analysis (e.g., story elements, features of different literary genres) and providing students with opportunities to apply comprehension skills to literature.
- Selects and uses a variety of materials to teach students about authors and about different purposes for writing.

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- Provides students with opportunities to engage in silent reading and extended reading of a wide range of materials, including expository texts and various literary genres.
- Engages students in varied reading experiences and encourages students to interact with others about their reading.
- Uses strategies to encourage reading for pleasure and lifelong learning.
- Knows how to teach students strategies for selecting their own books for independent reading.
- Uses technology to promote students' literacy and teaches students to use technology to access a wide range of appropriate narrative and expository texts.

Competency 006 (Written Language—Writing Conventions)

The teacher understands the conventions of writing in English and provides instruction that helps students develop proficiency in applying writing conventions.

The beginning teacher:

- Knows predictable stages in the development of writing conventions (including the physical and cognitive processes involved in letter formation, word writing, sentence construction, spelling, punctuation, and grammatical expression) and recognizes that individual variations occur.
- Knows and applies appropriate instructional strategies and sequences to teach writing conventions and their applications to all students, including English Language Learners.
- Knows informal and formal procedures for assessing students' use of writing conventions and uses multiple, ongoing assessments to monitor and evaluate students' development in this area.
- Uses ongoing assessment of writing conventions to determine when a student needs additional help or intervention to bring the student's performance to grade level, based on state content and performance standards for writing in the Texas Essential Knowledge and Skills (TEKS).
- Analyzes students' errors in applying writing conventions and uses the results of this analysis as a basis for future instruction.
- Knows writing conventions and appropriate grammar and usage and provides students with direct instruction and guided practice in these areas.
- Understands the contribution of conventional spelling toward success in reading and writing.

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- Understands stages of spelling development (prephonetic, phonetic, transitional, and conventional) and how and when to support students' development from one stage to the next.
- Provides systematic spelling instruction and gives students opportunities to use and develop spelling skills in the context of meaningful written expression.

Competency 007 (Written Language—Composition)

The teacher understands that writing to communicate is a developmental process and provides instruction that promotes students' competence in written communication.

The beginning teacher:

- Knows predictable stages in the development of written language and recognizes that individual variations occur.
- Promotes student recognition of the practical uses of writing, creates an environment in which students are motivated to express ideas in writing, and models writing as an enjoyable activity and a tool for lifelong learning.
- Knows and applies appropriate instructional strategies and sequences to develop students' writing skills.
- Knows characteristics and uses of informal and formal written language assessments, and uses multiple, ongoing assessments to monitor and evaluate students' writing development.
- Uses assessment results to plan focused instruction to address the writing strengths, needs, and interests of all individuals and groups, including English Language Learners.
- Uses ongoing assessment of written language to determine when a student needs additional help or intervention to bring the student's performance to grade level, based on state content and performance standards for writing in the Texas Essential Knowledge and Skills (TEKS).
- Understands the use of self-assessment in writing and provides opportunities for students to self-assess their writings (e.g., for clarity, interest to audience, comprehensiveness) and their development as writers.
- Understands differences between first-draft writing and writing for publication, and provides instruction in various stages of writing, including prewriting, drafting, editing, and revising.
- Understands the development of writing in relation to the other language arts, and uses instructional strategies that connect these various aspects of language.

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- Understands similarities and differences between language (e.g., syntax, vocabulary) used in spoken and written English and helps students use knowledge of these similarities and differences to enhance their own writing.
- Understands writing for a variety of audiences, purposes, and settings, and provides students with opportunities to write for various audiences, purposes, and settings.
- Knows how to write using voices and styles appropriate for different audiences and purposes, and provides students with opportunities to write using various voices and styles.
- Understands the benefits of technology for teaching writing and writing for publication, and provides instruction in the use of technology to facilitate written communication.

Competency 008 (Viewing and Representing)

The teacher understands skills for interpreting, analyzing, evaluating, and producing visual images and messages in various media and provides students with opportunities to develop skills in this area.

The beginning teacher:

- Knows grade-level expectations in the Texas Essential Knowledge and Skills (TEKS) and procedures for assessing students' skills in interpreting, analyzing, evaluating, and producing visual images, messages, and meanings.
- Uses ongoing assessment and knowledge of grade-level expectations in the Texas Essential Knowledge and Skills (TEKS) to identify students' needs regarding the interpretation, analysis, evaluation, and production of visual images, messages, and meanings and to plan instruction.
- Understands characteristics and functions of different types of media (e.g., film, print) and knows how different types of media influence and inform.
- Compares and contrasts print, visual, and electronic media (e.g., films and written stories).
- Evaluates how visual image makers (e.g., illustrators, documentary filmmakers, political cartoonists, news photographers) represent messages and meanings and provides students with varied opportunities to interpret and evaluate visual images in various media.
- Knows how to teach students to analyze visual image makers' choices (e.g., style, elements, media) and evaluate how these choices help to represent or extend meaning.
- Provides students with opportunities to interpret events and ideas based on information from maps, charts, graphics, video segments, and technology presentations and to use media to compare ideas and points of view.
- Knows steps and procedures for producing visual images, messages, and meanings to communicate with others.

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- Teaches students how to select, organize, and produce visuals to complement and extend meanings.
- Provides students with opportunities to use technology to produce various types of communications (e.g., class newspapers, multimedia reports, video reports) and helps students analyze how language, medium, and presentation contribute to the message.

Competency 009 (Study and Inquiry Skills)

The teacher understands the importance of study and inquiry skills as tools for learning in the content areas and promotes students' development in applying study and inquiry skills.

The beginning teacher:

- Understands study and inquiry skills (e.g., using text organizers; taking notes; outlining; drawing conclusions; applying test-taking strategies; previewing; setting purposes for reading; locating, organizing, evaluating, and communicating information; summarizing information; using multiple sources of information; interpreting and using graphic sources of information) and knows the significance of these skills for student learning and achievement.
- Knows grade-level expectations for study and inquiry skills in the Texas Essential Knowledge and Skills (TEKS) and procedures for assessing students' development and use of these skills.
- Knows and applies instructional practices that promote the acquisition and use of study and inquiry skills across the curriculum by all students, including English Language Learners.
- Knows how to provide students with varied and meaningful opportunities to learn and apply study and inquiry skills to enhance their achievement across the curriculum.
- Uses ongoing assessment and knowledge of grade-level expectations in the Texas Essential Knowledge and Skills (TEKS) to identify students' needs regarding study and inquiry skills, to determine when a student requires additional help or intervention, and to plan instruction.
- Responds to students' needs by providing direct, explicit instruction to promote the acquisition and use of study and inquiry skills.

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DOMAIN II—MATHEMATICS

Competency 010

The teacher understands the structure of number systems, the development of a sense of quantity, and the relationship between quantity and symbolic representations.

The beginning teacher:

- Analyzes the structure of numeration systems and the roles of place value and zero in the base ten system.
- Understands the relative magnitude of whole numbers, integers, rational numbers, and real numbers.
- Demonstrates an understanding of a variety of models for representing numbers (e.g., fraction strips, diagrams, patterns, shaded regions, number lines).
- Demonstrates an understanding of equivalency among different representations of rational numbers.
- Selects appropriate representations of real numbers (e.g., fractions, decimals, percents, roots, exponents, scientific notation) for particular situations.
- Understands the characteristics of the set of whole numbers, integers, rational numbers, real numbers, and complex numbers (e.g., commutativity, order, closure, identity elements, inverse elements, density).
- Demonstrates an understanding of how some situations that have no solution in one number system (e.g., whole numbers, integers, rational numbers) have solutions in another number system (e.g., real numbers, complex numbers).

Competency 011

The teacher understands number operations and computational algorithms.

The beginning teacher:

- Works proficiently with real and complex numbers and their operations.
- Analyzes and describes relationships between number properties, operations, and algorithms for the four basic operations involving integers, rational numbers, and real numbers.
- Uses a variety of concrete and visual representations to demonstrate the connections between operations and algorithms.
- Justifies procedures used in algorithms for the four basic operations with integers, rational numbers, and real numbers, and analyzes error patterns that may occur in their application.

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- Relates operations and algorithms involving numbers to algebraic procedures (e.g., adding fractions to adding rational expressions, division of integers to division of polynomials).
- Extends and generalizes the operations on rationals and integers to include exponents, their properties, and their applications to the real numbers.

Competency 012

The teacher understands ideas of number theory and uses numbers to model and solve problems within and outside of mathematics.

The beginning teacher:

- Demonstrates an understanding of ideas from number theory (e.g., prime factorization, greatest common divisor) as they apply to whole numbers, integers, and rational numbers, and uses these ideas in problem situations.
- Uses integers, rational numbers, and real numbers to describe and quantify phenomena such as money, length, area, volume, and density.
- Applies knowledge of place value and other number properties to develop techniques of mental mathematics and computational estimation.
- Applies knowledge of counting techniques such as permutations and combinations to quantify situations and solve problems.
- Applies properties of the real numbers to solve a variety of theoretical and applied problems.

Competency 013

The teacher understands and uses mathematical reasoning to identify, extend, and analyze patterns and understands the relationships among variables, expressions, equations, inequalities, relations, and functions.

The beginning teacher:

- Uses inductive reasoning to identify, extend, and create patterns using concrete models, figures, numbers, and algebraic expressions.
- Formulates implicit and explicit rules to describe and construct sequences verbally, numerically, graphically, and symbolically.
- Makes, tests, validates, and uses conjectures about patterns and relationships in data presented in tables, sequences, or graphs.
- Gives appropriate justification of the manipulation of algebraic expressions.
- Illustrates the concept of a function using concrete models, tables, graphs, and symbolic and verbal representations.
- Uses transformations to illustrate properties of functions and relations and to solve problems.

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Competency 014

The teacher understands and uses linear functions to model and solve problems.

The beginning teacher:

- Demonstrates an understanding of the concept of linear function using concrete models, tables, graphs, and symbolic and verbal representations.
- Demonstrates an understanding of the connections among linear functions, proportions, and direct variation.
- Determines the linear function that best models a set of data.
- Analyzes the relationship between a linear equation and its graph.
- Uses linear functions, inequalities, and systems to model problems.
- Uses a variety of representations and methods (e.g., numerical methods, tables, graphs, algebraic techniques) to solve systems of linear equations and inequalities.
- Demonstrates an understanding of the characteristics of linear models and the advantages and disadvantages of using a linear model in a given situation.

Competency 015

The teacher understands and uses nonlinear functions and relations to model and solve problems.

The beginning teacher:

- Uses a variety of methods to investigate the roots (real and complex), vertex, and symmetry of a quadratic function or relation.
- Demonstrates an understanding of the connections among geometric, graphic, numeric, and symbolic representations of quadratic functions.
- Analyzes data and represents and solves problems involving exponential growth and decay.
- Demonstrates an understanding of the connections among proportions, inverse variation, and rational functions.
- Understands the effects of transformations such as $f(x \pm c)$ on the graph of a nonlinear function $f(x)$.
- Applies properties, graphs, and applications of nonlinear functions to analyze, model, and solve problems.
- Uses a variety of representations and methods (e.g., numerical methods, tables, graphs, algebraic techniques) to solve systems of quadratic equations and inequalities.
- Understands how to use properties, graphs, and applications of non-linear relations including polynomial, rational, radical, absolute value, exponential, logarithmic, trigonometric, and piecewise functions and relations to analyze, model, and solve problems.

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Competency 016

The teacher uses and understands the conceptual foundations of calculus related to topics in middle school mathematics.

The beginning teacher:

- Relates topics in middle school mathematics to the concept of limit in sequences and series.
- Relates the concept of average rate of change to the slope of the secant line and instantaneous rate of change to the slope of the tangent line.
- Relates topics in middle school mathematics to the area under a curve.
- Demonstrates an understanding of the use of calculus concepts to answer questions about rates of change, areas, volumes, and properties of functions and their graphs.

Competency 017

The teacher understands measurement as a process.

The beginning teacher:

- Selects and uses appropriate units of measurement (e.g., temperature, money, mass, weight, area, capacity, density, percents, speed, acceleration) to quantify, compare, and communicate information.
- Develops, justifies, and uses conversions within measurement systems.
- Applies dimensional analysis to derive units and formulas in a variety of situations (e.g., rates of change of one variable with respect to another) and to find and evaluate solutions to problems.
- Describes the precision of measurement and the effects of error on measurement.
- Applies the Pythagorean theorem, proportional reasoning, and right triangle trigonometry to solve measurement problems.

Competency 018

The teacher understands the geometric relationships and axiomatic structure of Euclidean geometry.

The beginning teacher:

- Understands concepts and properties of points, lines, planes, angles, lengths, and distances.
- Analyzes and applies the properties of parallel and perpendicular lines.
- Uses the properties of congruent triangles to explore geometric relationships and prove theorems.
- Describes and justifies geometric constructions made using a compass and straight edge and other appropriate technologies.
- Applies knowledge of the axiomatic structure of Euclidean geometry to justify and prove theorems.

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Competency 019

The teacher analyzes the properties of two- and three-dimensional figures.

The beginning teacher:

- Uses and understands the development of formulas to find lengths, perimeters, areas, and volumes of basic geometric figures.
- Applies relationships among similar figures, scale, and proportion and analyzes how changes in scale affect area and volume measurements.
- Uses a variety of representations (e.g., numeric, verbal, graphic, symbolic) to analyze and solve problems involving two- and three-dimensional figures such as circles, triangles, polygons, cylinders, prisms, and spheres.
- Analyzes the relationship among three-dimensional figures and related two-dimensional representations (e.g., projections, cross-sections, nets) and uses these representations to solve problems.

Competency 020

The teacher understands transformational geometry and relates algebra to geometry and trigonometry using the Cartesian coordinate system.

The beginning teacher:

- Describes and justifies geometric constructions made using a reflection device and other appropriate technologies.
- Uses translations, reflections, glide-reflections, and rotations to demonstrate congruence and to explore the symmetries of figures.
- Uses dilations (expansions and contractions) to illustrate similar figures and proportionality.
- Uses symmetry to describe tessellations and shows how they can be used to illustrate geometric concepts, properties, and relationships.
- Applies concepts and properties of slope, midpoint, parallelism, and distance in the coordinate plane to explore properties of geometric figures and solve problems.
- Applies transformations in the coordinate plane.
- Uses the unit circle in the coordinate plane to explore properties of trigonometric functions.

**FIELD 111: GENERALIST 4–8
TEST FRAMEWORK**

Competency 021

The teacher understands how to use graphical and numerical techniques to explore data, characterize patterns, and describe departures from patterns.

The beginning teacher:

- Organizes and displays data in a variety of formats (e.g., tables, frequency distributions, stem-and-leaf plots, box-and-whisker plots, histograms, pie charts).
- Applies concepts of center, spread, shape, and skewness to describe a data distribution.
- Supports arguments, makes predictions, and draws conclusions using summary statistics and graphs to analyze and interpret one-variable data.
- Demonstrates an understanding of measures of central tendency (e.g., mean, median, mode) and dispersion (e.g., range, interquartile range, variance, standard deviation).
- Analyzes connections among concepts of center and spread, data clusters and gaps, data outliers, and measures of central tendency and dispersion.
- Calculates and interprets percentiles and quartiles.

Competency 022

The teacher understands the theory of probability.

The beginning teacher:

- Explores concepts of probability through data collection, experiments, and simulations.
- Uses the concepts and principles of probability to describe the outcome of simple and compound events.
- Generates, simulates, and uses probability models to represent a situation.
- Determines probabilities by constructing sample spaces to model situations.
- Solves a variety of probability problems using combinations, permutations, and geometric probability (i.e., probability as the ratio of two areas).
- Uses the binomial, geometric, and normal distributions to solve problems.

**FIELD 111: GENERALIST 4–8
TEST FRAMEWORK**

Competency 023

The teacher understands the relationship among probability theory, sampling and statistical inference, and how statistical inference is used in making and evaluating predictions.

The beginning teacher:

- Applies knowledge of designing, conducting, analyzing, and interpreting statistical experiments to investigate real-world problems.
- Demonstrates an understanding of random samples, sample statistics, and the relationship between sample size and confidence intervals.
- Applies knowledge of the use of probability to make observations and draw conclusions from single variable data and to describe the level of confidence in the conclusion.
- Makes inferences about a population using binomial, normal, and geometric distributions.
- Demonstrates an understanding of the use of techniques such as scatter plots, regression lines, correlation coefficients, and residual analysis to explore bivariate data and to make and evaluate predictions.

Competency 024

The teacher understands mathematical reasoning and problem solving.

The beginning teacher:

- Demonstrates an understanding of proof, including indirect proof, in mathematics.
- Applies correct mathematical reasoning to derive valid conclusions from a set of premises.
- Demonstrates an understanding of the use of inductive reasoning to make conjectures and deductive methods to evaluate the validity of conjectures.
- Applies knowledge of the use of formal and informal reasoning to explore, investigate, and justify mathematical ideas.
- Recognizes that a mathematical problem can be solved in a variety of ways and selects an appropriate strategy for a given problem.
- Evaluates the reasonableness of a solution to a given problem.
- Applies content knowledge to develop a mathematical model of a real-world situation and analyzes and evaluates how well the model represents the situation.
- Demonstrates an understanding of estimation and evaluates its appropriate uses.

**FIELD 111: GENERALIST 4–8
TEST FRAMEWORK**

Competency 025

The teacher understands mathematical connections within and outside of mathematics and how to communicate mathematical ideas and concepts.

The beginning teacher:

- Recognizes and uses multiple representations of a mathematical concept (e.g., a point and its coordinates, the area of circle as a quadratic function in r , probability as the ratio of two areas).
- Uses mathematics to model and solve problems in other disciplines, such as art, music, science, social science, and business.
- Expresses mathematical statements using developmentally appropriate language, standard English, mathematical language, and symbolic mathematics.
- Communicates mathematical ideas using a variety of representations (e.g., numeric, verbal, graphic, pictorial, symbolic, concrete).
- Demonstrates an understanding of the use of visual media such as graphs, tables, diagrams, and animations to communicate mathematical information.
- Uses the language of mathematics as a precise means of expressing mathematical ideas.
- Understands the structural properties common to the mathematical disciplines.

Competency 026

The teacher understands how children learn and develop mathematical skills, procedures, and concepts.

The beginning teacher:

- Applies theories and principles of learning mathematics to plan appropriate instructional activities for all students.
- Understands how students differ in their approaches to learning mathematics with regards to diversity.
- Uses students' prior mathematical knowledge to build conceptual links to new knowledge and plans instruction that builds on students' strengths and addresses students' needs.
- Understands how learning may be assisted through the use of mathematics manipulatives and technological tools.
- Understands how to motivate students and actively engage them in the learning process by using a variety of interesting, challenging, and worthwhile mathematical tasks in individual, small-group, and large-group settings.

FIELD 111: GENERALIST 4–8 TEST FRAMEWORK

- Understands how to provide instruction along a continuum from concrete to abstract.
- Recognizes the implications of current trends and research in mathematics and mathematics education.

Competency 027

The teacher understands how to plan, organize, and implement instruction using knowledge of students, subject matter, and statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) to teach all students to use mathematics.

The beginning teacher:

- Demonstrates an understanding of a variety of instructional methods, tools, and tasks that promote students' ability to do mathematics described in the TEKS.
- Understands planning strategies for developing mathematical instruction as a discipline of interconnected concepts and procedures.
- Develops clear learning goals to plan, deliver, assess, and reevaluate instruction based on the TEKS.
- Understands procedures for developing instruction that establishes transitions between concrete, symbolic, and abstract representations of mathematical knowledge.
- Applies knowledge of a variety of instructional delivery methods, such as individual, structured small-group, and large-group formats.
- Understands how to create a learning environment that provides all students, including English Language Learners, with opportunities to develop and improve mathematical skills and procedures.
- Demonstrates an understanding of a variety of questioning strategies to encourage mathematical discourse and to help students analyze and evaluate their mathematical thinking.
- Understands how technological tools and manipulatives can be used appropriately to assist students in developing, comprehending, and applying mathematical concepts.
- Understands how to relate mathematics to students' lives and a variety of careers and professions.

**FIELD 111: GENERALIST 4–8
TEST FRAMEWORK**

Competency 028

The teacher understands assessment and uses a variety of formal and informal assessment techniques to monitor and guide mathematics instruction and to evaluate student progress.

The beginning teacher:

- Demonstrates an understanding of the purpose, characteristics, and uses of various assessments in mathematics, including formative and summative assessments.
- Understands how to select and develop assessments that are consistent with what is taught and how it is taught.
- Demonstrates an understanding of how to develop a variety of assessments and scoring procedures consisting of worthwhile tasks that assess mathematical understanding, common misconceptions, and error patterns.
- Understands how to evaluate a variety of assessment methods and materials for reliability, validity, absence of bias, clarity of language, and appropriateness of mathematical level.
- Understands the relationship between assessment and instruction and knows how to evaluate assessment results to design, monitor, and modify instruction to improve mathematical learning for all students, including English Language Learners.

DOMAIN III—SOCIAL STUDIES

Competency 029 (History)

The teacher understands and applies knowledge of significant historical events and developments, multiple historical interpretations and ideas, and relationships between the past, the present, and the future, as defined by the Texas Essential Knowledge and Skills (TEKS).

The beginning teacher:

- Understands traditional historical points of reference in the history of Texas, the United States, and the world.
- Analyzes how individuals, events, and issues shaped the history of Texas, the United States, and the world.
- Analyzes the influence of various factors (e.g., geographic contexts, processes of spatial exchange, science and technology) on the development of societies.
- Knows common characteristics of communities, past and present.
- Applies knowledge of the concept of chronology and its use in understanding history and historical events.

**FIELD 111: GENERALIST 4–8
TEST FRAMEWORK**

- Applies different methods of interpreting the past to understand, evaluate, and support multiple points of view, frames of reference, and the historical context of events and issues.
- Understands similarities and differences among Native-American groups in Texas, the United States, and the Western Hemisphere before European colonization.
- Understands the causes and effects of European exploration and colonization of Texas, the United States, and the Western Hemisphere.
- Understands the foundations of representative government in the United States, significant issues of the revolutionary era, and challenges confronting the U.S. government in the early years of the republic.
- Understands westward expansion and analyzes its effects on the political, economic, and social development of the United States.
- Analyzes ways in which political, economic, and social factors led to the growth of sectionalism and the Civil War.
- Knows individuals, issues, and events of the Civil War and analyzes the effects of Reconstruction on the political, economic, and social life of the nation.
- Demonstrates knowledge of major U.S. reform movements of the nineteenth century (e.g., abolitionist, women's suffrage, temperance).
- Understands important issues, events, and individuals of the twentieth century in Texas, the United States, and the world.
- Understands the contributions of people of various racial, ethnic, and religious groups in Texas, the United States, and the world.
- Analyzes ways in which particular contemporary societies reflect historical events (e.g., invasion, conquests, colonization, immigration).

Competency 030 (Geography)

The teacher understands and applies knowledge of geographic relationships involving people, places, and environments in Texas, the United States, and the world, as defined by the Texas Essential Knowledge and Skills (TEKS).

The beginning teacher:

- Understands and applies the geographic concept of region.
- Knows the location and the human and physical characteristics of places and regions in Texas, the United States, and the world.
- Analyzes ways in which humans adapt to, use, and modify the physical environment.
- Knows how regional physical characteristics and human modifications to the environment affect people's activities and settlement patterns.
- Analyzes ways in which location (absolute and relative) affects people, places, and environments.

**FIELD 111: GENERALIST 4–8
TEST FRAMEWORK**

- Demonstrates knowledge of physical processes (e.g., erosion, deposition, and weathering; plate tectonics; sediment transfer; the flows and exchanges of energy and matter in the atmosphere that produce weather and climate) and their effects on environmental patterns.
- Understands the characteristics, distribution, and migration of populations in Texas, the United States, and the world.
- Understands the physical environmental characteristics of Texas, the United States, and the world, past and present, and how humans have adapted to and modified the environment.
- Analyzes how geographic factors have influenced the settlement patterns, economic development, political relationships, and policies of societies and regions in Texas, the United States, and the world.
- Analyzes interactions between people and the physical environment and the effects of these interactions on the development of places and regions.

Competency 031 (Economics)

The teacher understands and applies knowledge of economic systems and how people organize economic systems to produce, distribute, and consume goods and services, as defined by the Texas Essential Knowledge and Skills (TEKS).

The beginning teacher:

- Understands that basic human needs are met in many ways.
- Understands and applies knowledge of basic economic concepts (e.g., goods and services, free enterprise, interdependence, needs and wants, scarcity, economic system, factors of production).
- Demonstrates knowledge of the ways in which people organize economic systems, and similarities and differences among various economic systems around the world.
- Understands the value and importance of work and purposes for spending and saving money.
- Demonstrates knowledge of patterns of work and economic activities in Texas, the United States, and the world, past and present.
- Understands the characteristics, benefits, and development of the free-enterprise system in Texas and the United States.
- Analyzes the roles of producers and consumers in the production of goods and services.
- Demonstrates knowledge of how businesses operate in the U.S. free-enterprise system.
- Applies knowledge of the effects of supply and demand on consumers and producers in a free-enterprise system.
- Demonstrates knowledge of categories of economic activities and methods used to measure a society's economic level.

**FIELD 111: GENERALIST 4–8
TEST FRAMEWORK**

- Uses economic indicators to describe and measure levels of economic activity.
- Understands major events and trends in economic history (e.g., factors leading societies to change from agrarian to urban, economic reasons for exploration and colonization, economic forces leading to the Industrial Revolution, processes of economic development in world areas, factors leading to the emergence of different patterns of economic activity in regions of the United States).
- Analyzes the interdependence of the Texas economy with the United States and the world.
- Applies knowledge of significant economic events and issues and their effects in Texas, the United States, and the world.

Competency 032 (Government and Citizenship)

The teacher understands and applies knowledge of government, democracy, and citizenship, including ways in which individuals and groups achieve their goals through political systems, as defined by the Texas Essential Knowledge and Skills (TEKS).

The beginning teacher:

- Understands the purpose of rules and laws; the relationship between rules, rights, and responsibilities; and the individual's role in making and enforcing rules and ensuring the welfare of society.
- Knows the basic structure and functions of the U.S. government, the Texas government, and local governments (including the roles of public officials) and relationships among national, state, and local governments.
- Demonstrates knowledge of key principles and ideas in major political documents of Texas and the United States (e.g., Declaration of Independence, U.S. Constitution, Texas Constitution) and relationships among political documents.
- Knows how people organized governments in colonial America and during the early development of Texas.
- Understands the political process in the United States and Texas and how the U.S. political system works.
- Demonstrates knowledge of types of government (e.g., constitutional, totalitarian) and their effectiveness in meeting citizens' needs.
- Knows the formal and informal process of changing the U.S. and Texas constitutions and the impact of changes on society.
- Understands the impact of landmark Supreme Court cases.
- Understands components of the democratic process (e.g., voluntary individual participation, effective leadership, expression of different points of view) and their significance in a democratic society.

**FIELD 111: GENERALIST 4–8
TEST FRAMEWORK**

- Demonstrates knowledge of important customs, symbols, and celebrations that represent American beliefs and principles and contribute to national unity.
- Analyzes the relationship among individual rights, responsibilities, and freedoms in democratic societies.
- Applies knowledge of the rights and responsibilities of citizens in Texas and the United States, past and present.
- Understands how the nature, rights, and responsibilities of citizenship vary among societies.

Competency 033 (Culture; Science, Technology, and Society)

The teacher understands and applies knowledge of cultural development, adaptation, and diversity, and understands and applies knowledge of interactions among science, technology, and society, as defined by the Texas Essential Knowledge and Skills (TEKS).

The beginning teacher:

- Understands basic concepts of culture and the processes of cultural adaptation, diffusion, and exchange.
- Analyzes similarities and differences in the ways various peoples at different times in history have lived and met basic human needs.
- Applies knowledge of the role of families in meeting basic human needs and how families and cultures develop and use customs, traditions, and beliefs to define themselves.
- Demonstrates knowledge of institutions that exist in all societies and how characteristics of these institutions may vary among societies.
- Understands how people use oral tradition, stories, real and mythical heroes, music, paintings, and sculpture to create and represent culture in communities in Texas, the United States, and the world.
- Understands the contributions of people of various racial, ethnic, and religious groups in Texas, the United States, and the world.
- Demonstrates knowledge of relationships among world cultures and relationships between and among people from various groups, including racial, ethnic, and religious groups, in the United States and throughout the world.
- Analyzes relationships among religion, philosophy, and culture, and the impact of religion on ways of life in the United States and world areas.
- Understands the concept of diversity within unity.
- Analyzes the effects of race, gender, and socioeconomic class on ways of life in the United States and throughout the world.
- Understands the various roles of men, women, children, and families in cultures past and present.

**FIELD 111: GENERALIST 4–8
TEST FRAMEWORK**

- Understands how the self develops and the dynamic relationship between self and social context.
- Applies knowledge of the effects of scientific discoveries and technological innovations on political, economic, social, and environmental developments and on everyday life in Texas, the United States, and the world.
- Analyzes how science and technology relate to political, economic, social, and cultural issues and events.
- Demonstrates knowledge of the origins, diffusion, and effects of major scientific, mathematical, and technological discoveries throughout history.
- Knows how developments in science and technology have affected the physical environment; the growth of economies and societies; and definitions of, access to, and use of physical and human resources.
- Knows how changes in science and technology affect moral and ethical issues.

Competency 034 (Social Studies Foundations and Skills)

The teacher understands the foundations of social studies education and applies knowledge of skills used in the social sciences.

The beginning teacher:

- Understands the philosophical foundations of the social science disciplines and knows how knowledge generated by the social sciences affects society and people's lives.
- Understands how social science disciplines relate to each other.
- Understands practical applications of social studies education.
- Relates philosophical assumptions and ideas to issues and trends in the social sciences.
- Knows characteristics and uses of various primary and secondary sources (e.g., databases, maps, photographs, media services, the Internet, biographies, interviews, questionnaires, artifacts), and uses information from a variety of sources to acquire social science information and answer social science questions.
- Knows how to formulate research questions and use appropriate procedures to reach supportable judgments and conclusions in the social sciences.
- Understands social science research and knows how social scientists locate, gather, organize, analyze, and report information using standard research methodologies.
- Evaluates the validity of social science information from primary and secondary sources regarding bias issues, propaganda, point of view, and frame of reference.
- Understands and evaluates multiple points of view and frames of reference relating to issues in the social sciences.

**FIELD 111: GENERALIST 4–8
TEST FRAMEWORK**

- Knows how to analyze social science information (e.g., by categorizing, comparing and contrasting, making generalizations and predictions, drawing inferences and conclusions).
- Communicates and interprets social science information in written, oral, and visual forms and translates information from one medium to another (e.g., written to visual, statistical to written or visual).
- Knows how to use problem-solving processes to identify problems, gather information, list and consider options, consider advantages and disadvantages, choose and implement solutions, and evaluate the effectiveness of solutions.
- Knows how to use decision-making processes to identify situations that require decisions, gather information, identify options, predict consequences, and take action to implement decisions.
- Knows how to create maps and other graphics to present geographic, political, historical, economic, and cultural features, distributions, and relationships.
- Analyzes social science data by using basic mathematical and statistical concepts and analytical methods.
- Knows how to apply skills for resolving conflict, including persuasion, compromise, debate, and negotiation.
- Understands and uses social studies terminology correctly.

Competency 035 (Social Studies Instruction and Assessment)

The teacher plans and implements effective instruction and assessment in social studies.

The beginning teacher:

- Knows state content and performance standards for social studies that comprise the Texas Essential Knowledge and Skills (TEKS).
- Understands the vertical alignment of the social sciences in the Texas Essential Knowledge and Skills (TEKS) from grade level to grade level, including prerequisite knowledge and skills.
- Understands the implications of stages of child growth and development for designing and implementing effective learning experiences in the social sciences.
- Understands the appropriate use of technology as a tool for learning and communicating social studies concepts.
- Selects and uses effective instructional practices, activities, technologies, and materials to promote students' knowledge and skills in the social sciences.
- Knows how to promote students' use of social science skills, vocabulary, and research tools, including technological tools.
- Knows how to communicate the value of social studies education to students, parents/caregivers, colleagues, and the community.

**FIELD 111: GENERALIST 4–8
TEST FRAMEWORK**

- Knows how to provide instruction that relates skills, concepts, and ideas in different social science disciplines.
- Provides instruction that makes connections between knowledge and methods in the social sciences and in other content areas.
- Demonstrates knowledge of forms of assessment appropriate for evaluating students' progress and needs in the social sciences.
- Uses multiple forms of assessment and knowledge of the Texas Essential Knowledge and Skills (TEKS) to determine students' progress and needs and to help plan instruction that addresses the strengths, needs, and interests of all students, including English Language Learners.

DOMAIN IV—SCIENCE

Competency 036

The teacher understands how to manage learning activities to ensure the safety of all students.

The beginning teacher:

- Understands safety regulations and guidelines for science facilities and science instruction.
- Knows procedures for and sources of information regarding the appropriate handling, use, disposal, care, and maintenance of chemicals, materials, specimens, and equipment.
- Knows procedures for the safe handling and ethical care and treatment of organisms and specimens.

Competency 037

The teacher understands the correct use of tools, materials, equipment, and technologies.

The beginning teacher:

- Selects and safely uses appropriate tools, technologies, materials, and equipment needed for instructional activities.
- Understands concepts of precision, accuracy, and error with regard to reading and recording numerical data from a scientific instrument.
- Understands how to gather, organize, display, and communicate data in a variety of ways (e.g., charts, tables, graphs, diagrams, written reports, oral presentations).
- Understands the international system of measurement (i.e., metric system) and performs unit conversions within measurement systems.

FIELD 111: GENERALIST 4–8 TEST FRAMEWORK

Competency 038

The teacher understands the process of scientific inquiry and the history and nature of science.

The beginning teacher:

- Understands the characteristics of various types of scientific investigations (e.g., descriptive studies, controlled experiments, comparative data analysis).
- Understands how to design, conduct, and communicate the results of a variety of scientific investigations.
- Understands the historical development of science and the contributions that diverse cultures and individuals of both genders have made to scientific knowledge.
- Understands the roles that logical reasoning, verifiable evidence, prediction, and peer review play in the process of generating and evaluating scientific knowledge.
- Understands principles of scientific ethics.
- Develops, analyzes, and evaluates different explanations for a given scientific result.
- Demonstrates an understanding of potential sources of error in inquiry-based investigation.
- Demonstrates an understanding of how to communicate and defend the results of an inquiry-based investigation.

Competency 039

The teacher understands how science impacts the daily lives of students and interacts with and influences personal and societal decisions.

The beginning teacher:

- Understands that decisions about the use of science are based on factors such as ethical standards, economics, and personal and societal needs.
- Applies scientific principles and the theory of probability to analyze the advantages of, disadvantages of, or alternatives to a given decision or course of action.
- Applies scientific principles and processes to analyze factors that influence personal choices concerning fitness and health, including physiological and psychological effects and risks associated with the use of substances and substance abuse.
- Understands concepts, characteristics, and issues related to changes in populations and human population growth.
- Understands the types and uses of natural resources and the effects of human consumption on the renewal and depletion of resources.
- Understands the role science can play in helping resolve personal, societal, and global challenges.

FIELD 111: GENERALIST 4–8 TEST FRAMEWORK

Competency 040

The teacher knows and understands the unifying concepts and processes that are common to all sciences.

The beginning teacher:

- Understands how the following concepts and processes provide a unifying explanatory framework across the science disciplines: systems, order, and organization; evidence, models, and explanation; change, constancy, and measurements; evolution and equilibrium; and form and function.
- Demonstrates an understanding of how patterns in observations and data can be used to make explanations and predictions.
- Analyzes interactions and interrelationships between systems and subsystems.
- Applies unifying concepts to explore similarities in a variety of natural phenomena.
- Understands how properties and patterns of systems can be described in terms of space, time, energy, and matter.
- Understands how change and constancy occur in systems.
- Understands the complementary nature of form and function in a given system.
- Understands how models are used to represent the natural world and how to evaluate the strengths and limitations of a variety of scientific models (e.g., physical, conceptual, mathematical).

Competency 041

The teacher understands forces and motion and their relationships.

The beginning teacher:

- Demonstrates an understanding of properties of universal forces (e.g., gravitational, electrical, magnetic).
- Understands how to measure, graph, and describe changes in motion using concepts of displacement, velocity, and acceleration.
- Understands the vector nature of force.
- Identifies the forces acting on a object and applies Newton's laws to describe the motion of an object.
- Analyzes the relationship between force and motion in a variety of situations (e.g., simple machines, blood flow, geologic processes).

**FIELD 111: GENERALIST 4–8
TEST FRAMEWORK**

Competency 042

The teacher understands physical properties of and changes in matter.

The beginning teacher:

- Describes the physical properties of substances (e.g., density, boiling point, solubility, thermal and electrical conductivity).
- Describes the physical properties and molecular structure of solids, liquids, and gases.
- Describes the relationship between the molecular structure of materials (e.g., metals, crystals, polymers) and their physical properties.
- Relates the physical properties of an element to its placement in the periodic table.
- Distinguishes between physical and chemical changes in matter.
- Applies knowledge of physical properties of and changes in matter to processes and situations that occur in life and earth/space science.

Competency 043

The teacher understands chemical properties of and changes in matter.

The beginning teacher:

- Describes the structure and components of the atom.
- Distinguishes among elements, mixtures, and compounds and describes their properties.
- Relates the chemical properties of an element to its placement in the periodic table.
- Describes chemical bonds and chemical formulas.
- Analyzes chemical reactions and their associated chemical equations.
- Explains the importance of a variety of chemical reactions that occur in daily life (e.g., rusting, burning of fossil fuels, photosynthesis, cell respiration, chemical batteries, digestion of food).
- Understands applications of chemical properties of matter in physical, life, and earth/space science and technology (e.g., materials science, biochemistry, transportation, medicine, telecommunications).

Competency 044

The teacher understands energy and interactions between matter and energy.

The beginning teacher:

- Describes concepts of work, power, and potential and kinetic energy.
- Understands the concept of heat energy and the difference between heat and temperature.
- Understands the principles of electricity and magnetism and their applications (e.g., electric circuits, motors, audio speakers, nerve impulses, lightning).

FIELD 111: GENERALIST 4–8 TEST FRAMEWORK

- Applies knowledge of properties of light (e.g., reflection, refraction, dispersion) to describe the function of optical systems and phenomena (e.g., camera, microscope, rainbow, eye).
- Demonstrates an understanding of the properties, production, and transmission of sound.
- Applies knowledge of properties and characteristics of waves (e.g., wavelength, frequency, interference) to describe a variety of waves (e.g., water, electromagnetic, sound).

Competency 045

The teacher understands energy transformations and the conservation of matter and energy.

The beginning teacher:

- Describes the processes that generate energy in the sun and other stars.
- Applies the law of conservation of matter to analyze a variety of situations (e.g., the water cycle, food chains, decomposition, balancing chemical equations).
- Describes sources of electrical energy and processes of energy transformation for human uses (e.g., fossil fuels, solar panels, hydroelectric plants).
- Understands exothermic and endothermic chemical reactions and their applications (e.g., hot and cold packs, energy content of food).
- Applies knowledge of the transfer of energy in a variety of situations (e.g., the production of heat, light, sound, and magnetic effects by electrical energy; the process of photosynthesis; weather processes; food webs; food/energy pyramids).
- Applies the law of conservation of energy to analyze a variety of physical phenomena (e.g., specific heat, nuclear reactions, efficiency of simple machines, collisions).
- Understands applications of energy transformations and the conservation of matter and energy in life and earth/space science.

Competency 046

The teacher understands the structure and function of living things.

The beginning teacher:

- Describes characteristics of organisms from the major taxonomic groups.
- Analyzes how structure complements function in cells.
- Analyzes how structure complements function in tissues, organs, organ systems, and organisms.

**FIELD 111: GENERALIST 4–8
TEST FRAMEWORK**

- Identifies human body systems and describes their functions.
- Describes how organisms obtain and use energy and matter.
- Applies chemical principles to describe the structure and function of the basic chemical components (e.g., proteins, carbohydrates, lipids, nucleic acids) of living things.

Competency 047

The teacher understands reproduction and the mechanisms of heredity.

The beginning teacher:

- Compares and contrasts sexual and asexual reproduction.
- Understands the organization of hereditary material (e.g., DNA, genes, chromosomes).
- Describes how an inherited trait can be determined by one or many genes and how more than one trait can be influenced by a single gene.
- Distinguishes between dominant and recessive traits and predicts the probable outcomes of genetic combinations.
- Evaluates the influence of environmental and genetic factors on the traits of an organism.
- Describes current applications of genetic research (e.g., related to cloning, reproduction, health, industry, agriculture).

Competency 048

The teacher understands adaptations of organisms and the theory of evolution.

The beginning teacher:

- Describes similarities and differences among various types of organisms and methods of classifying organisms.
- Describes traits in a population or species that enhance its survival and reproductive success.
- Describes how populations and species change through time.
- Applies knowledge of the mechanisms and processes of biological evolution (e.g., variation, mutation, environmental factors, natural selection).
- Describes evidence that supports the theory of evolution of life on Earth.

**FIELD 111: GENERALIST 4–8
TEST FRAMEWORK**

Competency 049

The teacher understands regulatory mechanisms and behavior.

The beginning teacher:

- Describes how organisms respond to internal and external stimuli.
- Applies knowledge of structures and physiological processes that maintain stable internal conditions.
- Demonstrates an understanding of feedback mechanisms that allow organisms to maintain stable internal conditions.
- Understands how evolutionary history affects behavior.

Competency 050

The teacher understands the relationships between organisms and the environment.

The beginning teacher:

- Identifies the abiotic and biotic components of an ecosystem.
- Analyzes the interrelationships among producers, consumers, and decomposers in an ecosystem.
- Identifies factors that influence the size and growth of populations in an ecosystem.
- Analyzes adaptive characteristics that result in a population's or species's unique niche in an ecosystem.
- Describes and analyzes energy flow through various types of ecosystems.
- Knows how populations and species modify and affect ecosystems.

Competency 051

The teacher understands the structure and function of earth systems.

The beginning teacher:

- Understands the structure of Earth and analyzes constructive and destructive processes that produce geologic change.
- Understands the form and function of surface and subsurface water.
- Applies knowledge of the composition and structure of the atmosphere and its properties.
- Demonstrates an understanding of the interactions that occur among the biosphere, geosphere, hydrosphere, and atmosphere.
- Applies knowledge of how human activity and natural processes, both gradual and catastrophic, can alter earth systems.
- Identifies the sources of energy (e.g., solar, geothermal) in earth systems and describes mechanisms of energy transfer (e.g., convection, radiation).

**FIELD 111: GENERALIST 4–8
TEST FRAMEWORK**

Competency 052

The teacher understands cycles in earth systems.

The beginning teacher:

- Understands the rock cycle and how rocks, minerals, and soils are formed.
- Understands the water cycle and its relationship to weather processes.
- Understands the nutrient (e.g., carbon, nitrogen) cycle and its relationship to earth systems.
- Applies knowledge of how human and natural processes affect earth systems.
- Understands the dynamic interactions that occur among the various cycles in the biosphere, geosphere, hydrosphere, and atmosphere.

Competency 053

The teacher understands the role of energy in weather and climate.

The beginning teacher:

- Understands the elements of weather (e.g., humidity, wind speed, pressure, temperature) and how they are measured.
- Compares and contrasts weather and climate.
- Analyzes weather charts and data to make weather predictions.
- Applies knowledge of how transfers of energy among earth systems affect weather and climate.
- Analyzes how Earth's position, orientation, and surface features affect weather and climate.

Competency 054

The teacher understands the characteristics of the solar system and the universe.

The beginning teacher:

- Understands the properties and characteristics of celestial objects.
- Applies knowledge of the earth-moon-sun system and the interactions among them (e.g., seasons, lunar phases, eclipses).
- Identifies properties of the components of the solar system.
- Recognizes characteristics of stars and galaxies and their distribution in the universe.
- Demonstrates an understanding of scientific theories of the origin of the universe.

**FIELD 111: GENERALIST 4–8
TEST FRAMEWORK**

Competency 055

The teacher understands the history of the earth system.

The beginning teacher:

- Understands the scope of the geologic time scale and its relationship to geologic processes.
- Demonstrates an understanding of theories about the earth's origin and geologic history.
- Demonstrates an understanding of how tectonic forces have shaped landforms over time.
- Understands the formation of fossils and the importance of the fossil record in explaining the earth's history.

Competency 056

The teacher has theoretical and practical knowledge about teaching science and about how students learn science.

The beginning teacher:

- Understands how the developmental characteristics, prior knowledge and experience, and attitudes of students influence science learning.
- Selects and adapts science curricula, content, instructional materials, and activities to meet the interests, knowledge, understanding, abilities, experiences, and needs of all students, including English Language Learners.
- Understands how to use situations from students' daily lives to develop instructional materials that investigate how science can be used to make informed decisions.
- Understands common misconceptions in science and effective ways to address these misconceptions.
- Understands the rationale for the use of active learning and inquiry processes for students.
- Understands questioning strategies designed to elicit higher-level thinking and how to use them to move students from concrete to more abstract understanding.
- Understands the importance of planning activities that are inclusive and accommodate the needs of all students.
- Understands how to sequence learning activities in a way that allows students to build upon their prior knowledge and challenges them to expand their understanding of science.

FIELD 111: GENERALIST 4–8 TEST FRAMEWORK

Competency 057

The teacher understands the process of scientific inquiry and its role in science instruction.

The beginning teacher:

- Plans and implements instruction that provides opportunities for all students to engage in nonexperimental and experimental inquiry investigations.
- Focuses inquiry-based instruction on questions and issues relevant to students and uses strategies to assist students with generating, refining, and focusing scientific questions and hypotheses.
- Instructs students in the safe and proper use of a variety of grade-appropriate tools, equipment, resources, technology, and techniques to access, gather, store, retrieve, organize, and analyze data.
- Knows how to guide students in making systematic observations and measurements.
- Knows how to promote the use of critical-thinking skills, logical reasoning, and scientific problem solving to reach conclusions based on evidence.
- Knows how to teach students to develop, analyze, and evaluate different explanations for a given scientific result.
- Knows how to teach students to demonstrate an understanding of potential sources of error in inquiry-based investigation.
- Knows how to teach students to demonstrate an understanding of how to communicate and defend the results of an inquiry-based investigation.

Competency 058

The teacher knows the varied and appropriate assessments and assessment practices to monitor science learning in laboratory, field, and classroom settings.

The beginning teacher:

- Understands the relationships among science curriculum, assessment, and instruction and bases instruction on information gathered through assessment of students' strengths and needs.
- Understands the importance of monitoring and assessing students' understanding of science concepts and skills on an ongoing basis.
- Understands the importance of carefully selecting or designing formative and summative assessments for the specific decisions they are intended to inform.
- Selects or designs and administers a variety of appropriate assessment methods (e.g., performance assessment, self-assessment, formal/informal, formative/summative) to monitor student understanding and progress.

**FIELD 111: GENERALIST 4–8
TEST FRAMEWORK**

- Uses formal and informal assessments of student performance and products (e.g., projects, lab journals, rubrics, portfolios, student profiles, checklists) to evaluate student participation in and understanding of the inquiry process.
- Understands the importance of sharing evaluation criteria and assessment results with students.