Kiddom OpenStax Biology

Kiddom OpenStax Biology Executive Summary

Section 1. Science-Related Texas Essential Knowledge and Skills (TEKS) and English Language Proficiency Standards (ELPS) Alignment

TEKS Student %	TEKS Teacher %	ELPS Student %	ELPS Teacher %
60%	60%	100%	100%

Section 2. Instructional Anchor

- The materials are designed to strategically and systematically integrate scientific and engineering practices, recurring themes and concepts, and grade-level content as outlined in the TEKS.
- The materials anchor the learning in phenomena and problems as the key lever for driving learning and student mastery of disciplinary knowledge and skills.

Section 3. Knowledge Coherence

- The materials are designed to build knowledge systematically, coherently, and accurately.
- The materials provide educative components to support teachers' content and coherence knowledge.

Section 4. Productive Struggle

- The materials provide opportunities for students to engage in productive struggle through sensemaking that involves reading, writing, thinking, and acting as scientists and engineers.

Section 5. Evidence-Based Reasoning and Communicating

- The materials promote students' use of evidence to develop, communicate, and evaluate explanations and solutions.
- The materials provide teacher guidance to support student reasoning and communication skills.

Section 6. Progress Monitoring

- The materials include a variety of TEKS-aligned and developmentally appropriate assessment tools.
- The materials include guidance that explains how to analyze and respond to data from assessment tools.
- The assessments are clear and easy to understand.

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Section 7. Supports for All Learners

- The materials provide guidance on fostering connections between home and school.
- The materials include listening, reading, writing, and speaking supports to help Emergent Bilinguals meet grade-level science content expectations.
- The materials include a variety of research-based instructional methods that appeal to a variety of learning interests and needs.
- The materials include some guidance, scaffolds, supports, and extensions that maximize student learning potential.

Section 8. Implementation Supports

- The materials include year-long plans with some practice and review opportunities that support instruction.
- The materials include some classroom implementation support for teachers and administrators.
- The materials provide some implementation guidance to meet variability in program design and scheduling.

Section 9. Design Features

- The visual design of materials is clear and easy to understand.
- The materials are intentionally designed to engage and support student learning with the integration of digital technology.
- The digital technology or online components are developmentally and grade-level appropriate and provide support for learning.

Section 10. Additional Information

- The publisher submitted the technology, price, professional learning, and additional language supports.

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Indicator 2.1

Materials are designed to strategically and systematically integrate scientific and engineering practices and course-level content as outlined in the TEKS.

1	Materials provide multiple opportunities for students to develop, practice, and demonstrate mastery of appropriate scientific and engineering practices as outlined in the TEKS.	M
2	Materials strategically and systematically develop students' content knowledge and skills as appropriate for the concept and grade level or course as outlined in the TEKS.	M
3	Materials include sufficient opportunities, as outlined in the TEKS, for students to ask questions and plan and conduct classroom, laboratory, and field investigations and to engage in problem-solving to develop an understanding of science concepts.	M

Meets | Score 4/4

The materials meet the criteria for this indicator. Materials are designed to strategically and systemically integrate scientific and engineering practices and course-level content as outlined in the TEKS.

Materials provide multiple opportunities for students to develop, practice, and demonstrate mastery of appropriate scientific and engineering practices as outlined in the TEKS. Materials strategically and systematically develop students' content knowledge and skills as appropriate for the concept and grade level or course as outlined in the TEKS. Materials include sufficient opportunities, as outlined in the TEKS, for students to ask questions and plan and conduct classroom, laboratory, and field investigations and to engage in problem-solving to develop an understanding of science concepts.

Evidence includes but is not limited to:

Materials provide multiple opportunities for students to develop, practice, and demonstrate mastery of appropriate scientific and engineering practices as outlined in the TEKS.

- The materials provide opportunities for students to develop, practice, and demonstrate mastery of appropriate scientific and engineering practices (SEPs) as outlined in the TEKS. For example, the "Visual Concepts Questions" in Unit 7 in Chapter 33 give the student the opportunity to interpret and analyze diagrams. The "Visual Connection" section also allows opportunities for students to practice, develop, and demonstrate mastery of SEPs. For example, the Unit 8: Ecology, Chapter 45 Visual connection activity allows students to observe and analyze graphs and charts to draw conclusions about animal populations. This activity supports TEKS B.3A: develop explanations and propose solutions supported by data and models and consistent scientific ideas and principles.
- The "Scientific Connections" in the materials provide opportunities for students to develop, practice, and demonstrate mastery of appropriate SEPs as outlined in the TEKS. For example, the "Scientific Connection" in Unit 5: Biological Diversity, Chapter 26.4: The Role of Seed Plants, gives the students an opportunity to conduct scientific investigations.
- In the materials, the "Scientific Method Connection" found in Unit 2: The Cell, subchapter 10.2, provides opportunities for students to practice, develop and demonstrate mastery of the SEPs. In the activity, "Determine the Time Spent in Cell Cycle Stages," students conduct an investigation to determine how long a cell spends in each stage of the cell cycle. Students

formulate a hypothesis, conduct the experiment, and adhere to lab safety. After observing, recording, and analyzing data, students draw a conclusion. This investigation supports TEKS B.1A, B.1D, B.1E, B.2D, B.3A, and B.4A.

- Instructional materials provide support for students as they move from the development of understanding to mastery of concepts and SEPs. For example, in Lesson 26.4, The Role of Seed Plants, students understand the importance of seed plants to the environment through both the reproductive structures and functions of seed-bearing plants and the relationships between plants and pollinators. In addition, students then connect the initial concepts to how the diversity and stability of an ecosystem change through human actions or natural disasters. The culminating activity is a hands-on investigation of the ways flowers attract pollinators and how they contribute to environmental stability.
- In Lesson 10.2, The Cell Cycle, the student learns about the cell cycle and the phases that make cell production a regulated and successful process. Brief textual paragraphs, labeled graphics with descriptors, and embedded questions engage the student in the development of content knowledge. Students then engage in a hands-on lab investigation using tools, data tables, materials, and mathematical formulas to record the number of cells in various mitotic stages. The investigation is book-ended with pre-lab and post-lab questions.

Materials strategically and systematically develop students' content knowledge and skills as appropriate for the concept and grade level or course as outlined in the TEKS.

- The material strategically and systematically develops students' content knowledge and skills as appropriate for the concept and grade level or course as outlined in the TEKS. For example, the materials provide the teacher with a "Scope and Sequence" in the "Preface" that outlines the systematic and strategic approach to the concepts and grade levels as outlined in the TEKS. Each chapter begins with an introduction followed by appropriate content in subchapters presented in increasing complexity for deeper understanding. Additional sections include "Key Terms, Chapter Summary, Visual Connections, Review Questions, and Critical Thinking Questions" that students use to check for understanding, mastery, and application to real life.
- The materials for Chapter 4: Cell Structure subchapter 4.1 Studying Cells offer students an opportunity to develop a deeper understanding of the content. In the section, the student applies prior knowledge presented in the section about the role of cells in organisms, microscopy, and cell theory. The students can then conduct an interactive activity about cell size. A "Career Connection" included in the materials describes different types of scientists who study cells. This connection supports TEKS B.1D, B4, and B.5B.
- Chapter 19, The Evolution of Populations, has three distinct but connected sections, 19.1 Population Evolution, 19.2 Population Genetics, and 19.3 Adaptive Evolution. The first section lays a foundation for understanding the concept of evolution from small-scale to large scale changes over time. Students learn that the evolution of an organism can only be traced through changes in a population's allele frequencies over time. In section 19.2, the students learn that population genetics change through the processes of natural selection. One activity is a hands-on investigation that models possible outcomes of genetic drift. In the last section, students learn that natural selection seems to act on individuals only, but the concept of fitness better applies to the population as a whole. Additional types of selection are represented within the lesson materials.
- The understanding of what a eukaryotic cell is, identification of the structures and functions of cell organelles, and the comparison of animal and plant cells is the focus of section 4.3, Eukaryotic Cells. The concept of "form follows function" is introduced using various features and

their functions as applied to different types of buildings. The concept is then applied to the forms and functions of cell organelles common in both plant and animal cells. The students expand their understanding of how plant cells use additional organelles for plant-specific functions. These concepts support a better understanding of cells as the basic structure of all life forms and how biomolecules play a part in cell structure and function.

- The materials strategically and systematically develop students' content knowledge from a micro level, starting with the particles and subatomic particles of the building blocks of life with Unit 1, Chemistry of Life. The units systematically build the skills of the students for Biology throughout the lessons to a macro level ending with Ecology and Macro level systems.

Materials include sufficient opportunities, as outlined in the TEKS, for students to ask questions and plan and conduct classroom, laboratory, and field investigations, and to engage in problem-solving to develop an understanding of science concepts.

- The materials include sufficient opportunities, as outlined in the TEKS, for students to ask questions and plan and conduct classroom, laboratory, and field investigations and to engage in problem-solving to develop an understanding of science concepts. The materials include a “Scientific Method Connection.” For example, Unit 4: Evolutionary Processes, Chapter 19.2: Population Genetics (Scientific Method Connection) allows for the opportunity for field investigations and to engage in problem-solving to develop an understanding of science concepts.
- The materials provide “Links To Learning.” These links are an opportunity for the students to conduct interactive investigations that engage in problem-solving to develop an understanding of science concepts. For example, in Unit 8: Ecology, Chapter 46.1, Ecology of Ecosystems (Link to Learning), students do an interactive investigation which allows them to investigate the interactions between organisms in ecological systems.
- In the “Critical Thinking” section of Ch. 45: Population and Community Ecology, students are asked to provide explanations for their own field investigations to identify examples of predation, parasitism, and commensalism in an ecosystem of their choice. The students are asked to evaluate and explain how each influences the stability of the selected ecosystem.
- Located in each unit section near the end, the materials list investigations from previous units to connect previously learned units. Each new unit builds with new questioning and thinking with the new content the student has learned. This building helps students to think critically and build a problem-solving mindset.
- There is evidence of opportunities for students to apply scientific practices and processes within investigations. For example, Section 12.3, Laws of Inheritance, offers two types of investigations. The first one tests the hypothesis of independent assortment. The primary question for the student to answer concerns the outcome of offspring in a dihybrid cross. There is guidance and further questions within the investigation document. The second investigation opportunity is represented with a link to a website where a student can perform their own experiments on Mendel’s Peas.

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Indicator 2.2

Materials anchor the learning in phenomena and problems as the key lever for driving learning and student mastery of disciplinary knowledge and skills.

1	Materials embed phenomena and problems across lessons to support students in constructing, building, and developing knowledge through authentic application and performance of scientific and engineering practices and course-level content as outlined in the TEKS.	M
2	Materials intentionally leverage students' prior knowledge and experiences related to phenomena and engineering problems.	M
3	Materials clearly outline for the teacher the scientific concepts and goals behind each phenomenon and engineering problem.	M

Meets | Score 4/4

The materials meet the criteria for this indicator. Materials anchor the learning in phenomena and problems as the key lever for driving learning and student mastery of disciplinary knowledge and skills.

Materials embed phenomena and problems across lessons to support students in constructing, building, and developing knowledge through authentic application and performance of scientific and engineering practices and course-level content as outlined in the TEKS. Materials intentionally leverage students' prior knowledge and experiences related to phenomena and engineering problems. Materials clearly outline for the teacher the scientific concepts and goals behind each phenomenon and engineering problem.

Evidence includes but is not limited to:

Materials embed phenomena and problems across lessons to support students in constructing, building, and developing knowledge through authentic application and performance of scientific and engineering practices and course-level content as outlined in the TEKS.

- The materials embed phenomena and problems across lessons to support students in construction, building, and developing knowledge through authentic applications and performance of scientific and engineering practices (SEPS) and course-level content as outlined in the TEKS. Each chapter in every unit starts with an "Introduction" to introduce an "Anchoring Phenomena" that is used throughout the chapter. For example, Unit 5, Chapter 23, "Introduction," presents the students with a picture and a brief overview of protists. Each chapter begins with an "Introduction" followed by appropriate content in subchapters presented in increasing complexity for deeper understanding. Additional sections include "Key Terms, Chapter Summary, Visual Connections, Review Questions, and Critical Thinking Questions" that students use to check for understanding, mastery, and application to real life.
- The problems and phenomena introduced in Unit 2: The Cell are carried across all chapters in the unit, including 10.2: The Cell Cycle, 10.3 Control of the Cell Cycle, and 10.4 Cancer and the Cell Cycle. The embedded phenomena build and develop knowledge of the cell cycle and disruptions of the cell cycle, which are in the Biology TEKS.

- In the materials, the “Introduction” for each chapter provides a graphic with brief information prompting students to ask questions related to the phenomenon presented to engage their curiosity and activate prior knowledge. For example, in Chapter 21: Viruses, the “Introduction” presents the phenomena of the Tobacco Mosaic virus in plants; students generate their own questions and make connections between viruses and plants.
- Materials embed phenomena and problems across lessons to provide students with authentic opportunities to build and develop knowledge of science concepts and practices. For example, Unit 2: The Cell comprises five chapters that support student construction of knowledge and understanding of cell division. Chapter 10.1: Cell Division compares prokaryotes and eukaryotes with a closer look at chromosomes and how they replicate. Chapter 10.2: The Cell Cycle provides a deeper look into the stages of mitosis. Chapter 10.3: Control of the Cell Cycle concerns how internal controls manage the orderly mitotic process. Chapter 10.4: Cancer and the Cell Cycle provides an authentic application for the real-world phenomena of cancer. Chapter 10.5: Prokaryotic Cell Division provides a deeper understanding of how bacteria replicate by cell division.
- In 10.2, The Cell Cycle, the student approaches the concept by first understanding that cells can create new cells. The next steps for the construction of concepts of stages with cell division are supported by text explanations, graphics, and a link to review the stages. A checkpoint for understanding the stages of mitosis is provided to students in question format. Further construction of knowledge is represented within an authentic application of a lab investigation where students view a slide of cells in various states of stasis or division. The objective of the lab is to determine how long cells may stay in interphase as compared to the stages of mitosis. Students collect data and use mathematical formulas to support their conclusion. There are also post-investigation questions to make further connections and applications of what was learned.

Materials intentionally leverage students’ prior knowledge and experiences related to phenomena and engineering problems.

- The materials intentionally leverage students’ prior knowledge and experiences related to phenomena and engineering problems. They use “Every Day Connections” for this. For example, in Unit 4: Evolutionary Processes, Chapter 19.1: Population Evolution in the “Everyday Connection,” the material draws on the students’ prior knowledge of the flu and diseases to relate to viruses.
- The materials use the “Introductory Paragraph” of the chapters to leverage students' prior knowledge in order for them to relate to the topic at hand. For example, in Unit 2: The Cell, Chapter 4.3: Eukaryotic Cells, the “Introductory Paragraph” uses the students’ prior knowledge of buildings and their structures to relate cells and their organelles.
- The “Critical Thinking Questions” found in each chapter challenge students to apply the content and skills that they have learned to make connections, develop explanations, and draw conclusions to real-world situations. For example, in Chapter 8: Photosynthesis, the students are asked to describe how the gray wolf population would be impacted by a volcanic eruption that spewed a dense ash cloud that blocked sunlight in a section of Yellowstone National Park.
- In the “Introduction” of Unit 2, Chapter 9, Cell Communication, the importance of communication is highlighted. The text uses a cell phone analogy to demonstrate how helpful it is to be able to communicate and connect with someone that you have lost in a crowd. An example of connections to prior knowledge is found in 19.1, Population Evolution. The embedded feature, “Everyday Connection,” connects experiences with flu, vaccines, flu seasons, flu strains, and the rapid evolution of viruses to the overall concept of population evolution.

- The materials for Kiddom intentionally leverage students' prior knowledge by having a section in each unit titled “Visual Connections” to connect to previously learned units. The unit refers back to the anchoring phenomenon and challenges students to think deeper and relate the content to solve engineering problems and questions.

Materials clearly outline for the teacher the scientific concepts and goals behind each phenomenon and engineering problem.

- The materials clearly outline for the teacher the scientific concepts and goals behind each phenomenon and engineering problem. For example, the materials provide the teachers with a “Standard Alignment.”
- Materials clearly outline for the teacher the scientific concepts and goals behind each phenomenon and engineering problem. Every chapter in a unit starts with the “Learning Objectives” clearly stated. For example, in Unit 7: Animal Structure and Function, Chapter 33.3: Homeostasis, the “Learning Objectives” clearly outline the learning goals for the chapter.
- In the materials, each unit subchapter outlines the learning objectives for that section and outlines the goals for the phenomena presented. For example, in Unit 3 Subchapter 12.1, Mendel’s Experiments and the Laws of Probability, the teacher is provided with the “Learning Objectives.” The learning objectives state that “By the end of this section, you will be able to do the following: describe the scientific reasons for the success of Mendel’s experimental work; describe the expected outcomes of monohybrid crosses involving dominant and recessive alleles; and apply the sum and product rules to calculate probabilities.”
- Materials clearly outline instructional support for teachers within “Lessons and Lesson Components.” For example, in Chapter 3, Biological Macromolecules, instructional supports include “Key Term, Chapter Summary, Visual Connection Questions, Review Questions, and Critical Thinking” and short answer questions with notes for evaluating responses. The materials also clearly outline for the teacher the purpose and goals for students behind each phenomenon. The materials give support for all learners to be successful and reference materials that the teachers can use, such as the “Vocabulary” and “Glossary” sections.
- In Unit 33.3: Homeostasis, there is a clear outline of scientific concepts and goals behind phenomena. For example, the concept of homeostasis in cells is now expanded and supported to include homeostasis within the organs and organ systems of animals. The process and control of homeostasis are introduced prior to the explanations of positive and negative feedback loops. The phenomena of thermoregulation control is included with examples of how different organisms respond to variation in internal and/or external temperature fluctuations. Other connections to the phenomena of thermoregulation are the categorization of animals as either endotherms or ectotherms and how human thermoregulation, as controlled by the nervous system, helps us sweat to cool down and shiver to warm up.

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Indicator 3.1

Materials are designed to build knowledge systematically, coherently, and accurately.

1	Materials are designed for students to build and connect their knowledge and skills within and across units.	M
2	Materials are intentionally sequenced to scaffold learning in a way that allows for increasingly deeper conceptual understanding.	M
3	Materials clearly and accurately present course-specific core concepts and science and engineering practices.	M
4	Mastery requirements of the materials are within the boundaries of the main concepts of the course.	M

Meets | Score 6/6

The materials meet the criteria for this indicator. Materials are designed to build knowledge systematically, coherently, and accurately.

Materials are designed for students to build and connect their knowledge and skills within and across units. Materials are intentionally sequenced to scaffold learning in a way that allows for increasingly deeper conceptual understanding. Materials clearly and accurately present course-specific core concepts and science and engineering practices. Mastery requirements of the materials are within the boundaries of the main concepts of the course.

Evidence includes but is not limited to:

Materials are designed for students to build and connect their knowledge and skills within and across units.

- In the materials, the chapters for each unit are organized systematically and strategically to develop students' content knowledge and skills. Each chapter begins with an “Introduction” followed by appropriate content in subchapters presented in increasing complexity for deeper understanding. Additional sections include “Key Terms, Chapter Summary, Visual Connections, Review Questions, and Critical Thinking Questions” that students use to check for understanding, mastery, and application to real life. For example, Chapter 1, The Study of Life, begins by anchoring phenomena presenting a photo of Earth to engage curiosity about the diversity of life. Students progress to sections on the “Study of Life” and then “Themes and Concepts in Biology.” These sections include practice on analyzing graphics in evolution and career and visual connections. Through “Critical Thinking Questions,” students provide responses to prompts and questions to check for content knowledge, deeper understanding, and mastery.
- The “Critical Thinking” section found in each chapter challenges students to apply the content and skills that they have learned to make connections, develop explanations, and draw conclusions to real-world situations. For example, for Chapter 3, Biomolecules, the students are asked questions to check for understanding of the content, such as “Why are biological molecules considered organic?” As the questions continue in complexity, students are asked to revisit the “Further Exploration” article from Chapter 3.5 to explain the relationship between protein function and cellular structure and provide at least one example.

- Chapter 3.5, Nucleic Acids in Unit 1, offers a prime example for building and connecting knowledge within and across units. The text describes the structure and function of DNA and RNA molecules. “The Chemical Foundation of Life,” in Chapter 2, introduces the four most common elements in all living organisms. In Chapter 2.3, Carbon, molecular structures based on carbon are illustrated and explained. This structure allows for laying the foundational knowledge for the structure of nucleic acids. In Chapter 3.5, Nucleic Acids, the concept of molecular structure and function is thoroughly developed and applied through a comparison of DNA and RNA. Also, within the same section are further connections to concepts such as mutations and possible origins of DNA.
- Knowledge and skills development and connections are evidenced within Chapter 10.2, The Cell Cycle. The steps of mitosis are described as an ordered and controlled event where the initial replication of DNA and creation of additional organelles culminates in two identical daughter cells. There is a check for understanding opportunity within the text where students analyze a graphic representation of cell cycle stages and select the correct sequence from a selection of written options. Further building of knowledge in the lesson compares cell division in plants and animals. Knowledge and skills are specifically addressed in a hands-on lab where students use a microscope and slides of whitefish blastula to estimate the amount of time each stage of the cell cycle requires to reproduce cells within a 24-hour period.
- The materials are designed for students to build and connect their knowledge by the unit breakdowns in sections to scaffold their learning within the unit. The materials also have visual connection questions to connect their skills across units.

Materials are intentionally sequenced to scaffold learning in a way that allows for increasingly deeper conceptual understanding.

- In the materials, the chapters scaffold student learning allowing for increasingly deeper conceptual understanding. For instance, Chapter 32: Plant Reproduction sequences instruction across subchapters 32.1, 32.2, and 32.3 in a way that activates or builds prior knowledge before explicit teaching of the next topic begins. The chapter “Introduction” presents the phenomena of pollination to engage student curiosity and reveal prior knowledge. In the subchapters that follow, students learn about plant reproductive development and structures, pollination, and fertilization with checkpoints for understanding through graphics, visual connections, videos, and review questions. Students apply their knowledge from the previous subchapters and activities to gain an understanding of natural and artificial asexual reproduction in the final subchapter. The “Critical Thinking" section checks for student understanding and mastery through questions like “Discuss the differences between a complete flower and an incomplete flower” and “Explain the reproduction process that occurs in plants. Please include the interactions among systems and how this is facilitated by their structures.”
- In the materials, the chapters scaffold student learning allowing for increasingly deeper conceptual understanding. For example, Chapter 45, Fungi, begins with students observing photos with captions of different types of fungi aimed to activate their background knowledge and formulate questions. Students discuss what they observe and propose explanations. Next, students are presented with sequential content and concepts about Fungi: Characteristics, Classification, Ecology, and Fungal Parasites and Pathogens, including graphic interactions to make connections and for deeper understanding. The chapter further activates student background knowledge by asking them to conduct an investigation in the “Scientific Method Connection” activity titled “Do trees resistant to Dutch elm disease secrete antifungal compounds?” The investigation reinforces the scientific and engineering practices (SEPs) where

students ask questions, identify problems, and plan and safely conduct classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The materials for Kiddom are intentionally sequenced by micro to macro levels to scaffold students' learning in a way that allows for a deeper conceptual understanding of the big biological picture ending with ecology. The unit also questions students thinking with assessment questions and scaffolding students' vocabulary.

- There is evidence of concept development that scaffolds learning in Chapter 32.1, Reproductive Development and Structure. Students first build knowledge of the two phases of a plant's life cycle. The "Introduction" provides a framework for connection to prior knowledge of mitosis and meiosis and to the additional concepts within the chapter section. The subsequent concepts include the reproductive structures and functions of flowering plants and descriptions, supported by graphics with captions, of the male and female gametophytes. There are "Checks for Understanding" within the text to support the retention of new knowledge. The following concepts include the reproductive systems of gymnosperms as well as an opportunity to compare the reproductive systems of angiosperms and gymnosperms through text, images, graphics, and videos.
- The concepts within the content in Chapter 32.2, Pollination and Fertilization, are scaffolded to ensure student understanding. In the prior chapter, students learned that angiosperms and gymnosperms have different reproductive strategies to accomplish the same goal of continuing the species. In Chapter 32.2, students gain a further understanding of plant reproduction through pollination strategies. The concepts of self-pollination and cross-pollination are explained, and connections to species diversity provide support to prior knowledge. The chapter continues to develop the relation of plants to a variety of pollinators and abiotic factors. The development of sequenced scaffolds for deeper understanding is evidenced by explanations of seed and fruit development and dispersal.

Materials clearly and accurately present course-specific core concepts and science and engineering practices.

- The materials in the chapters for each unit present course-specific core concepts and SEPs. For instance, the content and concepts students study in Unit 3, Genetics, Subchapters 17.1–17.5. The introduction to these subchapters presents the study of entire genomes to pique student interest. The following subchapter presents concepts and ideas in "Biotechnology, Genome Sequencing, Applying Genomics, and Genomics Proteomics" to build on student knowledge and skills learned in previous chapters on genetics. The students are asked to consider the idea of "Personalized Medicine" as a critical thinking activity to connect their knowledge to the real world.
- The materials in the chapters for each unit present course-specific core concepts and SEPs. For instance, students study the content and concepts in Unit 5: Invertebrates, Subchapters 28.1–28.7. The introduction to these subchapters presents a photo of a sea star to engage student curiosity and reveal prior knowledge. The subchapters that follow present concepts and content about the phyla and subphyla of invertebrates to build on student knowledge and skills learned in previous chapters. The "Critical Thinking" section asks students to connect their knowledge to previous units and chapters through questions like, "Compare the differences in sexual reproduction between Porifera and Cubozoans. How does the difference in fertilization provide an evolutionary advantage to the Cubozoans?" and "Why are tardigrades essential to recolonizing habits following destruction or mass extinction?" The materials also clearly and accurately present SEPs with the student conversation pieces of the "STEM Careers and

Research." This structure gives every student and teacher an authentic learning experience and incorporates scientific research designs.

- Specific core concepts of SEPs are mapped out within Chapter 17, Biotechnology and Genomics. Section 17.1, Biotechnology, focuses on more recent technologies used in DNA and RNA research to improve advances in health, medicine, and agriculture. Sections 17.2 Mapping Genomes, 17.3 Whole-Genome Sequencing, and 17.4 Applying Genomics explain how genomic technologies help scientists study commonalities among species, the connection between genes and genetic diseases in humans, and the migration patterns of humans over time. The final section, 17.5 Genomics and Proteomics, describes how genomics is used by scientists to study proteins and protein functions. These technologies are used to research disease processes, including those of cancer, and develop medicines that better address health issues.
- Chapter 41, Osmotic Regulation and Excretion, presents scientific practices through course-specific core concepts. The overarching concept of homeostasis is the primary focus across the sections of the chapter. The relation between the balance of fluids and solutes is examined at the cellular, organ, and system levels. Also, a comparison of homeostatic structures and functions within a representation of select organisms is provided. References to health issues such as gout and kidney dysfunction in humans are specifically addressed.

Mastery requirements of the materials are within the boundaries of the main concepts of the course.

- Throughout the course, subchapters for each unit and chapter provide "Learning Objectives" for that section to direct teachers and students on what knowledge and skills are expected to be covered and learned. For example, for Chapter 29, Vertebrates, Subchapter 29.7: Evolution of Primates, the learning objectives include: 1) Describe the derived features that distinguish primates from other animals. 2) Describe the defining features of the major groups of primates. 3) Identify the major hominin precursors to modern humans. 4) Explain why scientists are having difficulty determining the true lines of descent in hominids. The subchapters include graphics and videos to reinforce the new knowledge and skills. This supports TEKS B.9A-B, B.10 A-D, and B.3A.
- Throughout the course, subchapters for each unit and chapter also provide "Review Questions" and "Critical Thinking" prompts to check for student understanding of the content and concepts. For example, for Chapter 29, Vertebrates, the "Review Questions" ask the students to check for understanding through multiple choice questions. "Critical Thinking" prompts the students to respond to questions of increasing complexity, such as "What are the characteristic features of the chordates? What is the structural advantage of the notochord in the human embryo? Be sure to compare the notochord with the corresponding structure in adults, and Why is it so difficult to determine the sequence of hominin ancestors that have led to modern Homo sapiens?"
- A check for mastery of TEKS B.5(A), function of biomolecules as they relate to cell structure and function, and TEKS B.5(C), investigation of homeostasis as provided through cell transport is provided by the "Review Questions" in Chapter 5, Structure and Function of the Plasma Membrane. Review questions are framed as multiple-choice questions and are available for every chapter.
- An evaluation of concept mastery is available in every chapter. For instance, the "Critical Thinking" feature in Chapter 20, Phylogenies and the History of Life, uses short answer prompts to ensure students understand TEKS B.9(A) concerning the types of evidence used to explain the unity and diversity of life.

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- The materials are within the boundaries of the main concept to promote mastery with review guiding questions, visual connections, and critical thinking. The “Critical Thinking“ sections offer different types of critical thinking questions. They challenge students to think like a scientist and a researcher to build on all previous units taught.

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Indicator 3.2

Materials provide educative components to support teachers' content and knowledge coherence.

1	Materials support teachers in understanding the vertical alignment of course-appropriate prior knowledge and skills guiding the development of course-level content and scientific and engineering practices.	M
2	Materials contain explanations and examples of science concepts, including course-level misconceptions to support the teacher's subject knowledge and recognition of barriers to student conceptual development as outlined in the TEKS.	M
3	Materials explain the intent and purpose of the instructional design of the program.	M

Meets | Score 6/6

The materials meet the criteria for this indicator. Materials provide educative components to support teachers' content and knowledge coherence.

Materials support teachers in understanding the vertical alignment of course-appropriate prior knowledge and skills guiding the development of course-level content and scientific and engineering practices. Materials contain explanations and examples of science concepts, including grade-level misconceptions, to support the teacher's subject knowledge and recognition of barriers to student conceptual development as outlined in the TEKS. Materials explain the intent and purpose of the instructional design of the program.

Evidence includes but is not limited to:

Materials support teachers in understanding the vertical alignment of course-appropriate prior knowledge and skills guiding the development of course-level content and scientific and engineering practices.

- In the materials, the chapters scaffold student learning allowing for increasingly deeper conceptual understanding. For instance, Chapter 32, Plant Reproduction, sequences instruction across subchapters 32.1, 32.2, and 32.3 in a way that activates or builds prior knowledge before explicit teaching of the next topic begins. The chapter "Introduction" presents the phenomena of pollination to engage student curiosity and reveal prior knowledge. In the subchapters that follow, students learn about plant reproductive development and structures, pollination, and fertilization with checkpoints for understanding through graphics, visual connections, videos, and review questions. Students apply their knowledge from the previous subchapters and activities to gain understanding of natural and artificial asexual reproduction in the final subchapter. The "Critical Thinking" section checks for student understanding and mastery through questions like "Discuss the differences between a complete flower and an incomplete flower" and "Explain the reproduction process that occurs in plants. Please include the interactions among systems and how this is facilitated by their structures."
- Throughout the course, subchapters for each unit and chapter provide "Learning Objectives" for that section to direct teachers and students on what knowledge and skills are expected to be covered and learned. For example, for Chapter 29, Vertebrates, Subchapter 29.7, Evolution of Primates, includes the learning objectives: 1. Describe the derived features that distinguish

primates from other animals, 2. Describe the defining features of the major groups of primates, 3. Identify the major hominin precursors to modern humans, and 4. Explain why scientists are having difficulty determining the true lines of descent in hominids. The subchapters include graphics and videos to reinforce the new knowledge and skills. This supports TEKS B.9A-B, B.10 A-D, and B.3A.

- The “Scope and Sequence” is located in the “Preface” under the heading “Coverage, Scope, and Pacing Guide.” The sequence of concepts starts at the molecular level, continues to cells and cell functions, connects genetics to evolutionary processes, then builds toward an understanding of the biodiversity of organisms, including plants and animals, and ends the course examining ecological concepts and localized real-world issues. The materials provide vertical alignment within each unit located in the introductions and the chapter summaries. The materials provide scientific and engineering practices (SEPs) with the preface materials with the “Pedagogical Section” breaking down scientific learning outcomes for students.
- Concepts earlier in the course are reiterated in concepts taught later in the year. The “Chapter Summary” within chapter resources provides evidence of vertical alignment within the course. For example, in Chapter 34, Animal Nutrition and the Digestive System, the “Chapter Summary” includes 34.1 Digestive Systems, which references differentiated digestive systems due to evolution, 34.2 Nutrition and Energy Production, which references the nutritive purpose of biomolecules, 34.3 Digestive System Processes which references enzymes and specific structure/function characteristics of organs, and 34.4 Digestive System Regulation which references neural and chemical control of specific processes.

Materials contain explanations and examples of science concepts, including course-level misconceptions to support the teacher's subject knowledge and recognition of barriers to student conceptual development as outlined in the TEKS.

- The materials within the subchapters identify common course-level misconceptions students may have about science concepts. For example, in Chapter 18: Evolution and the Origin of the Species, Subchapter 18.1: Understanding Evolution, a “Link to Learning” site is providing explanations about numerous misconceptions in evolution to support the teacher’s subject knowledge and to deepen students' conceptual development. For instance, the misconception that evolution is a theory about the origin of life includes a correction that this is not the central focus of the theory. Evolutionary biology deals with how life changed after its origin.
- In the materials throughout each unit, “Links to Learning, Visual Connections, Career Connections and Evolution Connections” contain adult-level explanations and examples of the more complex course-level concepts and concepts beyond the current course so that teachers can improve their own knowledge of the subject and students can further their understanding and extend their knowledge of course content. These sections include videos, articles, images, and diagrams teachers and students alike can use to further their knowledge. For example, Chapter 24, Fungi, Subchapter 24.1, Characteristics of Fungi, a “Career Connection” provides information about mycologists, the study of fungi, and associated careers and professions.
- Explanations and examples of science concepts support teacher knowledge with the “Chapter Summary.” For example, the “Chapter Summary” in Chapter 4, Cell Structure, includes a paragraph of informative text for each of the six sections in the chapter. For additional support, there are “Key Terms” with definitions, “Visual Connection Questions” that include graphics and notes for evaluating responses, “Review Questions” that include answers to the multiple choice questions, and “Critical Thinking Questions.” The questioning strategies are used to uncover obstacles and misconceptions in student thinking.

- Misconceptions about evolution are cited and explained in the section “Misconceptions of Evolution” in Chapter 18.1, Understanding Evolution. Topics that are confusing for people are the definition of a theory, the evolution of individuals, evolution and the origin of life, and organisms evolving on purpose. Also, within the same section, a “Link to Learning” is available for further exploration. The link leads you to the UC Museum of Paleontology, Berkeley, and addresses and clarifies over 30 different misconceptions.
- The materials contain explanations and examples of science concepts in the “Visual Connections, Introductions, and the Review Questions” sections. The materials provide background information to support the teacher's subject knowledge with an introduction for each unit. The materials also provide a “Link to Learning” that provides misconceptions, videos, and digital access to teacher resources.

Materials explain the intent and purpose of the instructional design of the program.

- In the materials, the “Preface” provides a “Coverage, Scope, and Pacing Guide,” which provides teachers with the core concepts and content to be covered for the unit. The guide explains the sequence in which units are suggested to be taught so student knowledge and skills build upon one another to attain mastery of science concepts. The scope and sequence also provides the suggested number of days to cover the content for each, which supports the instructional design of the course. For example, in Unit 1: The Chemistry of Life, over a six-day time frame, students are introduced to the scientific method and the fundamental concepts of chemistry and physics.
- In the materials, the “Preface” explains the “Pedagogical Foundation” to provide teachers with the intent and purpose of the instructional design of the program. The pedagogical choices, chapter arrangements, and learning objectives for each unit are reinforced via the following special features: 1. Evolution Connections upholds the importance of evolution, 2. Scientific Method Connections walk students through experiments, 3. Career Connections present information on a variety of careers, and 4. Career Connections tie biological concepts to emerging issues.
- The “Teacher Guide” section within the “Preface” describes a comprehensive text including foundational research and core biology concepts through an evolutionary lens. The instructional design and lesson components are meant to support inquiry, present common applications, and showcase biological careers. The intent is to “draw learners into the discipline.”
- Biology 2e is an updated version of a prior version. Within the “Preface,” “Changes to the Second Edition” list four major areas of improvement: content revisions, additional end-of-chapter questions, improved art and illustrations, and accessibility improvement. All listed areas of change stem from user input.
- The materials for Kiddom explain in detail the intent of the LMS and the purpose of the instructional design of the program. This material is evidenced in the “Preface” section of the curriculum. The materials also have a “Family Component” for suggestions on how families can support the learner.

Kiddom OpenStax Biology

Indicator 4.1

Materials provide opportunities for students to engage in productive struggle through sensemaking that involves reading, writing, thinking, and acting as scientists and engineers.

1	Materials consistently support students' meaningful sensemaking through reading, writing, thinking, and acting as scientists and engineers.	M
2	Materials provide multiple opportunities for students to engage with course-level appropriate scientific texts to gather evidence and develop an understanding of concepts.	M
3	Materials provide multiple opportunities for students to engage in various written and graphic modes of communication to support students in developing and displaying an understanding of scientific concepts.	M
4	Materials support students to act as scientists and engineers who can learn from engaging in phenomena and engineering design processes, make sense of concepts, and productively struggle.	M

Meets| Score 4/4

The materials meet the criteria for this indicator. Materials provide opportunities for students to engage in productive struggle through sensemaking that involves reading, writing, thinking, and acting as scientists and engineers.

Materials consistently support students' meaningful sensemaking through reading, writing, thinking, and acting as scientists and engineers. Materials provide multiple opportunities for students to engage with grade-level appropriate scientific texts to gather evidence and develop understanding of concepts. Materials provide multiple opportunities for students to engage in various written and graphic modes of communication to support students in developing and displaying understanding of scientific concepts. Materials support students to act as scientists and engineers who can learn from engaging in phenomena and engineering design processes, make sense of concepts, and productively struggle.

Evidence includes but is not limited to:

Materials consistently support students' meaningful sensemaking through reading, writing, thinking, and acting as scientists and engineers.

- The materials consistently support students' meaningful sensemaking through reading, writing, thinking, and acting as scientists and engineers. Each chapter concludes with "Critical Thinking Questions." For example, in Unit 1, Chemistry of Life, Chapter 1, The Study of Life, students read about the scientific method and perform "Visual Connection" activities. The "Critical Thinking" section of the chapter asks the students to think about a problem that they may have at home, at school, or with a car and apply the scientific method to solve it to apply real-world situations to the learning. Some prompts focus on recall of prior knowledge or application of biological concepts such as homeostasis while walking on a hot day. Others require students to use science and engineering processes to solve a problem. The "Critical Thinking" subsection within each chapter challenges students to think, read, and write as scientists by providing critical thinking questions from a text, image, diagram, or reflection from a hands-on experience.

- In the materials, Unit 3, Genetics, Chapter 3, Subchapter 12.3 Laws of Inheritance, the "Scientific Method Connection" engages students in learning activities that support meaningful sensemaking. The students read about Mendel's Laws of Inheritance and proceed through a dihybrid cross and ask the question: What will be the offspring of a dihybrid cross? The students test the hypothesis that both trait pairs will sort independently according to Mendelian Laws. Students then analyze the data and form a conclusion based on the results. "Post Investigation" questions ask students to consider limitations and how the investigation could be improved.
- Chapter 31.1, Nutritional Requirements of Plants, provides opportunities for sensemaking through reading, thinking, and acting like a scientist. Information in the chapter is divided into topics explained in short paragraphs. Explanations are enhanced with images, charts, and drawings. To make the concept of plant nutrients more meaningful, students visit a website to investigate the effects that various levels of specific nutrients have on the health of a plant.
- The materials consistently support students' meaningful sensemaking through reading, writing, thinking, and acting as scientists and engineers by providing a section within the LMS for "STEM Careers." This section asks questions to intrigue students to think as scientists and learn more about various types of science careers based on their own interests.
- The materials provide a "Preface" with materials for teachers to support students with an extensive section to learn the way scientists think, observe, act, write, and even communicate their research and findings in a scientific method. The materials include sentence stems and prompts on how to perform observations and allow students to verbalize their thoughts in a meaningful way.

Materials provide multiple opportunities for students to engage with course-level appropriate scientific texts to gather evidence and develop an understanding of concepts.

- The materials provide multiple opportunities for students to engage with grade-level appropriate scientific texts to gather evidence and develop an understanding of concepts. Within each chapter, the materials have a "Link To Learning" where the students engage with websites to explore and gather evidence of the concepts being presented. For example, in Unit 4, Chapter 20.1, there is a "Link to Learning" for Phylogenies and the History of Life: Organizing Life on Earth. Another example is Chapter 40.3, where a "Link to Learning" is provided to help students deepen their understanding by exploring video animations, text, images, and descriptions of how the heart's pacemaker controls blood flow by signaling the rhythmic opening and closing of the valves.
- In the materials throughout each unit are "Links to Learning, Visual Connections, Career Connections, and Evolution Connections," which are components of the resources that engage students with grade-level appropriate scientific texts to gather evidence and develop an understanding of concepts. These sections include content, videos, articles, images, and diagrams students interpret and analyze to extend their knowledge. For example, Chapter 2, Fungi, Subchapter 24.1 Characteristics of Fungi, a "Career Connection" provides information about mycologists, the study of fungi, and associated careers and professions. The "Link to Learning" for subchapter 24.3, Ecology of Fungi, asks students to explore the world of lichens. The subsection of Chapter 1 provides guidance for the student and the teacher on how Biology connections throughout the text are structured. It explains how to read the text and comprehend the repeating concepts such as cells, the chemistry of life, and biology concepts from a micro to macro level.
- The "Scientific Method Connections" throughout the materials for each unit and chapters engage the students working in groups to gather evidence and develop an understanding of

concepts. For example, the “Scientific Method Connection” in Unit 2, The Cell, Subchapter 10.2, provides opportunities for students to practice, develop, and demonstrate mastery of scientific engineering practices. In the activity, Determine the Time Spent in Cell Cycle Stages, students conduct an investigation in groups to determine how long a cell spends in each stage of the cell cycle. Students formulate a hypothesis, conduct the experiment, and adhere to lab safety. After observing, recording, and analyzing group data, students draw a conclusion. Following the investigation, students discuss what went well, what could improve protocol, and other ways to evaluate and conduct the investigation.

- Chapter 40.3, Mammalian Heart and Blood Vessels, includes multiple opportunities for students to gather evidence that helps with concept development. For example, the content text is divided into specific topics that are accompanied by high-quality graphics and images with clear and concise captions. There is a “Visual Connection” graphic immediately after the introductory paragraph that depicts and explains the circulatory pathway of blood in the human body. The student completes a check for understanding by answering a question after engaging with the content. A second “Visual Connection” about heart structure is also included within the chapter text.
- An example of appropriate scientific text for student learning is available in Chapter 20.2, Determining Evolutionary Relationships. As with other chapters, the topics are divided into short passages accompanied by graphics that provide additional and/or clarifying information about the content. Two “Visual Connection” opportunities are available for students to explore further information, understand a visual representation, and answer a checkpoint question. The checkpoint connects specific grade-level questioning through images and text and allows students to demonstrate what they know using textual evidence. Two “Link to Learning” sections provide additional experiences that support student understanding of concepts. Another feature is an embedded section titled “Evolution Connection.” The information in this section connects real-world work by evolutionary biologists to chapter content and activities.

Materials provide multiple opportunities for students to engage in various written and graphic modes of communication to support students in developing and displaying an understanding of scientific concepts.

- The materials provide multiple opportunities for students to engage in various written and graphic modes of communication to support students in developing and displaying an understanding of scientific concepts. Each chapter includes a “Visual Connection” question section which allows students to show their understanding of the scientific concepts being presented through the use of graphics. For example, Unit 2, Chapter 8, clearly shows the “Visual Connection” questions for photosynthesis. Another example is in Unit 8, Ecology, Chapter 45, the “Visual Connection” activity allows students to observe and analyze graphs and charts to draw conclusions about animal populations and provide written responses to prompts and answer multiple choice questions.
- In the materials, the “Critical Thinking” section in each unit provides opportunities for students to engage in various written and graphic modes of communication to support students in developing and displaying an understanding of scientific concepts. For example, in Unit 1, The Chemistry of Life, Chapter 3, Biological Molecules, question 6 of “Critical Thinking,” the students draw ketone and aldose molecules, noting the differences, and then provide a written response to a prompt asking how a monosaccharide is changed in the human body. The drawings and questions help students relate the concept to real life. Students must also call on previously

learned knowledge to answer the questions, but they also must apply critical thinking to provide answers applicable to scenarios described in the questions.

- Chapter 15.1, The Genetic Code, includes several opportunities for students to engage in various forms of communication to better learn scientific concepts. The chapter text includes supporting graphics with diagrams and captions. The “Link to Learning” section provides a link to an animated interactive for students to practice protein synthesis. The interactive is another learning opportunity through a different medium. The final activity in the chapter is a hands-on lab where students compare samples of DNA extracted from two different fruit samples. Students must review safety procedures, appropriate tools and equipment, and pre-investigation questions prior to beginning the investigation. The passages that follow are organized into components of an investigation, such as procedures, observations, analysis of data, and conclusions.
- The materials provide multiple opportunities for students to engage in various written and graphic modes of communication. Within each chapter is an introduction that makes connections to the real world. For example, in Chapter 5, The Structure and Function of the Plasma Membrane, students are challenged to read the text and analyze the graphic of Grand Central Station. Another example is in Chapter 6, Metabolism, where students are asked to reflect on the body structure of hummingbirds and the energy needed to fly.

Materials support students to act as scientists and engineers who can learn from engaging in phenomena and engineering design processes, make sense of concepts, and productively struggle.

- The materials support the students in acting like scientists and engineers who can learn from engaging in phenomena and engineering design processes, make sense of concepts, and productively struggle. For example, the “Planning and Conducting Investigations Activities” are throughout the materials in different chapters. In the materials, the “Link to Learning” within each chapter supports students to act as scientists and engineers by engaging in phenomena and design processes and making sense of concepts. For example, in Unit 2, The Cell, Chapter 4.6, Connections between Cells and Cellular Activities, the “Link to Learning” feature called Virtual Microscope provides a self-guided exploration of a common laboratory microscope. The virtual investigation teaches a student how to properly use a microscope, provides virtual slides for cell comparisons from different organisms, and offers the opportunity for a review of cell structures.
- In the materials, the “Scientific Method Connection,” in various chapters, supports students to act as scientists and engineers who can learn from engaging in phenomena and engineering design processes, make sense of concepts, and productively struggle. For example, in Chapter 19.2, The Evolution of Populations, the investigation Testing the Bottleneck Effect, students perform an investigation in groups to answer the question, How do natural disasters affect a population's genetic structure? The students test the hypothesis using beads to represent populations. The students observe results and record data to form a conclusion. The students then consider questions like, What happens when a hurricane hits the Mississippi Gulf Coast? What are the advantages and disadvantages of using this model to investigate, and think about another way you can conduct the investigation?
- “Scientific Processes” in Unit 1, Chemistry of Life, includes a document titled “Planning and Conducting Investigations.” The two primary topics within the document are Engineering Practices and Scientific Investigations. Each topic is fully explained and available for use as a reference throughout the course of study.

- The materials support students to act as scientists and engineers who can learn from engaging in phenomena and engineering design processes, make sense of concepts, and productively struggle by providing discussion questions for concepts that are better described and applied rather than memorizing and reading. For example, in Chapter 6.3, Laws of Thermodynamics, students are asked to discuss and describe the Laws of Thermodynamics, thus creating a productive struggle within certain student groups to accurately articulate the laws of motion and come to a consensus. The materials also provide a “phenomenon” or introduction that has a real-world connection for students to anchor the respective concept and engage with other students to reflect on a familiar situation and apply the concepts learned. This structure creates a productive struggle to make sense of the world through a scientific lens.

Kiddom OpenStax Biology

Indicator 5.1

Materials promote students' use of evidence to develop, communicate, and evaluate explanations and solutions.

1	Materials prompt students to use evidence to support their hypotheses and claims.	M
2	Materials include embedded opportunities to develop and utilize scientific vocabulary in context.	M
3	Materials integrate argumentation and discourse throughout to support students' development of content knowledge and skills as appropriate for the concept and course.	M
4	Materials provide opportunities for students to construct and present developmentally appropriate written and verbal arguments that justify explanations to phenomena and/or solutions to problems using evidence acquired from learning experiences.	M

Meets | Score 4/4

The materials meet the criteria for this indicator. Materials promote students' use of evidence to develop, communicate, and evaluate explanations and solutions.

Materials prompt students to use evidence to support their hypotheses and claims. Materials include embedded opportunities to develop and utilize scientific vocabulary in context. Materials integrate argumentation and discourse throughout to support students' development of content knowledge and skills as appropriate for the concept and course. Materials provide opportunities for students to construct and present developmentally appropriate written and/or verbal arguments that justify explanations to phenomena and solutions to problems using evidence acquired from learning experiences.

Evidence includes but is not limited to:

Materials prompt students to use evidence to support their hypotheses and claims.

- The materials prompt students to use evidence to support their hypotheses and claims. One example of this is the "Visual Connections Questions." For example, in Unit 1, Chapter 1, The Study of Life, the "Visual Connection Questions" provides a flow chart of the scientific process for students to study. Students are given the example of an electrical outlet that does not work. The students are tasked with matching the steps of the scientific method, including the hypothesis, with the experimental process of solving the everyday problem. Students determine if the hypothesis is correct or incorrect and propose an alternative hypothesis. Other examples are found in Chapter 1.1. A section titled "The Science of Biology" sets out a thorough and foundational explanation of scientific processes. It outlines how cause and effect relations in observable phenomena form the basis for investigations. There is an emphasis on creating a valid hypothesis that is testable and also falsifiable. The activities provide checkpoints for understanding and the difference between inductive and deductive reasoning.
- In the materials, the "Scientific Method Connection" found in various chapters prompts students to use evidence to support their hypotheses and claims. For example, in Chapter 19.2, The

Evolution of Populations, the investigation titled “Testing the Bottleneck Effect” tasks students to perform an investigation in groups to answer, “How do natural disasters affect a population's genetic structure?” The students test the hypothesis using beads to represent populations. The students observe results and record data to form a conclusion. The students then consider questions like “What happens when a hurricane hits the Mississippi Gulf Coast?” “What are the advantages and disadvantages of using this model to investigate?” and “Think about another way you can conduct the investigation.”

- Materials prompt student use of evidence to support their hypothesis. For example, the hands-on investigation titled Dutch Elm Disease in Chapter 24.4, Fungal Parasites and Pathogens, has students determine the mechanism by which trees resistant to Dutch elm disease survive. Students create a hypothesis and perform the tests. After data is taken and analyzed, a conclusion is reached, and students must then explain their results and answer post-investigation questions.

- The materials prompt students to use evidence to support their hypothesis and claims with the “Visual Connection Questions,” which are open-ended responses after a posed question. The review questions are also open-ended responses that ask a question but also specifically ask “why” for students to justify and support their answers with evidence when answering.

Materials include embedded opportunities to develop and utilize scientific vocabulary in context.

- The materials include embedded opportunities to develop and utilize scientific vocabulary in context. Each chapter provides a list of “Key Terms” with definitions and allows the students and teachers the opportunity to use those words in various activities in the chapters. Within the text of the units, the key terms are bolded and used scientifically in adjacent sentences with a visual for the students. Students can check their vocabulary usage using “Review Questions“ and “Critical Thinking” responses. For example, Chapter 2, The Chemical Foundation of Life, includes “Key Terms” and suggestions for the teacher to engage students to check for understanding. The ELL Support provided suggests a game where students act as the teacher and read out a key term and its definition. Then each student comes up with a sentence to correctly use the term. Students score points by using the term correctly and by using additional key terms in their sentences.

- In the materials, the “Review Questions” provided for each chapter include embedded opportunities to develop and utilize scientific vocabulary in context. The “Review Questions” check for student understanding of the important key concepts and terminology presented in the content. For example, in Unit 8, Ecology, Chapter 46, Ecosystems, a sample review question is “Decomposers are associated with which class of food web?” The following answer choices are provided: grazing, detrital, inverted, and aquatic. The students should choose detrital as the correct answer. The teacher monitors responses and can plan for reteaching and reinforcement of the concepts if needed.

- There are embedded opportunities for students to develop and use scientific vocabulary. For instance, in Chapter 32.1, Reproductive Development and Structure, instructional components include “Visual Connections Questions” that present labeled diagrams with captions from the chapter text and fill-in-the-blank questions using vocabulary terms. In the “Teacher Materials,” the teacher can modify the activity to personalize it for the learner.

Kiddom OpenStax Biology

Materials integrate argumentation and discourse throughout to support students' development of content knowledge and skills as appropriate for the concept and course.

- The materials integrate argumentation and discourse throughout to support students' development of content knowledge and skills as appropriate for the concept and course. The "Everyday Connection Activities" that are spread throughout the chapters are one way that the materials demonstrate this. In the materials, the "Everyday Connection" found in Unit 7, Animal Structure and Function, Chapter 43.6, Fertilization and Early Embryonic Development, integrates argumentation and discourse to support students' development of content knowledge and skills as appropriate for the concept and course. For the "Everyday Connection: Are Designer Babies in Our Future?" students observe a logo and then read information about eugenics and the use of information and technology to improve the genetic makeup of the human race. Students recall previous knowledge about genetics and human reproduction to discuss and debate where this process could lead.

- In the materials, each chapter begins with an "Introduction" to anchor phenomena allowing students to engage in discourse as it relates to core content knowledge. For the "Introduction" for Chapter 47, Conservation Biology and Biodiversity, students observe a photo of an aerial view of Lake Victoria in Africa and read information about cichlids in the lake. Students observe and recall their own prior knowledge to formulate their own questions and engage in discussions with their classmates about what is happening in the lake.

- The materials integrate argumentation and discourse throughout to support students' development of content knowledge and skills as appropriate for the concept and course by providing critical thinking questions that can be used as discussion questions for students to either write or talk out scientific solutions and engage in discourse within the classroom. The "Critical Thinking" questions in Chapter 18, Evolution and the Origin of the Species, provide a platform for students to formulate and express their thoughts, considerations, and explanations regarding evolution. Each of the 15 prompts asks a question about a concept, and students respond with short answers. Three of the questions require online research by students in order to formulate a response. Chapter 27.3, Animal Phylogeny, also helps students develop content knowledge and make connections to ways organisms are related. Students understand that the construction of phylogenetic trees is not exact and that scientists use the most current information and technology to explain evolutionary relationships.

- A "Link to Learning" activity provides an opportunity to explore an interactive tree of life that displays connections between organisms through a branching model. Also, students learn that even though molecular research has improved understanding, it has not brought agreement within the science community.

Materials provide opportunities for students to construct and present developmentally appropriate written and verbal arguments that justify explanations to phenomena and/or solutions to problems using evidence acquired from learning experiences.

- The materials provide opportunities for students to construct and present developmentally appropriate written and/or verbal arguments that justify explanations of phenomena and solutions to problems using evidence acquired from the learning experience. One way that the material does this is through the use of "Critical Thinking Questions." Each chapter has a set of

critical thinking questions that can be assigned to the students and edited by the instructor. For example, in Unit 8, Ecology, Chapter 45, Population and Community Ecology, question 9 of "Critical Thinking" asks, "Since the introduction of the Endangered Species Act, the number of species on the protected list has more than doubled. Describe how the human population's growth pattern contributes to the rise in endangered species." This question encourages students to use previous knowledge and information about human populations and the Act to write a valid explanation for the problem. In general, the "Critical Thinking" feature of each chapter provides students an opportunity to construct written arguments that justify explanations. For instance, in Chapter 44, Ecology and the Biosphere, question 2 asks students to justify the strengths and weaknesses of the definition of the term population.

- In the materials, each chapter opens with an "Introduction" of anchoring phenomena that provides opportunities for students to construct and present developmentally appropriate written and/or verbal arguments that justify explanations of phenomena and solutions to problems using evidence acquired from learning experiences. Each introduction includes a photo or graphic accompanied by captions and information for the students to read and analyze. For the "Introduction" to Chapter 44, Ecology and the Biosphere, students observe three photos: a deer tick, a bull's eye rash on the arm, and a white-footed mouse. The students are asked, "Why Study Ecology?" before they read the information provided. Students observe and recall their own prior knowledge about the prompt and about the photos to formulate their own questions and engage in discussions with their classmates.

- The materials provide opportunities for students to construct and present developmentally appropriate written and verbal arguments that justify explanations of phenomena and/or solutions to problems using evidence acquired from learning experiences through various activities such as the "Link to Learning," virtual microscopes, and support links to Khan Academy. Each of the activities provides visual connections, review questions, and embedded virtual learning questions. In Chapter 26.4, The Role of Seed Plants, students engage in a hands-on investigation titled "Testing Attraction of Flies by Rotting Flesh Smell." The investigation asks if flies would act as pollinators if flowers were sprayed with a substance that smells like decomposing flesh. Students can use the "Link to Learning" feature for additional information about pollinators. There are five trials for collecting data. Additional trials are recommended, and suggestions for using a different type of flowering plant are provided. Students analyze data, form conclusions, and justify explanations using evidence.

Kiddom OpenStax Biology

Indicator 5.2

Materials provide teacher guidance to support student reasoning and communication skills.

1	Materials provide teacher guidance on anticipating student responses and the use of questioning to deepen student thinking.	M
2	Materials include teacher guidance on how to scaffold and support students' development and use of scientific vocabulary in context.	M
3	Materials provide teacher guidance on preparing for student discourse and supporting students in using evidence to construct written and verbal claims.	M
4	Materials support and guide teachers in facilitating the sharing of students' thinking and finding solutions.	M

Meets | Score 4/4

The materials meet the criteria for this indicator. Materials provide teacher guidance to support student reasoning and communication skills.

Materials provide teacher guidance on anticipating student responses and the use of questioning to deepen student thinking. Materials include teacher guidance on how to scaffold and support students' development and use of scientific vocabulary in context. Materials provide teacher guidance on preparing for student discourse and supporting students in using evidence to construct written and verbal claims. Materials support and guide teachers in facilitating the sharing of students' thinking and finding solutions.

Evidence includes but is not limited to:

Materials provide teacher guidance on anticipating student responses and the use of questioning to deepen student thinking.

- The materials provide teacher guidance on anticipating student responses and the use of questioning to deepen student thinking. The activities have helpful prompts and guides on grading student responses. For example, in Unit 1, Chapter 1, "Visual Connection Questions," there is a "Note for Evaluating Responses" section that shows the instructor the incorrect answer and provides them with alternate correct responses and the correct response.
- Visual connections use figures or graphics to engage students' critical thinking and analytical skills to check for deeper understanding of the content and concepts presented. For instance, Unit 1, The Chemistry of Life, Chapter 3, Biological Macromolecules, covers proteins and nucleic acids. "Visual Connection Questions" for Chapter 3 include a graphic with a question or prompt. For each, a "note for evaluating responses" is provided for the teacher to identify if student responses are correct, incorrect, or partially correct. For example, in question 2, figure 3.23 asks the student what amino acids would be found on the surface and interior of a soluble protein and in a protein-embedded lipid bilayer. The "note" for teachers to gauge answers explains where polar and nonpolar amino acids are found, including exceptions.
- In the materials, the "Critical Thinking" section found in each chapter provides teacher guidance on anticipating student responses and the use of questioning to deepen student thinking. The "Critical Thinking" questions challenge students to apply the content and skills learned, allowing the teacher to check for deeper understanding of the concepts. For example, the "Critical

Thinking" section In Chapter 19, The Evolution of Populations, supports teacher use of short answer questions to deepen student thinking. Some of the questions are knowledge-based, while others are application-based. For instance, question 2 asks the student to explain the Hardy-Weinberg theory while question 4 asks students to describe a situation where a population undergoes the bottleneck effect and then explain the impact on the population's gene pool. For each, a "note for evaluating responses" is provided for the teacher to identify if student responses are correct. For example, "A hurricane kills a large percentage of a population of sand-dwelling crustaceans—only a few individuals survive. The alleles carried by those surviving individuals would represent the entire population's gene pool. If those surviving individuals are not representative of the original population, the post-hurricane gene pool will differ from the original gene pool." The "Critical Thinking" questions are open responses to allow each student to show what they know and provide evidence of their learning and knowledge. The materials offer answers to critical thinking questions for teachers that possess depth and breadth so teachers are able to gauge appropriate grading for each student.

- The materials also include "Review Questions," such as those in Chapter 5, Structure and Function of Plasma Membranes, which provide evidence for guidance on possible student responses. The questions are multiple-choice, with correct answers indicated in the teacher's view. Teachers can modify the questions using the "Personalize" feature.

Materials include teacher guidance on how to scaffold and support students' development and use of scientific vocabulary in context.

- The materials include teacher guidance on how to scaffold and support students' development and use of scientific vocabulary in context. One example is in Chapter 1, The Study of Life, 1.1 The Science of Biology. One suggested strategy involves students' creating flashcards to use in vocabulary games and reviews. A second strategy includes student access to digital tools for vocabulary support. Every chapter in the platform includes access to "Key Terms" and definitions. Additionally, instructional supports are within each of the chapter sections. For example, in Chapter 18.2, Formation of New Species, students watch a video about the scientific use of evidence to understand bird evolution. After the video, students write a summary of their learning, which includes a minimum of three underlined vocabulary terms within the summary. The materials provided in the "Preface," Evaluating Scientific Models, also include sentence stems with the use of academic vocabulary to scaffold and support students' development of scientific vocabulary.
- Embedded throughout the chapters, the instructors find "English Language Learner Support" sections which include strategies to be used for all learners in the building of scientific vocabulary. In 5.1 Component and Structure the Materials, under English Language Learners Support, provide scaffolding strategies that can be used for both ELL's and All Students. For example, "Point out to students that the Career Connection section often has a word that ends in the suffix -gist. Ask language learners what they think -logist means. As a group, look up the meaning of the suffix and discuss that it refers to a person who studies something or is an expert in something. Have students come up with words they know in English that end with the suffix -logist (cardiologist; psychologist; geologist; biologist.) Write the suggestions on the board and define each one as a group, using online resources."
- These sections include teacher guidance on how to scaffold and support students' development and use of scientific vocabulary in context. For example, Unit 8, Chapter 47, Subchapter 47.2, has the "ELL Support" section, which shows the instructor ways to scaffold the materials and how to use the vocabulary. These sections provide teacher guidance that can be implemented

throughout the course for all learners. For example, in Unit 1, The Chemistry of Life, Chapter 1.1, The Science of Biology, "ELL Supports" includes teacher guidance on how to scaffold and support students' development and use of scientific vocabulary in context. These supports can be used for any chapter and scientific terms in the materials. It suggests teachers have students create flashcards with the scientific term on one side and the definition on the other. The support recommends students work in pairs to quiz one another for understanding. Key scientific terms are bolded throughout the chapters, and a list is provided for each chapter with definitions. It also suggests that students apply their vocabulary knowledge after writing a summary of a video by underlining at least three vocabulary terms from the chapter.

- The materials provide teacher guidance on how to scaffold and support students' development and use of scientific vocabulary in context within the subsections of the unit chapters by bolding the words and then giving textual background and information about the word. For example, in Chapter 21, Viruses, it states, "microbial mat is a multi-layered sheet of prokaryotes (Figure 22.2) that includes mostly bacteria, but also archaeans." The material also provides a visual representation of the vocabulary term. Another paragraph states, "Then, cyanobacteria, also known as 'blue-green algae,' evolved from these simple phototrophs at least one billion years later. It was the ancestral cyanobacteria (Figure 22.4) that began the 'oxygenation' of the atmosphere." The materials give the bolded definition, explanation of the word, and also a visual image which all help to scaffold and support students' development and use of scientific vocabulary in context.

Materials provide teacher guidance on preparing for student discourse and supporting students in using evidence to construct written and verbal claims.

- The materials provide the instructor guidance on preparing for student discourse and supporting students in using evidence to construct written and verbal claims. The materials use "Notes For Evaluating Responses" in the "Critical Thinking Questions" to achieve this. For example, Unit 3, Chapter 11, under "Critical Thinking Questions," has notes that help the teachers guide the students with claims in written evidence.
- "Visual Connections" use figures or graphics to engage students' critical thinking and analytical skills to check for deeper understanding of the content and concepts presented. In Unit 3, Genetics, Chapter 17, Biotechnology and Genomics provides teacher guidance that supports student use of evidence to construct claims. The activity uses a labeled and captioned diagram as part of each question prompt. Two out of three prompts in this example require a short answer that includes cited evidence in the explanation. Teachers are provided with possible answers to the prompts.
- In the materials, the "STEM Research" activity found in the "STEM Career Research" component provides teacher guidance on preparing for student discourse and supporting students in using evidence to construct written and verbal claims. The document provides a grid for students to use in tracking their research. The teacher version includes suggested resources and examples for grid responses. There are also guiding questions to frame the research focus. An evaluation guide is available for teachers to use as an assessment tool in order to provide targeted feedback.
- For the research activity, students conduct independent research on a chosen STEM career related to biology using a variety of resources. Students complete a worksheet to list the sources and write the information they gather. The activity provides teachers a "note for evaluating responses, indicating the criteria teachers should look for to determine success, such as, "Are answers detailed and comprehensive? Are they able to identify potential biases or

limitations in resources used? Are they able to think outside the box and provide unique perspectives and insights?"

- The materials provide teacher questions for supporting student discourse and the use of evidence in constructing written and verbal claims. Questions push students to use evidence to support their claims, both in writing and in discourse. For example, Unit 1, Scientific Processes: Evaluating Experimental Design, includes questions to ask for validity. Some of the questions included are "Is the experiment measuring what it is intended to measure? Are the results generalizable to the population of interest? Were the appropriate statistical analyses used for this data?" The "Engineering Designs" sections help the teacher guide student discourse and support students using evidence to construct written and verbal claims. One section on sustainability asks, "Have you evaluated the design's environmental impact and sustainability? Are sustainable materials and technologies used? Are potential long-term environmental impacts considered?" These and other questions provided to the teacher with a plethora of questions for student discourse supporting students in using evidence to construct written and verbal claims.

Materials support and guide teachers in facilitating the sharing of students' thinking and finding solutions.

- The materials support and guide teachers in facilitating the sharing of students' thinking and finding solutions. For example, within the "Preface" of the "Scientific Communication section" under "Scientific Processes," Unit 1 gives the student support on how to communicate their thoughts and share solutions with the use of sentence stems. The sentence stems are available to support students in communicating their thoughts and sharing solutions. The sentence stems are organized into 13 separate groups according to their purpose. For example, two of the 13 categories include sentence stems to support sharing observations and others for explaining data. The communication document is available for teachers to use for guidance or to share outright with students. The materials provide teacher support and guidance to engage students' thinking in various modes of communication throughout the year/course with this document. It can be used as a reference for each chapter and scientific investigation, whether virtual or hands-on, based on the need of the activity. For example, the materials specifically state that "these questions and statements can be used both individually or collaboratively with a group" and can be used for questioning "how we figure things out" and "how we communicate."
- In the materials, supports found throughout the chapters for each unit provide teacher guidance that can be implemented throughout the course for all learners. For example, in Unit 1, The Chemistry of Life, Chapter 1, The Study of Life, the "Critical Thinking Questions" are prefaced to guide teachers in facilitating the sharing of students' thinking and finding solutions. The support recommends that teachers work with students in small groups to respond to critical thinking questions focusing on the content of responses rather than pronunciation. For instance, question 1 asks the student to think about a problem that you may have at home, at school, or with your car and apply the scientific method to solve it. Working with small groups, the teacher facilitates and evaluates responses for understanding the content and concepts rather than pronunciations.
- In the materials, Unit 3, Genetics, Chapter 16.7, Cancer and Gene Regulation, helps support and guide teachers in facilitating the sharing of students' thinking and finding solutions. An embedded strategy instructs the teacher to allow groups of students to form a "video club" that watches and discusses the "Link to Learning" videos within the chapter. Guiding questions to help students share their thoughts are included within the description of the strategy.

Kiddom OpenStax Biology

Indicator 6.1

Materials include a variety of TEKS-aligned and developmentally appropriate assessment tools.

1	Materials include a range of diagnostic, formative, and summative assessments to assess student learning in a variety of formats.	M
2	Materials assess all student expectations over the breadth of the course and indicate which student expectations are assessed in each assessment.	M
3	Materials include assessments that integrate scientific concepts and science and engineering practices.	M
4	Materials include assessments that require students to apply knowledge and skills to novel contexts.	M

Meets | Score 2/2

The materials meet the requirements for this indicator. Materials include a variety of TEKS-aligned and developmentally appropriate assessment tools.

Materials include a range of diagnostic, formative, and summative assessments that include formal and informal opportunities to assess student learning in a variety of formats. Materials assess all student expectations and indicate which student expectations are assessed. Materials include assessments that integrate scientific concepts and science and engineering practices. Materials include assessments that require students to apply knowledge and skills to novel contexts.

Evidence includes but is not limited to:

Materials include a range of diagnostic, formative, and summative assessments to assess student learning in a variety of formats.

- The materials include a range of diagnostic, formative, and summative assessments that include formal and informal opportunities to assess student learning in a variety of formats. There are various places to select a variety of assessments which include the “Introduction Anchoring Phenomenon,” the “Visual Connections Questions,” the “Review Questions,” or the “Critical Thinking Questions.” Each section provides both multiple-choice and open-response question options. The material gives plenty of informal and formal opportunities for the assessment of student learning. For example, in Unit 4, Chapter 18, the instructor has the option of using any of the question sections at any time by using the “Assign” and “Personalize” features for any of the activities.
- In the materials, the “Review Questions” for each chapter include formative and summative assessment opportunities to assess student learning. Students respond to the “Review Questions” to demonstrate their knowledge which allows teachers to closely monitor student progress at the end of each chapter. For example, in Unit 6, Plant and Structure Function, Chapter 31, Soil and Plant Nutrition, the “Review Questions” provide 12 multiple choice questions which can be auto-graded to determine student learning and understanding of appropriate course content and skills for the chapter. Teachers receive the score and can use this data to decide if intervention, reteaching, or extensions are needed.

- In the materials, the “Visual Connection Questions” for each chapter include a range of diagnostic, formative, and summative assessments that include formal and informal opportunities to assess student learning in a variety of formats. For example, Unit 3, Genetics, Chapter 17, Biotechnology and Genomics, “Visual Connection Questions” provide multiple choice and written response questions to monitor, evaluate, and respond to student progress toward the development of appropriate course content and skills. The teacher is provided with correct answer choices, and a “note for evaluating responses” to assess student learning and knowledge for the TEKS addressed in that chapter. Teachers can use this data to decide if intervention, reteaching, or extensions are needed.
- Materials include a variety of assessment formats for every chapter. For example, Chapter 23, Protists includes three categories of questions: “Visual Connection Questions,” “Review Questions,” and “Critical Thinking Questions.” “Visual Connection Questions” use chapter diagrams and captions as part of the prompt. Question types might be short answer or multiple choice. “Review Questions” are multiple choice and are based on information from the chapter text. “Critical Thinking Questions” are a mixture of knowledge, application, and synthesis-based short answer questions. The “Visual Connection” feature in each chapter includes selected images with accompanying captions and questions to use as diagnostic opportunities in the classroom. The “Review Questions” and “Critical Thinking” questions can act as a diagnostic checkpoint, a formative assessment of a chapter section, or a summative assessment of the chapter.
- The materials include a range of diagnostic, formative, and summative assessments to assess student learning in a variety of formats beginning with the learning objectives within the introduction of each unit. The materials provide several formative assessments for students with learning objective suggestions for each of the units. The materials provide summative assessments with “Visual Connection Questions” that assess the students on their visual learning of images, diagrams, biological processes, and more. The materials also provide multiple choice “Review Questions” at the end of the unit. The teacher can personalize and individually assign any question per student. The “Critical Thinking Questions” are free-response questions for students to explain and elaborate in their own words to show their understanding. All question types include answer keys, with a grading rubric, point value, and suggested responses for teacher guidance.

Materials assess all student expectations over the breadth of the course and indicate which student expectations are being assessed in each assessment.

- The materials assess all student expectations and indicate which student expectations are assessed. At the beginning of each sub-chapter, the materials clearly state the “Learning Objectives.” An example of this is Unit 6, Chapter 31, sub-chapter 31.1, where the first thing the student sees is the “Learning Objectives” that will be assessed at the end of the chapter.
- In the materials, each unit subchapter begins by listing the “Learning Objectives,” which indicate which student expectations are assessed. For example, in Unit 4, Evolutionary Processes, Chapter 18.3, Reconnection and Speciation Rates, the “Learning Objective” indicates that by the end of this section, the student will be able to do the following: Describe pathways of species evolution in hybrid zones and explain the two major theories on rates of speciation. The teacher can then monitor, evaluate, and respond to student progress toward the development of appropriate course content and skills.
- In the materials, the “Coverage” and “Scope and Pacing Guide” found in the “Preface” indicates which student expectations are assessed. The Guide outlines what will be taught in the high

school biology course and suggests the number of days to allow for instruction of the content and concepts. For example, the guide indicates that for Unit 2, The Cell: Students will gain a solid understanding of the structures, functions, and processes of the most basic unit of life, the cell. The guide also suggests that 26 days be allotted for this topic. The teacher can then monitor, evaluate, and respond to student progress toward the development of appropriate course content and skills.

- "Learning Objectives" for students are found at the beginning of each chapter section. For example, in Chapter 18.2, Formation of New Species, five learning objectives are listed. One objective states, "Describe adaptive radiation." Correct answers to both Question 3 in "Visual Connection Questions" and Question 5 in the "Critical Thinking Questions" require an understanding of adaptive radiation. One of the "Learning Objectives" in Chapter 4.1, Studying Cells, is "Summarize cell theory." Question 2 in the "Review Questions" section and Question 5 in the "Critical Thinking" section both assess the cited learning objective.
- The materials assess all student expectations over the breadth of the course and indicate which student expectations are being assessed in each assessment with explanations of student expectations and learning objectives in the "Introduction" of each unit. For example, in Unit 10.1 Cell Reproduction, "Learning Objectives: By the end of this section, you will be able to do the following: Describe the structure of prokaryotic and eukaryotic genomes; distinguish between chromosomes, genes, and traits; describe the mechanisms of chromosome compaction." The "Review Questions" for 10.1, Cell Reproduction, coincide with the "Learning Objectives." For example, the question "The first level of DNA organization in a eukaryotic cell is maintained by which molecule?" addresses the learning objective of describing the structure of eukaryotic cells. Another fill-in-the-blank review question addresses the learning objective of distinguishing between chromosomes, genes, and traits. The materials may include assessments and questions which are not specifically TEKS aligned or indicated because the content is targeted for advanced Biology and may not directly align with STAAR level curriculum. The content goes incredibly in depth and covers many topics in Biology.

Materials include assessments that integrate scientific concepts and science and engineering practices.

- The materials include assessments that integrate scientific concepts and science and engineering practices. Each sub-chapter has "Critical Thinking Questions" that instructors can use to assess scientific concepts and science and engineering practices. For example, in Unit 7, Chapter 37, students can find the "Critical Thinking Questions" at the bottom of the chapter.
- In the materials, the "Critical Thinking Questions" found in each chapter provide opportunities for students to construct developmentally appropriate written arguments that justify explanations for problems using evidence acquired from learning experiences. For example, in Unit 8, Ecology, Chapter 45, Population and Community Ecology, question 9 of "Critical Thinking" states that "Since the introduction of the Endangered Species Act, the number of species on the protected list has more than doubled. Describe how the human population's growth pattern contributes to the rise in endangered species." This encourages students to use previous knowledge and information about human populations and the Act to write a valid explanation for the problem. The teacher can monitor, evaluate, and respond to student progress based on student responses.
- The "Scientific Method Connections" found throughout the materials for each unit and chapter include assessments that integrate scientific concepts and science and engineering practices. For example, the "Scientific Method Connection" found in Unit 2, The Cell, subchapter 10.2, provides opportunities for students to practice, develop, and demonstrate mastery of scientific

engineering practices. In the activity, "Determine the Time Spent in Cell Cycle Stages," students conduct an investigation in groups to determine how long a cell spends in each stage of the cell cycle. Students formulate a hypothesis, conduct the experiment, and adhere to lab safety. After observing, recording, and analyzing group data, students draw a conclusion. Following the investigation, students discuss what went well, what could improve protocol, and other ways to evaluate and conduct the investigation. The teacher can monitor, evaluate, and respond to student progress during the investigation.

- There is evidence that assessments include scientific concepts integrated with recurring themes and concepts. For instance, Question 8 in the "Critical Thinking" section of Chapter 36, Sensory Systems, provides a descriptor of studies concerning the sensitivity of a canine's olfactory system. The short answer question asks for a possible hypothesis and an explanation of why a canine is a better choice in situations where the detection of scent is important. Question 13 in the "Critical Thinking" section of Chapter 21, Viruses, integrates scientific concepts and processes with recurring themes and concepts. The prompt describes a botanist that notices a diseased plant. The student is asked to describe the procedural steps necessary to determine if a virus is or is not the cause of the plant's condition.
- The materials include assessments that integrate scientific concepts and science and engineering practices with the "Critical Thinking Questions." For example, Unit 1, Scientific Processes, asks the student to think like a scientist and "Think about a problem that you may have at home, at school, or with your car, and apply the scientific method to solve it." This question can create powerful conventions among students within the classroom, create innovation, inspire thinking of everyday solutions, and bring STEM ideas for students to look objectively at the environment around them. In Unit 2, Chapter 4, Cell Structure, students are again asked about a real-world scenario and to once again think like scientists by taking everyday household items and thinking about how they apply to science. The first "Critical Thinking Question," states that "In your everyday life, you have probably noticed that certain instruments are ideal for certain situations. For example, you would use a spoon rather than a fork to eat soup because a spoon is shaped for scooping, while soup would slip between the tines of a fork. The use of ideal instruments also applies in science. In what situation(s) would the use of a light microscope be ideal, and why?"

Materials include assessments that require students to apply knowledge and skills to novel contexts.

- The materials include assessments that require students to apply knowledge and skills to novel contexts. Within all the sub-chapters, you will find "Visual Connections" that are embedded in the material to assess the content being studied. For example, in Unit 7, Chapter 37, Sub-Chapter 37.3, there is a "Visual Connection" question that displays a cell and shows how a hormone regulates a cell process which asks the students, "Why do you think the cell responds to a heat shock by increasing the activity of proteins that help refold misfolded proteins?" Asking students this type of question requires students to apply knowledge and skills to answer.
- In the materials, the "Visual Connection" questions include assessments that require students to apply knowledge and skills to novel contexts as appropriate for course content and skills. "Visual Connections" use figures or graphics to engage students' critical thinking and analytical skills to check for a deeper understanding of the content and concepts presented. In Unit 3, Genetics, Chapter 17, Biotechnology and Genomics, Visual Connection question 3 asks students to study Figure 17.15 of the PCA3 gene and respond in writing to the prompt if healthy men should be screened using the PCA3 test and should people in general be screened if they have a genetic

risk for cancer and other diseases. The teacher monitors, evaluates, and responds to student progress.

- The “Critical Thinking” section of Chapter 30, Plant Form and Physiology, provides evidence of students applying knowledge and skills to a novel context. Question 14 poses a problem concerning lighting schedules for specific plants that flower in February. The student is asked to explain their recommendation for lighting periods as well as the best color of light to use. There is an application of student knowledge and skills to a novel context in the “Critical Thinking” section of Chapter 44, Ecology and the Biosphere. Question 7 describes how ancient but well-preserved human bodies and other living things were discovered in a bog. Explanations about why decomposition had not taken place must be grounded in biological concepts.
- The materials include assessments that require students to apply knowledge and skills to novel contexts with the “Introduction Phenomenon” presented before each chapter. For example, Chapter 4, Cell Plasma Membrane, creates a phenomenon making connections with Grand Central Train Station and the plasma membrane of the cell. In Chapter 5, Metabolism, the “Phenomenon” is created with the energy spent by hummingbirds and how their bodies process nectar and the energy required to complete the process. These phenomena and others throughout the chapters bring to life real-world scenarios that are familiar to students and trigger their thinking like scientists to better comprehend, explain, and retain challenging concepts such as the metabolism of the body.

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Indicator 6.2

Materials include guidance that explains how to analyze and respond to data from assessment tools.

1	Materials include information and/or resources that provide guidance for evaluating student responses.	M
2	Materials support teachers' analysis of assessment data with guidance and direction to respond to individual students' needs, in all areas of science, based on measures of student progress appropriate for the developmental level.	M
3	Assessment tools yield relevant information for teachers to use when planning instruction, intervention, and extension.	M
4	Materials provide a variety of resources and teacher guidance on how to leverage different activities to respond to student data.	M

Meets | Score 2/2

The materials meet the requirements for this indicator. Materials include guidance that explains how to analyze and respond to data from assessment tools.

Materials include information and/or resources that provide guidance for evaluating student responses. Materials support teachers' analysis of assessment data with guidance and direction to respond to individual students' needs, in all areas of science, based on measures of student progress appropriate for the developmental level. Assessment tools yield relevant information for teachers to use when planning instruction, intervention, and extension. Materials provide a variety of resources and teacher guidance on how to leverage different activities to respond to student data.

Evidence includes but is not limited to:

Materials include information and/or resources that provide guidance for evaluating student responses.

- The materials include information and/or resources that provide guidance for evaluating student responses. The materials provide the instructors with "Notes For Evaluating Responses" for "Critical Thinking Questions." For example, in Unit 3, Chapter 13, you can see the "Notes for the Critical Thinking Questions" that give guidance to the instructor on what to look for in the correct answers. Guidance and information for evaluating student responses are found in instructional materials within every chapter. For example, the "Critical Thinking" questions in Chapter 24, Fungi, include a note for evaluating responses for each question within the assessment. The note provides an appropriate response to the question. Each question is worth a set number of points. The targeted response and total point value offer teachers leeway in assessing correct but incomplete student responses.
- In the materials, the "Visual Connection" questions include information and/or resources that provide guidance for evaluating student responses. Visual connections use figures or graphics to engage students' critical thinking and analytical skills to check for a deeper understanding of the content and concepts presented. The teacher is provided with correct responses to multiple-choice, fill-in-the-blank, and written response questions. For example, in Unit 1, Genetics, Chapter 2, The Chemical Foundation of Life, the "Visual Connection" provides the students with figures of carbon and its isotope, Bohr models, and isomers. Question 1 is a fill-in-the-blank

where students determine the number of neutrons in Carbon-12 and Carbon-13 from Figure 2.3. The teacher is provided with the correct response and a “note for evaluating responses” of six and seven neutrons, respectively. After the student studies Figure 2.7, the prompt asks the student to “determine how many electrons the elements need to gain or lose to become stable?” The “note” for this question provides the correct numbers. After studying Figure 2.24 about isomers, question 3 asks the student to read a group of statements and choose which is true. The teacher is provided with the correct choice: enantiomers must have at least three different atoms or groups connected to a central carbon.

- In the materials, the “STEM Research” activity found in the “STEM Career Research" component includes information and/or resources that provide guidance for evaluating student responses. For the research activity, students conduct independent research on a chosen STEM career related to Biology using a variety of resources. Students complete a worksheet to list the sources and write the information they gather. The activity provides teachers a “note for evaluating responses,” indicating the criteria teachers should look for, in the form of questions, to determine success, such as “Are answers detailed and comprehensive? Are they able to identify potential biases or limitations in resources used? Are they able to think outside the box and provide unique perspectives and insights?”
- The “Visual Connection Questions” in Chapter 18, Evolution and the Origin of the Species, provide guidance for evaluating student responses. For instance, there are two multiple-choice questions and one short answer question, each with a diagram from the chapter text. Both multiple-choice questions note the correct response. The short answer question also includes an example of a proper response to the question.
- The materials include information and resources that provide guidance for evaluating student responses for all open-ended responses with teacher guidance on scoring and an answer exemplar. For example, in Chapter 7, “Visual Connection,” question 1 states that “Dinitrophenol (DNP) is an ‘uncoupler’ that makes the inner mitochondrial membrane ‘leaky’ to protons. It was used until 1938 as a weight-loss drug. What effect would you expect DNP to have on the change in pH across the inner mitochondrial membrane? Why do you think this might be an effective weight-loss drug?” The teacher guidance is as follows: four sentences and four-point response with the exemplar stating that “After DNP poisoning, the electron transport chain can no longer form a proton gradient, and ATP synthase can no longer make ATP. DNP is an effective diet drug because it uncouples ATP synthesis; in other words, after taking it, a person obtains less energy from the food he or she eats. Interestingly, one of the worst side effects of this drug is hyperthermia, or overheating of the body. Since ATP cannot be formed, the energy from electron transport is lost as heat.”

Materials support teachers' analysis of assessment data with guidance and direction to respond to individual students’ needs, in all areas of science, based on measures of student progress appropriate for the developmental level.

- The materials support teachers' analysis of assessment data with guidance and direction to respond to individual student’s needs, in all areas of science, based on measures of student progress appropriate for the developmental level. For example, the materials provide the instructor with the “Classes” tab. In this tab, the materials house a place for the instructors to classify their classes, organize reports that have student data, and a planner area so the instructor can keep track of the student progress. Student progress can also be found in the “Reports” for each class. The material includes downloadable reports on class standard data and class assignment data. The data includes percent mastery by student for each standard or

assignment by student that enables teachers to identify areas where students may be struggling and provide targeted support. By providing teachers with data on student progress, the data and reports enable them to respond to individual student needs in a timely and effective manner.

- The platform supports teachers' analysis of assessment data based on measures of student progress. In the material, in “Class Settings,” teachers set grading options of percentage, mastery, grade, and grade point and weighting methods of unweighted, max law, and weighted by assignment type to create reports that enable teachers to identify areas where students may be struggling and provide targeted support. By providing teachers with data on student progress (i.e., exceeds, mastery, approaching, developing), the data and reports enable them to respond to individual student needs in a timely and effective manner.
- Materials support teachers with guidance to respond to individual students’ needs. An example is the embedded support recommended for those who struggle to read scientific text. In Chapter 3.3, Lipids, the recommendation is to provide linguistic accommodations from other online content sources until there is evidence of increased comprehension observed in one-on-one discussions or other assessment tools.
- Support is available for teachers to monitor and address student progress through analysis of assessment data. The title of the digital resource is “How Are Grades Calculated?”, which is located in the “Need Help” link in the “Grading” section. Mastery levels are on a 1–4 scale labeled as 1: Developing, 2: Approaching Mastery, 3: Mastery, and 4: Exceeding Mastery. The 1–4 scale is correlated to a 0–10 scale and also to a percentage value. Another tool called Max Law uses the highest score from multiple assessments of a standard as the achieved mastery.
- The materials support teachers’ analysis of assessment data with guidance and direction to respond to individual students’ needs, in all areas of science, based on measures of student progress appropriate for the developmental level with the two types of reports the LMS provides. The data reports help to monitor student progress and development. The first report for teachers is a class report for each student based on the learning standards on the assignment. This report is useful for the teacher to assess what learning standards are low/high and make lesson modifications for reteach opportunities for individual students or for a small group. This report provides percentages for overall grades along with the percentage for each of the learning categories. The second type of report that is provided to monitor students’ development and progress is based on the individual assignment, whether it be a video question, visual learning questions, or individual assignment by name. This report is helpful for teachers to monitor student completion of lesson assignments and communicate to the student what assignments are missing or give the student an opportunity to redo an assignment for a higher grade.

Assessment tools yield relevant information for teachers to use when planning instruction, intervention, and extension.

- The materials have assessment tools that yield relevant information for teachers to use when planning instruction, intervention, and extension. For example, the materials allow the instructor to make interventions and extensions necessary for planning instruction. Teachers can use the “Reports” found in the “Classes” tab with the “Assignment Setting” options. This option allows the instructor to customize each assignment to fit the needs of their students. The “Reports” section provides assessment data on class grade averages, mastery groups, and class standard mastery. The data is color coded so teachers can easily analyze and interpret the information. In addition, downloadable reports on class standard data and class assignment data

are included. The data includes the percent mastery by student for each standard or assignment by student. This report enables teachers to identify areas where students may be struggling and provide targeted support, and to inform data-driven instruction in a timely and effective manner.

- The platform assessment tools yield relevant information for teachers to use when planning instruction, intervention, and extension. In the material, in "Class Settings," teachers set grading options of percentage, mastery, grade and grade point and weighting methods of unweighted, max law, and weighted by assignment type to create reports that enable teachers to identify areas where students may be struggling and provide targeted support. By providing data on student progress (i.e., exceeds, mastery, approaching, developing), the reports enable teachers to respond to data, inform instruction, and target individual student needs in a timely and effective manner.
- There are assessment tools listed under the "Grading" tab in the Classes view that yield relevant information to aid in teacher planning for the different learning needs of students. For instance, teachers can select from a list of assessment tools to meet the specific needs of students. Assessment tools such as paper, quizzes, homework, poll, exit ticket, project, lab, pre-test, etc., are available for teachers to assign as a class, small group, or individual. Information and an example for using weighted assessment types to calculate grades are also provided for the teacher.
- There are assessment tools that yield information for teachers to use when planning instruction. When a teacher makes an assignment within the digital platform, students can complete the assignment and earn points or grades. A teacher can click the "Planner" tab in "Classes" to view whole-class and/or individual data by date. Assigned assessments and activities are categorized as formative or summative according to the teacher's decision.
- The materials have assessment tools that yield relevant information for teachers to use when planning instruction, intervention, and extension with the two types of reports that the materials provide. The first report for teachers is a class report for each student based on the learning standards on the assignment. This report is useful for the teacher to assess what learning standards are low/high and make lesson modifications for reteach opportunities for individual students or for a small group. This report provides percentages for overall grades along with the percentage for each of the learning categories. The second type of report that is provided to monitor students' development and progress is based on the individual assignment, whether it be a video question, visual learning questions, or individual assignment by name. This report is helpful for teachers to monitor student completion of lesson assignments and communicate to the student what assignments are missing or give the student an opportunity to redo an assignment for a higher grade. The teacher can provide intervention support for students collectively and individually.

Materials provide a variety of resources and teacher guidance on how to leverage different activities to respond to student data.

- In the materials, the "Practice, Assessment, & Progress Monitoring" section found in the "Preface" provides a variety of resources and teacher guidance on how to leverage different activities to respond to student data. The "Visual Connection" features present questions using graphics to engage students' critical thinking and analytical abilities and to ensure their genuine understanding. "Link to Learning" features direct students to online interactive exercises and animations to add a fuller context of examples to core content. "Review Questions" help prepare students to demonstrate their knowledge by responding to the multiple-choice format

questions allowing students and teachers to closely monitor student progress at the end of a section and/or chapter. “Critical Thinking Questions” challenge students to apply the content and skills that they have learned. This format allows teachers to closely monitor student progress at the end of a section and/or chapter. These features provide direct instruction of science concepts, followed by reviews and skills practice activities for students.

- In the materials, “English Language Learner (ELL) Supports” found throughout the chapters for each unit provide a variety of resources and teacher guidance on how to leverage different activities to respond to student data that can be implemented throughout the course for all learners. For example, Unit 1, The Chemistry of Life, Chapter 1.1, The Science of Biology, “ELL Supports,” includes teacher guidance on how to scaffold and support students’ development and use of scientific vocabulary in context. These supports can be used for any chapter and scientific terms in the materials. For example, the “ELL Support” in this chapter suggests teachers have students create flashcards with the scientific term on one side and the definition on the other. The support recommends students work in pairs to quiz one another for understanding. Key scientific terms are bolded throughout the chapters, and a list is provided for each chapter with definitions. These features provide direct instruction of science concepts, followed by reviews and skills practice activities for students.
- Teachers have tools that leverage different activities in response to student data throughout the digital curriculum. For instance, in Chapter 32.3, Asexual Reproduction, there is a pencil icon in the tab labeled “Personalize” on the right side of the page that allows a teacher to create a modified assignment for students. The assignment is saved under a different title and can then be assigned to specific students or launched to the class for synchronous learning. Also, there is a gear icon denoting a tab titled “Assignment Settings” in the upper left-hand corner of the page. A teacher can change the assignment settings to further personalize the assignment. Assessments are editable and, therefore, customizable. For example, in Chapter 29, Vertebrates, there are 19 “Review Questions.” The teacher can hide questions, randomize the answer order for each question, and assign the questions to specific students. The teacher can also use the “Lesson Launch” feature to use review questions as exit tickets. Assigned “Review Questions” are auto-graded, and the “Lesson Launch” tracks live progress in the classroom.
- The materials provide a variety of resources and teacher guidance on how to leverage different activities to respond to student data within the reports and the data features. These easily allow teachers to review class data to track mastery progress or to gauge if students are still developing their knowledge. The “OpenStax” features for teachers offer pedagogical support on how to create autonomous student groups, lesson integration, lesson PowerPoints, community hubs with other OpenStax users, and technology support and resources for teachers and students. The “Getting Started” feature offers support for teachers on how to implement the LMS digital resources and printed resources for students. There are a plethora of resources for both students and teachers and the “Getting Started” allows teachers to carefully implement the LMS by first familiarizing themselves with the platform and then thus preparing integration for their classroom with students.

Kiddom OpenStax Biology

Indicator 6.3

Assessments are clear and easy to understand.

1	Assessments contain items that are scientifically accurate, avoid bias, and are free from errors.	M
2	Assessment tools use clear pictures and graphics that are developmentally appropriate.	M
3	Materials provide guidance to ensure consistent and accurate administration of assessment tools.	M
4	Materials include guidance to offer accommodations for assessment tools that allow students to demonstrate mastery of knowledge and skills aligned to learning goals.	M

Meets | Score 2/2

The materials meet the requirements for this indicator. Assessments are clear and easy to understand.

Assessments contain items that are scientifically accurate, avoid bias, and are free from errors. Assessment tools use clear pictures and graphics that are developmentally appropriate. Materials provide guidance to ensure consistent and accurate administration of assessment tools. Materials include guidance to offer accommodations for assessment tools that allow students to demonstrate mastery of knowledge and skills aligned to learning goals.

Evidence includes but is not limited to:

Assessments contain items that are scientifically accurate, avoid bias, and are free from errors.

- In the materials, “Review” questions found in each chapter contain items that are scientifically accurate, avoid bias, and are free from errors. Formative and summative assessments include assessment items that align with taught objectives and present course content and concepts, science and engineering practices, and recurring themes and concepts in a scientifically accurate way. For example, in Unit 1, The Chemistry of Life, Chapter 2, The Chemical Foundation of Life, the Review Questions provide teachers with scientifically correct questions that address the standard that is being assessed. The questions provide straightforward questions, some with tables and/or charts, that avoid bias and are free from errors. Assessments, such as the “Review Questions” in Unit 3, Genetics, Chapter 17, Biotechnology and Genomics, are scientifically accurate, avoid bias, and are free from errors. For instance, multiple choice Question 2 asks how many nucleotides are in 12 mRNA codons. Answer choices include numbers 12, 24, 36, and 48, with 36 as the correct answer. Question 13 asks where RNA components of ribosomes are synthesized. The correct answer is identified as the nucleolus. For Question 5 of the “Review Questions” in Chapter 35 of Unit 7, the question states, “For a neuron to fire an action potential, its membrane must reach _____.”The question is scientifically accurate, contains no errors, and is free of bias.
- In the materials, the “Visual Connection Questions” found in each chapter contain items that are scientifically accurate, avoid bias, and are free from errors. Formative and summative assessments include assessment items that present content and examples in a fair and impartial manner with no impact on student performance based on such factors as a student’s home language, place of origin, gender, or race and ethnicity. For example, in Unit 2, The Cell, Chapter

9, Cell Communication, “Visual Connection Questions” provides teachers with scientifically correct questions that address the standard that is being assessed. The questions are straightforward, using figures of tables and/or charts that avoid bias and are free from errors.

- In Unit 2, The Cell, Chapter 9, Cell Communication, the “Visual Connection Questions” includes multiple choice and short answer questions relating to images and captions from the chapter text. For assessment purposes, the correct answer choice is marked in multiple-choice questions. In the short answer questions, a suggested response is provided in the text box. For example, in Question 4, information about *S. aureus* working together to create a biofilm in a patient's catheter is provided for a proper response to the question about the advantages the biofilm offers to the bacteria.
- The assessments contain items that are scientifically accurate, avoid bias, and are free from errors for all formal and non-formal assessments. Formative and summative assessments include assessment items that align with taught objectives and present course content and concepts, science and engineering practices, and recurring themes and concepts in a scientifically accurate way. For example, in Unit 4, Chapter 18, Evolutionary Processes, the “Visual Connection Questions” uses Figure 18.22 to depict various beaks of finches and asks students the unbiased question, “If two species eat a different diet, but one of the food sources is eliminated, and both species are forced to eat the same foods, what change in the hybrid zone is most likely to occur?” The LMS provides a concept-focused question and unbiased answer for evaluating responses and point value for the response as, “Fusion is most likely to occur because the two species will interact more and similar traits in food acquisition will be selected.”
- Formative and summative assessments include assessment items that present content and examples in a fair and impartial manner with no impact on student performance based on such factors as a student’s home language, place of origin, gender, or race and ethnicity. For example, in Unit 4, Chapter 18, Critical Thinking Question 5 asks the students, “Why is it so important for scientists to distinguish between homologous and analogous characteristics before building phylogenetic trees?” The question uses academic key terms such as “homologous and analogous” for students to think critically and not spiritually. The answer provided for evaluating responses and adding a point value is “Phylogenetic trees are based on evolutionary connections. If an analogous similarity were used on a tree, this would be erroneous, and furthermore, would cause the subsequent branches to be inaccurate.” The response is unbiased, and it does not ask students about their spiritual beliefs of the evolutionary process and merely reflects on academic terminology and not a belief system.

Assessment tools use clear pictures and graphics that are developmentally appropriate.

- In the materials, the “Visual Connection Questions” found in each chapter use clear pictures and graphics that are developmentally appropriate and course appropriate with enough detail about science content but without excessive detail that would alarm or overwhelm high school students. The ”Visual Connection Questions” feature figures that are in color and large enough to be able to be seen clearly. For example, Unit 6, Plant Structure and Function, Chapter 31, Soil and Plant Nutrition, “Visual Connection Questions,” features diagrams of soil composition and photos of legumes to study and answer the questions. These graphics are clear and appropriate for the course.
- In the materials, the “Introduction” to each chapter uses clear pictures and graphics that are developmentally and course appropriate. For example, for Unit 6, Plant Structure and Function, Chapter 31, Soil and Plant Nutrition, the “Introduction” presents photographs of a squash

seedling and a full-grown squash to engage students in the phenomenon and draw from their prior knowledge to pique their curiosity and participate in the discussion. The photographs, accompanied by brief text, allow students to clearly see the phenomenon being depicted. The graphics are appropriate for the age level and the course.

- In Unit 8, Ecology, Chapter 45, Population and Community Ecology, "Visual Connection Question" 1 contains a graph displaying the relation between population density and body size of animals in Australia. Students are asked to explain why population density decreases as body size increases. The image is clear, and the caption summarizes the information represented by the graph. Question Number 2 in "Visual Connection Questions," located in Unit 6, Plant Structure and Function, Chapter 31, Soil and Plant Nutrition, contains a graphic of a soil cross-section displaying measurement data regarding layers. The image is credited to USDA. The question asks for students to identify which layers represent the topsoil and subsoil. The graphic is clear and appropriate.
- The assessment tools use clear pictures and graphics that are developmentally appropriate and depict microscopic images for students that may not have access to such technology. For example, Figure 30.2 contains pictures and graphics of stems that are developmentally appropriate with enough detail to learn science content but without excessive detail that would alarm or overwhelm high school students. Figure 30.9 depicts the vascular tissues of a plant that are color-coded and appropriately labeled. The assessment tools use clear pictures and graphics for developmentally appropriate biology students. For example, biology assessment items contain drawings that clearly depict root growth and the anatomy of the root. The illustrations in Figure 30.16 allow students to clearly see the structure of the "area of maturation," "area of elongation," and "area of cell division" for a microscopic root. This image allows students to learn and comprehend how a roop cap grows and matures.

Materials provide guidance to ensure consistent and accurate administration of assessment tools.

- In the materials, the "Visual Connection Questions" provide guidance to ensure consistent and accurate administration of assessment tools. The "Visual Connection Questions" support the teacher in the use of informal and formal assessment tools included in the curriculum. The "Visual Connections" use figures or graphics to engage students' critical thinking and analytical skills to check for a deeper understanding of the content and concepts presented. The teacher is provided with correct responses to multiple-choice, fill-in-the-blank, and written response questions. For example, in Unit 1, Genetics, Chapter 2, The Chemical Foundation of Life, "Visual Connection," the students are provided figures of carbon and its isotope, Bohr models, and isomers. Question 1 is a fill-in-the-blank where students determine the number of neutrons in Carbon-12 and Carbon-13 from Figure 2.3. The teacher is provided with the correct response and a "note for evaluating responses" of six and seven neutrons, respectively. The note helps the instructor with the grading of the responses. After the student studies Figure 2.7, the prompt asks the student to determine how many electrons the elements need to gain or lose to become stable. The "note" for this question provides the correct numbers. After studying Figure 2.24 about isomers, question 3 asks the student to read a group of statements and choose which is true. The teacher is provided with the correct choice: enantiomers must have at least three different atoms or groups connected to a central carbon.
- In the materials, the "STEM Research" activity found in the "STEM Career Research" component provides guidance to ensure consistent and accurate administration of assessment tools. The challenges include detailed information that supports the teacher's understanding of assessment tools and their scoring procedures. For the research activity, students conduct

independent research on a chosen STEM career related to Biology using a variety of resources. Students complete a worksheet to list the sources and write the information they gather. The activity provides teachers a "note for evaluating responses," indicating the criteria teachers should look for, in the form of questions, to determine success, such as are answers detailed and comprehensive, are they able to identify potential biases or limitations in resources used, and are they able to think outside the box and provide unique perspectives and insights?

- Information about "Practice, Assessment, and Progress Monitoring" is provided in the "Preface." There are four types of tools individually described. The "Visual Connection" feature within the chapters engages students' analytical abilities. It suggests that students use clickers to answer the accompanying questions. "Links to Learning" connects students to an activity, video, or article to further deepen understanding. "Review Questions" have a standardized format for multiple choice questions. Teachers can use this tool for student practice or as a monitoring checkpoint. "Critical Thinking Questions" include both multiple choice and short answer questions that require students to apply what they have learned. Teachers use these questions to monitor student progress.
- There are tools that teachers can use to ensure consistent and accurate administration of assessments. For example, assessments such as "Review Questions" in Unit 3, Genetics, Chapter 15, Genes and Proteins, are easy features to modify and personalize prior to assignments. There are also training and informational modules for teachers to explain how to use the assignment and assessment features within the platform.
- The materials provide guidance to ensure consistent and accurate administration of assessment tools with its "Ancillary Materials" from the publisher's website. The formal assessment tool is supported by a "User Guide," which gives an overview of the assessment, outlines the time to administer each task, provides step-by-step guidance for administering each measure, and includes information to support the teacher in understanding the benchmarks. The "Preface" provides an overview for "Teacher Guidance" of all sections and all subsections of the units and how they are to be administered to students individually or as a small group. "Assessment Report" resources are also part of the "Classes" and student data reports.

Materials include guidance to offer accommodations for assessment tools that allow students to demonstrate mastery of knowledge and skills aligned to learning goals.

- The materials include guidance to offer accommodations for assessment tools that allow students to demonstrate mastery of knowledge and skills aligned with learning goals. They do this through the "TEKS Correlation" and "ELPS Correlation" documents that are found at the bottom of the homepage for the OpenStax Biology page. Both of the documents help the instructor with the guidance they need to offer accommodations that allow the students to demonstrate knowledge and skills aligned with learning goals.
- In the materials, the "English Language Learner Support (ELL)" found throughout the chapters includes guidance to offer accommodations for assessment tools that allow students to demonstrate mastery of knowledge and skills aligned with learning goals. For example, in Unit 5, Biological Diversity, Chapter 23, Protists, the "ELL Support" in "Critical Thinking Questions" supports flexible grouping based on learning needs. The ELL support specifically suggests the teacher assign partners to take turns reading the question aloud, discuss the answer to the question referring to the relevant text when needed, and take turns writing the agreed-upon response. Another example is found in Unit 5, Biological Diversity, Chapter 23, Protists, where the "ELL Support" in "Visual Connection Questions" supports oral accommodations based on learning needs. The ELL support specifically suggests the teacher read the questions aloud to

language learners to assist them in locating the image and corresponding question. The teacher can note whether students demonstrate listening comprehension by finding the correct figure and correctly answering the question.

- The “Critical Thinking Questions” in Unit 5, Biological Diversity, Chapter 23, Protists, provides guidance for teachers to offer accommodations for assessment tools. In this instance, teachers assign students to work in pairs to read and answer each question. When partners disagree, they are encouraged to reference the appropriate text. Partners take turns with the assignment tasks while teachers check in to monitor for understanding.
- There is evidence of accommodations for assessments in Unit 5, Biological Diversity, Chapter 23, Protists. The “Visual Connection Questions” assessment instructs the teacher to read the questions aloud to students, prompt them to locate the appropriate graphic, and then reread the question. The teacher closely monitors students for understanding as they respond with answers to the questions. The guidance informs teachers to provide assistance as needed.
- The materials include guidance to offer accommodations for assessment tools that allow students to demonstrate mastery of knowledge and skills aligned with learning goals. The materials within the text bold the academic key terms for students to easily identify. For example, video clips use a closed-captioning feature to help all students see and hear scientific vocabulary in context. Materials offer tests that have fewer questions (while still holding true to objective coverage) to students with this accommodation. The review questions for each unit are between four to six questions for students. This format is also true for the “Visual Connection Questions” and “Critical Thinking Questions.” For example, Unit 6, Chapter 30, Plant Form and Physiology, has only four review questions.

Kiddom OpenStax Biology

Indicator 7.1

Materials include guidance, scaffolds, supports, and extensions that maximize student learning potential.

1	Materials provide recommended targeted instruction and activities to scaffold learning for students who have not yet achieved mastery.	M
2	Materials provide enrichment activities for all levels of learners.	M
3	Materials provide scaffolds and guidance for just-in-time learning acceleration for all students.	M

Meets | Score 2/2

The materials meet the criteria for this indicator. Materials include guidance, scaffolds, supports, and extensions that maximize student learning potential.

Materials provide recommended targeted instruction and activities to scaffold learning for students who still need to achieve mastery. Materials offer enrichment activities for all levels of learners. Materials provide scaffolds and guidance for just-in-time learning acceleration for all students.

Evidence includes but is not limited to:

Materials provide recommended targeted instruction and activities to scaffold learning for students who have not yet achieved mastery.

- The materials provide recommended targeted instruction to scaffold learning for students. For example, in Unit 7, Animal Structure and Function, Chapter 40.3, Mammalian Heart and Blood Vessels, the section “English Language Learner Support” provides the teacher with suggestions on how to scaffold the material for students to use their prior knowledge and visual skills to help achieve mastery. Using the graphics in the text as a guide, students can recall prior knowledge to engage in discussion to connect new concepts to what they already know.
- The materials in each chapter provide opportunities to reteach, review, and practice to scaffold learning for students who need clarification or additional time to master the concepts. For example, in Unit 7, Animal Structure and Function, Chapter 40.3, Mammalian Heart and Blood Vessels, the “Chapter Summary” content provides the key concepts (i.e., The cell is the smallest unit of life) for the chapter and definitions in “Key Terms” (i.e., chloroplast- plant cell organelle that carries out photosynthesis) give students a quick reference for use during instruction and following as they advance. The “Review Questions” (i.e., Which of the following organisms is a prokaryote?) prepare students to demonstrate their knowledge and allow teachers to monitor student progress at the end of each chapter.
- Evidence shows that materials provide targeted instruction for students who have not mastered the content. In Unit 1, The Chemistry of Life, Chapter 3.3, Lipids, materials provide instruction for reading accommodations for teachers to support English Language Learners (ELLs) or emergent bilinguals (EBs) better. Also, the “Link to Learning” section contains additional information on lipids. The interactive animation includes a closed caption feature and a text transcript. Reading passages within the chapters are customizable to scaffold better learning for students. For instance, in Unit 8, Ecology, Chapter 47.1, The Biodiversity Crisis, each passage

includes a “student-facing” checkbox to hide or show the text. In addition, there is direct recommended instruction to teachers regarding EB support for the “Career Connection” section and an empty text box where teachers can provide alternative or additional text for students who have not yet achieved mastery.

- The materials provide recommended targeted instruction and activities to scaffold learning for students who still need to achieve mastery. These suggestions are within chapter overviews. Vocabulary strategies are scaffolded where students connect with challenging new terms, such as photosynthesis, by identifying common roots and or familiar “sounds like” characteristics. For example, Chapter 8, Photosynthesis, references learning objectives and provides examples of how to support students using recommendations on comprehension and application of challenging words like photosynthesis for EBs.
- The materials provide recommended targeted instruction and activities to scaffold learning for students who have not yet achieved mastery with the “Link to Learning.” For example, in Chapter 8.1, Photosynthesis, the link takes learners to a Khan Academy site for an in-depth breakdown of photosynthesis and how to comprehend the concepts for a greater understanding while challenging students to achieve content mastery.

Materials provide enrichment activities for all levels of learners.

- The materials do provide enrichment activities for all levels of learners. For example, in Unit 7, Chapter 40, Section 40.3, the materials provide a “Link to Learning” where students can explore and see videos of the human heart in action. The “Visual Connection” section allows students to observe and analyze a picture of a mammalian heart and answer questions about it. The materials allow students to engage in various written and graphic enrichment activities.
- In the materials, throughout each unit, the Links to Learning, Career Connections, Everyday Connections, and Evolution Connections are components of the resources that engage students through enrichment activities for all levels of learners and encourage further exploration of science concepts. These sections include content, videos, articles, images, and diagrams that students interpret and analyze to extend their knowledge. For example, in Unit 7, Animal Structure and Function, Chapter 34.2, Nutrition and Energy Production, the “Link to Learning” section takes students through an interactive and in-depth look at daily food requirements, and in the “Everyday Connections” section, students learn about the “Let’s Move!” program which addresses childhood obesity.
- Materials, such as those in Unit 3, Genetics, Chapter 16.2, Prokaryotic Gene Regulation, provide enrichment activities for students. Two “Link to Learning" videos offer animations and explanations about gene regulation in prokaryotes. Additionally, there is an opportunity to make inferences about the content in the “Visual Connection” feature. For example, the Unit 8, Ecology, Chapter 45, “Visual Connection” activity allows students to observe and analyze graphs and charts to draw conclusions about animal populations, provide written responses to prompts, and answer multiple-choice questions.
- Chapter 34.2, Nutrition and Energy Production in Unit 7, Animal Structure and Function, provides enrichment activities centered on concepts of nutrition and energy. The “Link to Learning” connects students to a USDA website for updated human nutrition and health information. In the “Every Day Connection” section, a link to information on obesity trends in America, nutrition, and fitness activities offers guidance through text, videos, and additional links for parents and communities.
- The materials provide enrichment activities for all levels of learners with embedded links that take students to various sites such as Berkley Learning, Khan Academy, YouTube, and DNA

Center. Each site offers multiple activities, including virtual simulations, interactive lessons, videos, and more.

Materials provide scaffolds and guidance for just-in-time learning acceleration for all students.

- The materials provide scaffolds and guidance for just-in-time learning acceleration for all students by allowing the instructor to adjust the visible content for the assigned chapter. For example, in Unit 7, Chapter 34, Section 34.2, the teacher is allowed to use the "student-facing" checkbox to hide or show the text; they can also click the trashcan to delete the passage, and they use the text box and provide alternative or additional text for students who have not yet achieved mastery.
- In the materials, throughout each unit, the Links to Learning, Visual Connections, Career Connections, Everyday Connections, and Evolution Connections are components of the resources that provide a deeper understanding of the subject matter within each lesson to support self-paced learning and allow students to spend more time on topics they find interesting. These sections include content, videos, articles, images, and diagrams that students interpret and analyze to extend their knowledge. For example, Chapter 24, Fungi Subchapter 24.1, Characteristics of Fungi, a "Career Connection," provides information about mycologists, the study of fungi, and associated careers and professions. For the Link to Learning for Subchapter 24.3, Ecology of Fungi, students can explore the world of lichens via a website link.
- The "Scientific Method Connections" found throughout the materials for each unit and chapters provide support and resources for students who are ready to accelerate their learning. For example, the "Scientific Method Connection" found in Unit 2, The Cell, Subchapter 10.2, provides opportunities for students to practice, develop, and demonstrate mastery of scientific engineering practices. In the activity, "Determine the Time Spent in Cell Cycle Stages," students investigate in groups to determine how long a cell spends in each stage of the cell cycle. Students formulate a hypothesis, conduct the experiment, and adhere to lab safety. Students draw a conclusion after observing, recording, and analyzing group data. Following the investigation, students discuss what went well, what could improve protocol, and other ways to evaluate and conduct the investigation.
- There is evidence of scaffolding and guidance for just-in-time learning in Unit 2, The Cell, Chapter 4.3, Eukaryotic Cells. Students, such as EBs, recreate tables, charts, and labeled diagrams from the chapter using markers and poster boards. Teachers arrange a time for a gallery walk/talk for brief presentations. Unit 3, Genetics, Chapter 15.5, Genes and Proteins allows teachers to prompt students to select the most interesting concepts in the chapter, write a summary, and include at least four key terms relating to the concept. Students in pairs exchange and read summaries and ask one another clarifying questions.
- The materials provide scaffolds and guidance for just-in-time learning acceleration for all students, with review questions at the end of each chapter. The materials present the questions as multiple-choice options. Still, teachers can also use them as discussion and warm-up questions to review missed concepts, address misconceptions, or correct missed questions based on data.

Kiddom OpenStax Biology

Indicator 7.2

Materials include a variety of research-based instructional methods that appeal to a variety of learning interests and needs.

1	Materials include a variety of developmentally appropriate instructional approaches to engage students in the mastery of the content.	M
2	Materials consistently support flexible grouping (e.g., whole group, small group, partners, one-on-one).	M
3	Materials consistently support multiple types of practices (e.g., modeled, guided, collaborative, independent) and provide guidance and structures to achieve effective implementation.	M
4	Materials represent a diversity of communities in the images and information about people and places.	M

Meets | Score 2/2

The materials meet the criteria for this indicator. The materials include a variety of research-based instructional methods that appeal to various learning interests and needs.

Materials include a variety of developmentally appropriate instructional approaches to engage students in the mastery of the content. Materials consistently support flexible grouping (e.g., whole group, small group, partners, one-on-one). Materials consistently support multiple types of practices (e.g., modeled, guided, collaborative, independent) and provide guidance and structures to achieve effective implementation. Materials represent a diversity of communities in the images and information about people and places.

Evidence includes but is not limited to:

Materials include a variety of developmentally appropriate instructional approaches to engage students in the mastery of the content.

- The materials include various developmentally appropriate instructional approaches to engage students in the mastery of the content. For example, the materials use techniques like Link to Learning, Visual Connections, and Critical Thinking Questions to engage students in content mastery. Materials also provide Key Terms and Visual Connection Questions, which provide multiple-choice review questions and open-response critical thinking questions throughout the chapters.
- The “Scientific Method Connections” found throughout the materials for each unit and chapter present opportunities for student-led investigations, questioning, and discussions related to the student’s course level. For example, the “Scientific Method Connection” found in Unit 2, The Cell, Subchapter 10.2, provides opportunities for students to engage in the mastery of the content through the scientific engineering process. In the activity, “Determine the Time Spent in Cell Cycle Stages,” students investigate in groups to determine how long a cell spends in each stage of the cell cycle. Students formulate a hypothesis, conduct the experiment, and adhere to lab safety. Students draw a conclusion after observing, recording, and analyzing group data.

Following the investigation, students discuss what went well, what could improve the protocol, and other ways to evaluate and conduct the investigation.

- In the materials, "Critical Thinking Questions" are provided for each chapter to engage students in the mastery of the content by responding to writing prompts so students can apply their science knowledge in writing. For example, in Unit 34, Animal Nutrition and Digestive System, students provide a written response to critical thinking questions like, "Discuss why obesity is a growing epidemic" and "Describe one or more scenarios where loss of hormonal regulation of digestion can lead to disease."
- Unit 6, Chapter 30.4, Leaves, includes a variety of instructional approaches to support mastery of the concept of adaptations in plants. For instance, the two "Link to Learning" features are videos about specific carnivorous plants. The "Evolution Connection" is a brief passage that provides textual information and images about plant adaptations for alternative nutrient acquisition. Instructional approaches in Unit 5, Chapter 27.4, The Evolutionary History of the Animal Kingdom, are varied and appropriate. For example, students interact with text, examine charts, reference images and captions, analyze graphs, watch videos, and learn about the work of paleontologists in the "Career Connection" section.
- The materials also include learning objectives to center the teacher and student focus around the central concept. The materials provide structures for learning concepts such as defining words, discussion questions, and verbs for students to conduct scientific research and thinking for each chapter and subchapter.

Materials consistently support flexible grouping (e.g., whole group, small group, partners, one-on-one).

- The materials consistently support flexible grouping. For example, any activities found in the Link to Learning, Visual Connections, Critical Thinking Questions, and Labs can be adjusted to small groups, partners, one-on-one, or whole groups. The materials include an option button to personalize the lesson. The teacher can change the options to question students and filter who can see the groupings.
- In the materials, the "English Language Learner Support" found throughout the chapters supports flexible grouping based on learning needs. For example, in Unit 1, The Chemistry of Life, Chapter 1.1, The Science of Biology, the "English Language Learner Support" guidance suggests two grouping scenarios for learning the content. Students can individually read the chapter content and preview the headings and graphics. They can work as a whole group, in small groups, with partners, or individually to complete a KWL chart as they read to reinforce their understanding of the concepts. Teachers have the option to implement types of grouping configurations to support all learners.
- In the materials, the "Scientific Method Connection" component found in various chapters supports a variety of instructional groupings while engaging in science and engineering processes. For example, in Chapter 10.2, The Cell Cycle, titled "Determine the Time Spent in Cell-Cycle Stages," students observe a fixed, stained slide of a whitefish blastula under the microscope to count the various stages of the cell cycle for 100 cells. The investigation allows students to gather individual and group data to increase the sample size for the best results.
- The assignment tool is available throughout the platform and provides flexibility. For instance, in Chapter 36.1, Sensory Processes, the teacher's view of the lesson displays an edit button in the upper right corner of the screen to customize instruction. The Assign button allows the teacher to select the group of students to engage in the customized lesson. In addition, the "Just-Noticeable Difference" lab investigation within the chapter suggests a grouping strategy to facilitate collecting subsets of data.

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Materials consistently support multiple types of practices (e.g., modeled, guided, collaborative, independent) and provide guidance and structures to achieve effective implementation.

- The materials consistently support multiple practices and provide guidance and structure to achieve effective implementation. “Learning Objectives,” found at the beginning of each subchapter, state a clear purpose and learning goals for group or independent practice activities contained in the subchapters. For example, the “Learning Objectives” in Unit 6, Chapter 30.1, The Plant Body, show the students and instructor what teachers should expect students to learn by the end of the subchapter. Subchapter 18.2, Formation of New Species, states five learning objectives the students will be able to do at the end of the section.
- In the materials, the “Scientific Method Connections” found throughout the resources include opportunities for students to engage in individual or collaborative learning structures while learning a new concept and provide opportunities for scientific discussions. For example, in Unit 3, Genetics, Chapter 15.1, The Genetic Code, “Scientific Method Connection,” the portion entitled “Which has more DNA: a Kiwi or a Strawberry?” the teacher guides the students through safety considerations and pre-investigation questions before students carry out the investigation. Post-investigation questions offer students the opportunity to engage in scientific discussions.
- The “STEM Career Research” section includes an assignment titled STEM Research, which offers students an opportunity to explore STEM careers as it relates to biology. The authors intended this particular assignment to be for independent research. The materials provide vetted resources and guiding questions to focus student research efforts better. There is also guidance for teachers to use as they support students with targeted feedback throughout the research and report phases.
- The materials consistently support multiple types of practices for teachers with the “Link to Learning” in Teacher Tools for each unit. The materials within the chapter sections support various types of practice through the “Link to Learning.” It provides teachers with methods and pedagogical strategies to teach evolution to students with materials, activities, and resources. For example, in Chapter 15.1, The Genetic Code, students learn about protein synthesis by reading text and analyzing charts and diagrams. Then the teacher or a student can use a “Link to Learning” digital interactive to model the process. Afterward, students work collaboratively to plan and implement a hands-on lab investigation.
- The materials consistently support multiple types of practices with the “Preface: Teacher Guide” for teachers in the Practice, Assessment and Progress Monitoring section. The section guides teachers on incorporating the materials provided by the LMS to achieve effective implementation.

Materials represent a diversity of communities in the images and information about people and places.

- The materials represent diverse communities in images and information about people and places. The Introduction to Unit 7, Animal Structure and Function, Chapter 38, The Musculoskeletal System, provides a picture of an athlete with prosthetics. Students view the phenomena and the accompanying text to discuss the musculoskeletal system and improvements in the design of prosthetics.
- In the materials, Unit 3, Genetics, Subchapter 12.3, Laws of Inheritance, Figure 12.15 demonstrates how the resources represent a diversity of communities in the content of the chapters. The figure shows a mother with her child with albinism, a recessive genetic trait. Students use the image as an example to learn that alleles can be dominant or recessive.

- Images and information represent diversity within communities. For instance, in Chapter 33.1, Animal Form and Function, images include drawings and diagrams of different types of animals to compare types of symmetry in body plans. The materials use information and tables to explain the effect of size and shape on the speed of animals across the globe. Similarly, a reading passage about cell size's relation to diffusion rates reminds students of cellular communities. Another concept in the chapter uses images and text to compare energy requirements to body size. “Career Connections” describes how physical anthropologists study human size, shape, and anatomy, which are highly important in careers such as the aerospace, automobile, and museum industries.
- Chapter 13.1, Chromosomal Theory and Genetic Linkage, provides information about historical genetics research using images, web links, diagrams, and text representing the foundational work of contributing scientists, including Mendel in the 1800s, Sutton, Boveri, Morgan, Janssen, Sturtevant, etc. Also included are researchers from the 1930s, such as Barbara McClintock and Harriet Creighton.
- The materials represent diverse communities in the images and information about people and places through reviewing various chapter sections. For example, in Chapter 33, the publisher offers a balanced depiction of male and female humans along with a balance of diversity of animals, from insects, aquatic organisms, and terrestrial animals.

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Indicator 7.3

Materials include listening, speaking, reading, and writing supports to assist emergent bilingual students in meeting course-level science content expectations.

1	Materials include guidance for linguistic accommodations (communicated, sequenced, and scaffolded) commensurate with various levels of English language proficiency as defined by the ELPS.	M
2	Materials encourage strategic use of students' first language as a means to linguistic, affective, cognitive, and academic development in English.	M

Meets| Score 2/2

The materials meet the criteria for this indicator. Materials include listening, speaking, reading, and writing supports to assist emergent bilingual students in meeting course-level science content expectations.

Materials include guidance for linguistic accommodations (communicated, sequenced, and scaffolded) commensurate with various levels of English language proficiency as defined by the ELPS. Materials encourage strategic use of students' first language as a means to linguistic, affective, cognitive, and academic development in English.

Evidence includes but is not limited to:

Materials include guidance for linguistic accommodations (communicated, sequenced, and scaffolded) commensurate with various levels of English language proficiency as defined by the ELPS.

- The materials include guidance for linguistic accommodations commensurate with various levels of English language proficiency as defined by the ELPS. In the materials, "ELL Learner Support" is provided throughout the resources in the chapter content. The "ELL Learner Support" suggests linguistic accommodations commensurate with various levels of English language proficiency for emergent bilinguals (EB). For example, in Unit 3, Chapter 16, Gene Expression, the "ELL Learner Support" suggests when introducing the topic of a new chapter, rephrase concepts using simple language, and similarly, when students contribute to the discussion, rephrase their language to make sure it is on level for language learners in the classroom. The materials provide another example in Unit 7, Chapter 40, subchapter 40.3, where the "ELL Learner Support" suggests easing students into new content by starting with the familiar, using the photographs and diagrams in the text as a guide. Within Chapter 18.2, Formation of New Species, the "ELL Learner Support" provides a writing activity in response to a video in a "Link to Learning" feature. The materials suggest modifications to the writing strategies that differentiate for various levels of language learners.
- Embedded within the introduction units such as Unit 1.1, The Science of Biology, and Unit 1.2, Themes and Concepts of Biology, the materials include guidance for linguistic accommodations with various levels of English language proficiency as defined by the ELPS. In the materials, the "Visual Connection Questions" found for each chapter provide visuals, graphics, and graphic organizers to classify information, order steps in a process, or scaffold written tasks to reinforce the concepts of the unit. For example, in Unit 1, Chapter 1, The Study of Life, students study

flow charts and diagrams to complete tables about the scientific method and the process of solving an everyday problem.

- The materials provide evidence of guidance for linguistic accommodations. For example, in Chapter 40.3, Mammalian Heart and Blood Vessels, the recommended strategy is to use the images in the chapter to open a discussion with students so they can identify what looks familiar and describe what is happening in the picture. There are sentence stems provided for the teacher. The unchecked box for student-facing mode also hides the embedded guidance from students' view.

Materials encourage strategic use of students' first language as a means to linguistic, affective, cognitive, and academic development in English.

- The materials encourage strategic use of students' first language as a means to linguistic, affective, cognitive, and academic development in English. For example, in Unit 1, The Chemistry of Life, Chapter 1, Sub-Chapter 1.1, The Science of Biology, the "ELL Learner Support" section recommends teachers be aware of various levels of language learners in the classroom and empower students to utilize online translation tools for basic vocabulary or keep a notebook with translations for quick reference. The materials contain "ELL Learner Support" sections throughout the content of the chapters and recommend teachers have students look out for multisyllabic words they can define based on prior experience with the English language.
- The "Teacher Resources" includes a "Link to Learning," which provides support from a community of teachers with resources in various languages to support students in academically building their knowledge of Biology. Teachers can find help strategically using a student's first language to develop English in Chapter 1.1, The Science of Biology. Students first read the introduction, chapter outline, headings, and graphics. Then, with a partner or small group, students complete a KWL chart for each section. A second suggested strategy is the creation of vocabulary flash cards so students can quiz one another. The third recommendation in the chapter reminds the teacher that various levels of EBs need additional support through online translation tools.
- In Chapter 5.1, Components and Structures, the "English Language Learner Support" feature suggests the intentional use of suffixes in the previous reading assignment to help students connect to words they already know. Suffixes and a list of words using the suffixes are written on the board so that students can identify patterns that provide clues to definitions of vocabulary words.

Kiddom OpenStax Biology

Indicator 7.4

Materials guide fostering connections between home and school.

1	Materials provide information to be shared with students and caregivers about the design of the program.	PM
2	Materials provide information to be shared with caregivers for how they can help reinforce student learning and development.	DNM
3	Materials include information to guide teacher communications with caregivers.	PM

Partial Meets | Score 1/2

The materials partially meet the requirements for this indicator. Materials somewhat guide fostering connections between home and school.

Materials provide some information to be shared with students and caregivers about the design of the program. Materials do not provide information to be shared with caregivers for how they can help reinforce student learning and development. Materials include some information to guide teacher communications with caregivers.

Evidence includes but is not limited to:

Materials provide information to be shared with students and caregivers about the design of the program.

- The material provides information to be shared with students and caregivers about the program's design. They do this with the “Student Getting Started Guide.” The document has a welcome to OpenStax, which tells them how to access the materials and partner materials that may be assigned.
- The materials provide some information about the design of the program based on some additional resources in the “Preface.” The other resources state that the students should share with their family the chapter summaries. The information in the “Preface” is designed for teachers’ use but can be shared with caregivers, although materials do not explicitly give this guidance. The “Preface” informs about the program's design. The first paragraph explains the course's learning objectives, and the section labeled “Coverage, Scope, and Pacing Guide” provides information about the scope and sequence of study. The Preface labeled Pedagogical Foundation section describes four types of connections throughout the textbook. The pedagogical foundation connections are Evolution, the Scientific Method, Careers, and Everyday Life. Additional information about the art and animations, including video links, are used to provide visual connections that help students better understand the content. The materials do not mention the design in any capacity outside the preface, which is directed at the instructor. It makes no mention at all of sharing the design of the course with family members or caregivers.

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Materials provide information to be shared with caregivers for how they can help reinforce student learning and development.

- The materials provide “Chapter Summary” sections where students can start discussions with their families and caregivers as they gain knowledge of Biology. The “Preface” section describes how to assign family materials through the “Chapter Summary” section. The materials provide information to be shared with caregivers for how they can help reinforce student learning and development with the suggested “Chapter Summary” and with the hands-on learning activities that are virtual or in person. Caregivers can assist and ask questions. For example, in Chapter 44 of Ecology, “Chapter Summary” introduces ecology and breaks down the elements of ecology, including terms and definitions, examples, and references for ecology. Students can share their learning experiences with caregivers. However, materials do not give this suggestion. It is not apparent how to access the parent materials, but the phrasing indicates it is available for teachers to use, not specifically for caregivers. The authors assume that caregivers can assist when needed, but the materials do not provide information on how caregivers can help reinforce learning.
- A “Family Materials” section in the preface suggests the “Chapter Summary” can be assigned to share with family and caregivers. However, the materials do not provide information for caregivers on how they can specifically reinforce student learning and development. The “Chapter Summary” does not offer caregivers suggestions or guidance on using the information, indicating that the authors designed it for student and teacher use. There was a lack of materials intended to be shared with caregivers on how they can help reinforce student learning and development.

Materials include information to guide teacher communications with caregivers.

- In the Preface: Additional Resources section, materials state, “Family Materials,” which can be assigned through the “Chapter Summary” section. Students can utilize the chapter summaries as discussion starters as they share their knowledge of Biology with their families and caregivers.
- Materials do not include information to guide teacher communications with caregivers.

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Indicator 8.1

Materials include year-long plans with practice and review opportunities that support instruction.

1	Materials are accompanied by a TEKS-aligned scope and sequence outlining the order in which knowledge and skills are taught and built in the course materials.	DNM
2	Materials provide clear teacher guidance for facilitating student-made connections across core concepts and scientific and engineering practices.	PM
3	Materials provide review and practice of knowledge and skills spiraled throughout the year to support mastery and retention.	M

Partial Meets | Score 1/2

The materials partially meet the criteria for this indicator. Materials include some plans with some practice and review opportunities that support instruction.

Materials are not accompanied by a TEKS-aligned scope and sequence outlining the order in which knowledge and skills are taught and built in the course materials. Materials provide some teacher guidance for facilitating student-made connections across core concepts and scientific engineering practices. Materials provide review and practice of knowledge and skills spiraled throughout the year to support mastery and retention.

Evidence includes but is not limited to:

Materials are accompanied by a TEKS-aligned scope and sequence outlining the order in which knowledge and skills are taught and built in the course materials.

- The materials provide a scope and sequence outlining the order in which the knowledge and skills are taught; however, it is not accompanied by the TEKS. TEKS are not built into the course materials, and they are not in the order in which the skills are taught.
- No evidence of the materials accompanied by a TEKS-aligned scope and sequence found in the curriculum provided. TEKS alignment was found in another document but not in the curriculum link.
- There is evidence of a scope and sequence within the “Preface” section of the OpenStax Biology 2e Curriculum. The TEKS and ELPS standards are at the bottom of the “Preface” section. These are accessed by links to spreadsheets. The TEKS are not noted within the lessons.
- In the “Safety Protocol” document found in Unit 1: Scientific Processes, there is one reference to the “Science Safety Standards” represented by a link to the TEA website for access to the portable document format (pdf) version of the document.
- The TEKS are not built into the course material. The materials do not include the TEKS embedded for each unit. There is an additional link to the TEKS; however, the TEKS is not aligned with the unit topics or curriculum.

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Materials provide clear teacher guidance for facilitating student-made connections across core concepts and scientific and engineering practices.

- The materials provide a “Teacher Guide” section in the “Preface” on how teachers can use the materials. However, it does not provide clear guidance on how the teacher is to facilitate student-made connections. The materials provide a “Lesson Implementation” in the “Preface,” as well as guidance within chapters. For example, the Scientific Method section of Chapter 38.2: Bones provides teachers with a completely formatted lab investigation on the decalcification of bones. Chapter 1: Safety Protocols and Scientific Equipment is referenced, pre- and post-investigation questions are supplied, and the instructions for the investigations are aligned with science practices.
- The materials provide a “Preface,” giving the teacher a general overview of how the curriculum is organized. The “Preface” does not include detailed or clear guidance to facilitate student instruction.
- Teacher materials are embedded within the digital textbook. There is no section or resource link for teachers. There is no evidence of a teacher guide for instruction or differentiation in a diverse classroom.
- The materials do not clearly outline what teachers are specifically supposed to do, but it does give an introduction for both teachers and students.

Materials provide review and practice of knowledge and skills spiraled throughout the year to support mastery and retention.

- The materials provide an opportunity to review and practice knowledge and skills. Each chapter allows the teacher to assign review questions for the practice of knowledge.
- The materials provide an opportunity to review. Practice opportunities are spiraled throughout the year to support mastery and retention. Within each chapter, the teacher can assign and customize a set of critical thinking questions that can support mastery and retention of the knowledge and skills. There was no evidence to support the spiraling throughout the entire year. For example, in Unit 5: Biological Diversity in Chapter 21: Viruses, the teacher can assign any number of “Critical Thinking Questions” for evidence of mastery and retention of the material.
- The materials provide “Review Questions” in each chapter of the curriculum. For example, Chapter 8: Photosynthesis provides a multiple choice review activity to check for understanding of key concepts in the unit. The materials provide a “Critical Thinking” activity in the chapter for each core concept. For example, in Chapter 6: Metabolism, the teacher provides students with questions to check for mastery of key concepts in the chapter.
- Materials within each chapter include an “Introduction, Biology Content, Vocabulary Support, a Chapter Summary, Visual Connection Questions, Review Questions, and Critical Thinking Activities.” The evidence for review and practice is in the sequence of overarching topics
- represented by each unit. For example, the titles for units one through four are Chemistry of Life, The Cell, Genetics, Evolutionary Processes, and Biological Diversity.
- The materials provide review and practice of knowledge and skills spiraled throughout the year to support mastery and retention with the “Visual Connection Questions," “Review Questions,”

and the embedded questions within the “Link to Learning,” additional support videos, and digital interactives provided for students throughout the units.

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Indicator 8.2

Materials include classroom implementation support for teachers and administrators.

1	Materials provide teacher guidance and recommendations for use of all materials, including text, embedded technology, enrichment activities, research-based instructional strategies, and scaffolds to support and enhance student learning.	M
2	Materials include standards correlations, including cross-content standards, that explain the standards within the context of the course.	PM
3	Materials include a comprehensive list of all equipment and supplies needed to support instructional activities.	PM
4	Materials include guidance for safety practices, including the course-appropriate use of safety equipment during investigations.	M

Partial Meets| Score 1/2

The materials partially meet the criteria for this indicator. Materials include some classroom implementation support for teachers and administrators.

Materials provide teacher guidance and recommendations for use of all materials, including text, embedded technology, enrichment activities, research-based instructional strategies, and scaffolds to support and enhance student learning. Materials include some standards correlations, including cross-content standards, that explain the standards within the context of the course. Materials sometimes include a comprehensive list of all equipment and supplies needed to support instructional activities. Materials include guidance for safety practices, including the grade-appropriate use of safety equipment during investigations.

Evidence includes but is not limited to:

Materials provide teacher guidance and recommendations for use of all materials, including text, embedded technology, enrichment activities, research-based instructional strategies, and scaffolds to support and enhance student learning.

- The materials provide the teacher guidance and recommendation on the use of all materials, including text, embedded technology, enrichment activities, research-based instructional strategies, and scaffolds to support and enhance student learning. In the “Preface,” the materials show how to use “The Visual Connections” and “Link to Learning.”
- Within the “Preface,” there is an instructor section that provides support for the teachers. Teachers can also access instructor solution guides and lecture slides. Some of the components are available for both the teacher and student, such as the “Glossary.” The teacher is directed to go to the Openstax website to find the “Teacher Resource Tab.” The “Preface” of the materials also provides a “Coverage and Scope and Pacing Guide” for each unit of the curriculum. The guide suggests the number of days to spend on each unit. Additional support components mentioned in the “Preface” and located within the lessons are “Visual Connections, Link to Learning, Review Questions, and Critical Thinking Questions.” Lessons can be customized, assigned per class, or assigned individually.

- The “Teacher Resource” provides guidance and recommendations for materials use. For example, the “Biology 2e” lecture slides include selected graphics from the text, key concepts and definitions, examples, and discussion questions. The “Lesson Implementation” section recommends that the teacher present the units as a whole or break the unit into smaller sections assigning either the digital or print format of the textbook.
- Foundational guidance documents for processing scientific phenomena are available in “Unit 1: Chemistry of Life, Scientific Processes.” Examples of topics such as Scientific Communication, Planning and Conducting Investigations, Qualitative or Quantitative Data, etc., are found and may be used by both teachers and students.
- The materials provided for the teacher support emergent bilingual (EB) students, and vocabulary recommendations are explained to the teacher. The teacher guidance is in the LMS Preface and Unit 1, through the “Link to Learning” feature and the Visual Connection Questions. Teachers can refer back to Unit 1 or LMS Preface for reference on how to use these supports.

Materials include standards correlations, including cross-content standards, that explain the standards within the context of the course.

- In the OpenStax website, under the “Teacher Resource” tab, there is the TEKS Alignment that details how the textbook aligns with the 2018 TEKS. Also, there is the Next Generation Science Standards (NGSS) alignment, which allows the teacher to access an alignment between this book and the NGSS.
- The “Critical Thinking” section for each chapter of the materials reinforces the sequencing of skills such as reading, writing, and analyzing. For example, in Chapter 18: Evolution and the Origin of Species, in the “Critical Thinking” section, students are presented with a phenomenon. They must read the content and engage in several activities before writing a response to a critical thinking question.
- The “Visual Connection” sections for the chapters provide charts and graphs which teachers can utilize to engage students in drawing inferences and evaluating models. For example, in Chapter 19: Evolution of Populations, the “Visual Connections” section presents several charts to analyze and refer to when responding to critical thinking questions.
- Learning objectives are available at the beginning of each lesson but the TEKS are not noted. Correlations of the English Language Proficiency Standards (ELPS) are not noted within the lessons. Recommendations for strategies to support EB students are sometimes included within a lesson, such as the recommendations found in 8.1: Overview of Photosynthesis.
- Cross-content standards are not consistently noted even though some, such as Mathematics standards, are represented in Unit 1: Chemistry of Life, “Scientific Processes, Calculations for Data Analysis.” Depending on the topic and the chapter summary, the materials may include correlations, including cross-content standards, for example, those found in the unit on Chemistry.

Materials include a comprehensive list of all equipment and supplies needed to support instructional activities.

- The material provides a partial list of materials needed for the course; however, a comprehensive list of all equipment and supplies was not found. For example, teachers can find the list in Unit 2 under Scientific Equipment. It simply states, “Below is a table of some of the equipment you'll see during this course with a brief description for each.” As stated, the materials list provided is a partial list and does not comprehensively support the instructional

activities. Other materials are mentioned in some of the Scientific Method Connections Activities; however, no list of materials is presented for these activities. Teachers must read the Test Your Hypothesis section to derive the extra materials not listed in the Unit 1 list.
- Unit 1: Chemistry of Life in "Scientific Processes" includes a document that provides a comprehensive list of equipment, including explanations of the purpose and use of each item.
- Lists for equipment and supplies for investigations are not readily observable. Interactive lab simulations and hands-on lab investigations are not well represented within the platform. Instructional activities are clickable interactives that include questions, videos, and links to additional content. For example, in Chapter 46: Ecosystems, the unit on Biogeochemical Cycles has five "Links to Learning" within the content text.

Materials include guidance for safety practices, including the course-appropriate use of safety equipment during investigations.

- In Unit 1: Scientific Processes, the "Safety Protocol" section gives a general overview of science safety practices for laboratory, classroom, and field investigations. For example, materials state, "Science safety practices in laboratories or classrooms require engineering controls and personal protective equipment (e.g., wearing safety goggles, non-latex aprons and gloves, eyewash/shower station, fume hood, and fire extinguishers). Science investigations should always be directly supervised by qualified adults. Prior to each investigation, students should also be reminded specifically of the safety procedures that need to be followed."
- A "Safety Protocol" document is included in Unit 1: Chemistry of Life, Scientific Processes. The document is an NSTA link to a safety acknowledgment form and a link to TEA Texas Science Safety Standards. This lesson can be assigned to students individually or as a class.
- The materials provide a link to the Texas Education Agency's (TEA) Texas Science Safety Standards and give a list of the minimum lab safety guidelines for classroom and field investigations.
- Materials provide virtual labs, which do not require safety equipment, as they are not wet labs and are done via computer. Safety equipment is not required for virtual labs. Materials state, "It is important to adopt and follow appropriate safety practices within the context of hands-on investigations and demonstration, whether this is in a traditional science laboratory or in the field."

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Indicator 8.3

Materials provide implementation guidance to meet variability in program design and scheduling.

1	Materials support scheduling considerations and include guidance and recommendations on required time for lessons and activities.	PM
2	Materials guide strategic implementation without disrupting the sequence of content that must be taught in a specific order following a developmental progression.	PM
3	Materials designated for the course are flexible and can be completed in one school year.	M

Partially Meets | Score 1/2

The materials partially meet the criteria for this indicator. Materials provide some guidance to meet variability in program design and scheduling.

Materials somewhat support scheduling considerations and include guidance and recommendations on required time for lessons and activities. Materials somewhat guide strategic implementation without disrupting the sequence of content that must be taught in a specific order following a developmental progression. Materials designated for the course are flexible and can be completed in one school year.

Evidence includes but is not limited to:

Materials support scheduling considerations and include guidance and recommendations on required time for lessons and activities.

- The “Preface” of the materials provides a “Coverage” and “Scope and Pacing Guide” for each unit of the curriculum, suggesting the number of days to spend on each unit of the curriculum throughout the year. For example, Unit 1: The Chemistry of Life suggests five days to cover the topic.
- The “Preface” and “Scope and Pacing Guide” recommend a set number of days to spend on instruction for each unit. There is no direct evidence of guidance or recommendations for lessons or activities. The platform provides opportunities for scheduling considerations through customization of the content. For example, the “Customization” section within the “Preface” describes the digital textbook as openly licensed, which allows an instructor to use the whole course or only selected sections as needed.
- The materials support scheduling considerations and include guidance and recommendations on required time for lessons and activities. Units are explained and there are a suggested number of days to spend on each unit topic. This suggestion allows teachers to spend more or less time on subunits based on their students needs.
- The information is “general and not guided specifically.”

Materials guide strategic implementation without disrupting the sequence of content that must be taught in a specific order following a developmental progression.

- The units and chapters follow a sequence of topics and concepts which reinforce knowledge and skills. This sequence allows students to make an easy connection to the Science and Engineering

Practices (SEPs). For example, Unit 2: The Cell introduces the phenomena, presents features of cells, and gives the function of cells, all before moving on to the next unit on Genetics.
- The materials include chapter subsections for each unit that provide a developmental progression of content and skills through activities that introduce key terms and content, culminating in critical thinking exercises.
- The layout of Units 1 through 7 within the course "Scope and Sequence" in the "Preface" follows the sequence of Biology TEKS Science Concepts. No additional evidence is available.
- The material has units in sequential order. However, it does not justify or state the reasoning as to how or why certain topics are taught before or after others.

Materials designated for the course are flexible and can be completed in one school year.

- The materials for each unit and chapter provide various sections and activities which the teacher can implement to support learning during the school year. For example, B.5A Biomolecules lists four "Vocabulary and Literacy" activities, allowing teachers the flexibility to select from them for time management or reinforcement purposes.
- The materials provide a pacing guide in the "Preface" with the suggested number of days to teach each unit topic utilizing the "Participation Lesson" and other various activities during the school year.
- Materials are flexible and customizable to the extent that chapter text can be personalized and/or printed. Instructors can choose whether or not to assign the text and activities for individual or classroom instruction. For example, in 8.1: Overview of Photosynthesis, there are buttons or icons for "Assignment Settings," "Personalization," and "Printing and Previewing." Chapter texts also include a feature to either hide or display paragraphs within the page.
- Every chapter includes additional instructional materials following the link to chapter sections. Teachers can customize any of these materials to manage instructional time. For example, in Chapter 6: Metabolism, the "Review Questions" section includes multiple-choice questions with an arrow to the right that either hides or displays the question. The "Critical Thinking and Visual Connection Questions" have the same feature.
- The materials designed for the course are flexible and can be completed in one school year. The total number of days provided for the curriculum is 173 days, but there are typically between 186–196 days of school.

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Indicator 9.1

The visual design of materials is clear and easy to understand.

1	Materials include an appropriate amount of white space and a design that supports and does not distract from student learning.	Yes
2	Materials embed age-appropriate pictures and graphics that support student learning and engagement without being visually distracting.	Yes
3	Materials include digital components that are free of technical errors.	Yes

Not Scored

The visual design of materials is clear and easy to understand.

Materials include an appropriate amount of white space and a design that supports and does not distract from student learning. Materials embed age-appropriate pictures and graphics that support student learning and engagement without being visually distracting. Materials include digital components that are free of technical errors.

Evidence includes but is not limited to:

Materials include an appropriate amount of white space and a design that supports and does not distract from student learning.

- The materials include an appropriate amount of white space and a design that supports and does not distract from student learning with the careful and easy-to-read bolded headings and subheadings. Student materials are appropriately designed to support student learning. Student materials include the following: A clear main subject, topic, or purpose. Titles and headings are prominent and clear; sections are clearly marked with subheadings. The subheadings have a clear, relevant hierarchy. The Biology content is organized in a logical progression from micro- to macro-. Topics begin with cells and organelles and end with evolution and ecology.
- In the materials, adequate white space around and between lines of text or blocks of text makes content easy to read and comprehend. Margins, edges, and empty spaces around the content are consistent throughout the materials. For example, in Unit 1, The Chemistry of Life, Subchapter 2.2, Water, white space containing no content is at least a half inch around the side and top margins of the material. The sections containing content text for the subchapters have ample amount of space to indicate a break in the topics.
- In the materials, the few colors used are strategically and consistently placed to help the reader navigate through the content. For example, in Unit 8, Ecology, Chapter 47, Conservation Biology and Biodiversity, a light blue color is used to track navigation through the table of contents. A lime green color indicates the chapter selected and subchapter topics. Royal blue indicates the teacher tab to assign course material. The same color scheme is used consistently throughout the materials.
- There is evidence of appropriate white space and design that supports student learning. For example, in the Introduction of Chapter 18, Evolution and Origin of the Species, the student's digital view displays white space in all margins and between paragraphs. There are also three

line markers denoting graphics, paragraphs, and footnotes. There is a slight difference between the digital and print views. However, the print view also provides white space and a user-friendly layout. Materials provide a design layout to better support student learning. For example, the digital version of "Review Questions" in Chapter 18, Evolution and Origin of the Species, provides white space in the margins and between each of the questions. There is also a line in between each question and answer set to further define the spaces. Questions are denoted by white numbers in a blue field, and the answer choices are black letters in a pale gray field. As a student scrolls over a question, a box appears around the question and answer set. The print version of the review questions also provides white space and a design layout that does not distract students.

Materials embed age-appropriate pictures and graphics that support student learning and engagement without being visually distracting.

- The materials embed age-appropriate pictures and graphics that support student learning and engagement without being visually distracting. For example, in Unit 4, Evolutionary Processes, Chapter 18, under 18.3, Reconnection and Speciation Rates, they have a couple of "Visual Connections" that support the content being discussed and are engaging. One is on Varying Rates of Speciation, and the other is on Reconnection. The "Visual Connection" activity displays a diagram of the changes in The Hybrid Zones Over Time. The digital component includes a question that states, "If two species eat a different diet, but one of the food sources is eliminated and both species are forced to eat the same foods, what change in the hybrid zone is most likely to occur?" Materials are free of spelling, grammar, and punctuation errors.
- The materials strategically use pictures and graphics to enhance student learning and engagement without being visually distracting. Age-appropriate pictures and graphics are selected to support the content and engage students without overwhelming them. The images and graphics serve a clear purpose to support and enhance student sense-making of grade-level appropriate content. For example, in Unit 6, Plant Structure and Function, Chapter 31, Soil and Plant Nutrition, the "Introduction" shows photographs of a squash seedling and a full-grown squash. They are presented to engage students in the phenomenon, drawing from their prior knowledge to pique their curiosity and participate in discussion without distracting them.
- The materials strategically use pictures and graphics to enhance student learning and engagement without being visually distracting. The images and graphics serve a clear purpose to support and enhance student sense-making of grade-level appropriate content. The materials include age-appropriate pictures and graphics that support student learning and engagement. For example, in Unit 3, Genetics, "Visual Connection Questions" give images in the figures for students to study of a eukaryote, DNA replication, and mutation, which are each accompanied by descriptive text and have enough color contrast to distinguish the focus of the image from the background without being visually distracting.
- Pictures within the materials are age-appropriate, visually engaging, and supportive of student learning. In Chapter 46.1, Ecology of Ecosystems, there are two sets of paired photographs providing a visual comparison of different types of ecosystems as referenced in the text and captions. In addition, there is a graphic that exemplifies a food chain in Lake Ontario, which is also referenced in the text. A right-click on the image opens a new tab to view a larger version of the graphic. In Chapter 18.1, Understanding Evolution, a caption and graphic image of Darwin's finches is embedded within textual information regarding Darwin's trip to the Galapagos Islands and the observations he made there. Information about similar travels and observations made by Wallace is also represented in the text. Images of both men are included within the passage

that describes their simultaneous presentation of papers to the science community and the subsequent publishing of “On the Origin of the Species" by Darwin.

- The materials embed age-appropriate pictures and graphics that support student learning and engagement without being visually distracting with the proper labels for subheadings and materials that are readily accessible. For example, it is visually clear where to find key terms for vocabulary words and the subunits of chapters. The materials include age-appropriate pictures and graphics that support student learning and engagement with proper coloring, labels, and organization of accurate images and key terms.

Materials include digital components that are free of technical errors.

- The materials include digital components that are free of technical errors. For example, in Unit 2, The Cell, Chapter 8.1, Introduction to Photosynthesis, the materials include a section on the Two Parts of Photosynthesis which is free of spelling, grammar, and punctuation errors.
- The materials include digital components that are free of technical errors. For example, in the “Everyday Connection” found in Unit 7, Animal Structure and Function, Chapter 43.6, Fertilization and Early Embryonic Development, “Are Designer Babies in Our Future,” students observe a logo and read information about eugenics and information and technology to improve the genetic makeup of the human race. Students recall previous knowledge about genetics and human reproduction to discuss and debate where this process could lead. Grammar is used correctly in this activity.
- In the materials, the “Scientific Method Connection” found in various chapters includes digital components that are free of technical errors. For example, in Chapter 19.2, The Evolution of Populations, the investigation Testing the Bottleneck Effect, students perform an investigation in groups to answer “How do natural disasters affect a population's genetic structure?” The students test the hypothesis using beads to represent populations. The students observe results and record data to form a conclusion. The students then consider questions like “What happens when a hurricane hits the Mississippi Gulf Coast?, What are the advantages and disadvantages of using this model to investigate?, and Think about another way you can conduct the investigation.” The instructions and content of the activity are free of spelling and punctuation errors.
- There is evidence of functional digital components within the platform. For instance, Chapter 22.4, Bacterial Diseases in Humans, includes text-based information about the bubonic plague and provides a “Link to Learning” as a learning extension for students. The five-minute video, titled “Secrets of the Black Death,” describes historical information about the bubonic plague in Europe and reports fairly recent research into the genome of the bacteria. The video is created by Nature Video. Chapter 46.3, Ecology of Ecosystems, includes a “Link to Learning” opportunity for students to explore and compare biomes in an Earth Observatory interactive provided by NASA. Each biome has a clickable tab linking to different pages of information. Information about each biome is represented in photographs, descriptions, maps, temperature and precipitation data, as well as geographical and seasonal information. Additional links to articles and resources are located in the borders of the webpage.
- The materials include digital components that are free of technical errors. Materials are free of spelling, grammar, and punctuation errors. Capitalization, periods, and commas are where they should be. Materials are free of inaccurate content materials or misinformation. Materials are free of wrong answer sheets to problems. The “Links to Learning” are links to reliable and accurate Biology content and curriculum, are age appropriate, and do not possess misinformation, misconceptions, or inappropriate language. There are various digital

components at the end of the “Curriculum Content.” There is a “STEM Career Research project” with information on Geologic Time, and Measurements and the Metric System. All are in working order. There is also The Periodic Table of Elements tab. However, information about the periodic table is not available after clicking the tab link.

Kiddom OpenStax Biology

Indicator 9.2

Materials are intentionally designed to engage and support student learning with the integration of digital technology.

1	Materials integrate digital technology and tools that support student learning and engagement.	Yes
2	Materials integrate digital technology in ways that support student engagement with the science and engineering practices and course-specific content.	Yes
3	Materials integrate digital technology that provides opportunities for teachers and/or students to collaborate.	Yes
4	Materials integrate digital technology that is compatible with a variety of learning management systems.	Yes

Not Scored

The materials are intentionally designed to engage and support student learning with the integration of digital technology.

Materials integrate digital technology and tools that support student learning and engagement. Materials integrate digital technology in ways that support student engagement with the science and engineering practices and course-specific content. Materials integrate digital technology that provides opportunities for teachers and/or students to collaborate. Materials integrate digital technology that is compatible with a variety of learning management systems.

Evidence includes but is not limited to:

Materials integrate digital technology and tools that support student learning and engagement.

- The materials integrate digital technology and tools that support student learning and engagement. The material provides interactive tools that allow students to manipulate variables and provides them with additional video resources with the “Links to Learning.” In the materials, the “Link to Learning” feature found throughout the curriculum integrates digital technology and tools that support student learning and engagement. The “Link to Learning” features can be used as a formative assessment as they present the students with content in a simulation or game platform. For example, Unit 3, Genetics, Chapter 11.1, The Process of Meiosis “Link to Learning” in Meiosis I, Cells Alive!, provides an interactive video simulation of the process of meiosis and allows students to observe how chromosomes align and migrate. The video enhances student learning through digital interactives and simulations.
- Materials provide teacher guidance for using simulations, interactives, and related activities to support student learning. In the materials, the “Link to Learning” feature found throughout the curriculum integrates digital technology and tools that support student learning and engagement. The “Link to Learning” videos include embedded technology within materials, which supports the print and does not replace it. For example, in Unit 5, Biological Diversity, Chapter 24.1, Characteristics of Fungi, the “Link to Learning” in “Reproduction, What are Fungi?” connects students to an informational video about the characteristics of Fungi. It includes a detailed video description of types and characteristics of fungi that can be used for formative

and informal assessment to support student learning. The link is at the bottom of the chapter text and can also be used as a review for students.

- In Unit 3, Genetics, Chapter 11.1, The Process of Meiosis, the “Link to Learning” connects students to an animation of the different stages of meiosis. Students can play, pause, replay, and fast-forward the animation in order to better understand the differences between the stages. A chime sound provides notice of phase changes. Additional information about each phase is accessed by clicking the icon next to each phase name.
- Materials provide guidance for integrating digital technology and tools in whole group, small group, and individual settings. Digital technology and tools can be projected on a large screen or individual student device and utilized with touchscreen technology or a keyboard and mouse. For example, the materials and assignments can be personalized and assigned to individual students or small groups.

Materials integrate digital technology in ways that support student engagement with the science and engineering practices and course-specific content.

- In the materials, the “Link to Learning” feature throughout the curriculum integrates digital technology in ways that support student engagement with the science and engineering practices and course-specific content. The “Link to Learning” feature provides opportunities for students to obtain, evaluate, and communicate information using digital tools. For example, in Unit 4, Evolutionary Processes, Chapter 19.1, Population Evolution, “Link to Learning,” the students use an online Hardy-Weinberg equilibrium calculator for allele and genotype frequencies to determine a population's genetic structure. Another example is found in Unit 2, The Cell, Chapter 8.2, The Light-Dependent Reactions of Photosynthesis in the “Link to Learning,” which asks students to view an animation of a graphical model representing photosynthesis within a leaf to develop an understanding of the cellular process.
- Unit 4, Evolutionary Processes, Chapter 19.1, Population Evolution, includes a section explaining the Hardy-Weinberg Principle. The textual explanations and images help students learn the concept of allele frequencies within populations and understand that the principle is a model of population equilibrium. This prepares a student to use the online Hardy-Weinberg Equilibrium Calculator in the “Link to Learning” feature. The calculator allows students to set the number of alleles and their frequencies in order to predict genotypic outcomes.
- The “Link to Learning” feature in Unit 2, The Cell, Chapter 8.1, Overview of Photosynthesis, connects to additional information about photosynthesis provided by Khan Academy. The concepts are aligned with the content in the chapter but are presented in a different way that provides an option for learning. For example, the text in Chapter 8.1 displays a modified photograph of a tree with labels and arrows representing the photosynthesis process. Khan Academy uses a graphic image to depict the same information. Both platforms include the chemical equation for photosynthesis.
- The materials integrate digital technology in ways that support student engagement with the science and engineering practices and course-specific content with short videos like the three-dimensional video clip explaining the double helix in Unit 1.2, Themes and Concepts of Biology, and the video clip explaining plant phototropism.
- The materials for “STEM Connections” in the last unit also support student engagement and explain careers in STEM. The materials ask students to reflect on what they know about STEM careers and provide assignments for students to complete research on future careers in STEM.

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Materials integrate digital technology that provides opportunities for teachers and/or students to collaborate.

- The “Classes” component of the materials integrate digital technology that provides opportunities for teachers and/or students to collaborate. A virtual “Whiteboard” icon option students and teachers can use to encourage creativity and collaboration through such means as brainstorming projects and experiments, real-time note-taking, and sharing videos and images are provided to engage and support student learning. A “Chat with Class” option allows students and teachers to communicate in real time either in groups or one-to-one to encourage creativity and collaboration. This chat option allows students and teachers to collaborate through text and emojis, share videos, images, and audio files, and attach additional files to engage and support student learning.
- The materials integrate digital technology that provides opportunities for teachers and/or students to collaborate. All of the assignment materials provided can be tailored by the instructor to be either done individually or in groups. This is done through the “Assignment Settings” button on all assignments. For example, the “Assignment Setting” allows the instructor to turn the “Review Questions” for Chapter 23 in Unit 5 into a group assignment.
- In the “Classroom” feature, a teacher can chat with the classroom or just one person. A teacher can use individual chats to collaborate through personal support and guidance. Also, there is a “digital whiteboard, a hand-raise tool, and Lesson Launch” available to work with the class digitally. “Lesson Launch” is used in synchronous face-to-face learning opportunities.
- Materials integrate tools that support teacher collaboration. A clickable link to “Planner” is present on the “Classroom/Classes” screen. “Planner” includes a function for sharing curricula with other teachers. There is also access to guidance within the platform for teachers to learn how to use the tools that support collaboration.
- The materials integrate technology that provides opportunities for teachers and students to collaborate under the classes section of the LMS. The classes have the capability of communicating with the whole class group and also have the capability of individual student communication. Materials provide an online collaborative platform in which teachers and students can share educational materials, create collaborative spaces, post assignments, collaborate on projects, and give immediate feedback to students.

Materials integrate digital technology that is compatible with a variety of learning management systems.

- The material’s digital technology is compatible with a variety of learning management systems and technology devices. When assigning lessons, the teacher can assign using either the platform, a URL link, or an LMS platform like Google Classroom.
- The platform’s digital technology is compatible with a variety of learning management systems and technology devices. The materials are accessible and compatible with multiple operating systems and devices. The materials are accessible online through any device with internet access.
- In Unit 7, Animal Structure and Function, Chapter 33.2, Animal Primary Tissues, the “Link to Learning” connects to an interactive video provided by the Wisconsin Online website. The video is a review about nervous and epithelial tissues. The platform is compatible with the Wisconsin platform due to Creative Commons licensing.
- The “Link to Learning” feature in Unit 8, Ecology, Chapter 45.2, Life Histories and Natural Selection, provides an opportunity for students to engage in a simulation titled “The Mating Game.” The point of the game is for students to better understand the selection pressure of

mating and the effects on the gene pool of the population. The platform is compatible with the PBS educational platform.

- The materials integrate digital technology that is compatible with a variety of learning management systems. On the OpenStax Website, under “Instructor Resources,” the materials provide resources for taking the course online. They have three different packages that instructors can use for three different platforms. The materials integrate digital technology that is compatible with a variety of learning management systems, such as Chromebooks, iPads, PCs, Apple computers, and/or smartphones. The materials are accessible online through any device with internet access. OpenStax requires an educator or student login with uploaded documents to prove credentials.

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Indicator 9.3

Digital technology and online components are developmentally and course-appropriate and provide support for learning.

1	Digital technology and online components are developmentally appropriate for the course and align with the scope and approach to science knowledge and skills progression.	Yes
2	Materials provide teacher guidance for the use of embedded technology to support and enhance student learning.	Yes
3	Materials are available to parents and caregivers to support student engagement with digital technology and online components.	Yes

Not Scored

Digital technology and online components are developmentally and course-appropriate and provide support for learning.

Digital technology and online components are developmentally appropriate for the course and align with the scope and approach to science knowledge and skills progression. Materials provide teacher guidance for the use of embedded technology to support and enhance student learning. Materials are available to parents and caregivers to support student engagement with digital technology and online components.

Evidence includes but is not limited to:

Digital technology and online components are developmentally appropriate for the course and align with the scope and approach to science knowledge and skills progression.

- In the materials, “Link to Learning” features found throughout the chapters provide digital technology and online components that are developmentally appropriate for the course and align with the scope and approach to science knowledge and skills progression. The “Link to Learning” features include live hyperlinks to other online resources to engage and support student learning. For example, in Unit 8, Ecology, Chapter 45.5, Human Population Growth, the “Link to Learning" directs students to an animation by the American Museum of Natural History of how populations have changed through time.
- The materials provide information that identifies how online and digital components align with science knowledge and skills. Within the “Classes” page of the platform, the materials provide related TEKS for online and digital components. For instance, Biology TEKS can be added via settings and then can be integrated into the digital planning and assigning of lessons.
- There is evidence that online components are developmentally appropriate and aligned. For instance, Unit 2, The Cell, Chapter 9.4, Signaling in Single-Celled Organisms, includes a “Link to Learning” to a Ted Talk about signaling in bacteria. The speaker is the geneticist who discovered quorum sensing in biofilm bacteria in squid. The second “Link to Learning” consists of interview clips of researchers explaining bacterial biofilms and an animated sequence explaining how biofilms are created. The two links are evidence of alignment with the approach to progressions in science knowledge and skills. Another example is found in the “Link to Learning” activity in Unit 1, The Chemistry of Life, Chapter 2.1, Atoms, Isotopes, Ions, and Molecules, The Building

Blocks, which reinforces the chapter's textual information. The embedded PhET simulation is an opportunity for students to further explore and "play" with the variables within the activity in order to observe characteristics of the chemical building blocks of life.

- The digital technology and online components are developmentally appropriate for the course and align with the scope and approach to science knowledge and skills progression from molecular concepts like Unit 1, The Chemistry of Life, and Unit 2, The Cell Structures and Functions, to the final unit, Ecology. This progression displays a micro-to-macro perspective of Biology.
- The materials include a digital planning guide with live hyperlinks to OpenStax and other online resources to facilitate planning and ease of use. Materials provide tips for selecting grade-appropriate resources, guidance on how to effectively integrate the components into lessons, and suggestions for evaluation of student learning via digital components.

Materials provide teacher guidance for the use of embedded technology to support and enhance student learning.

- The materials provide support for teachers to successfully integrate the technology within the program. For example, the "Preface" indicates that the "Link to Learning" should be used to direct students to online interactive exercises and animations to add a fuller context and examples to core content. The chapter provides guidance to the teacher about when in the lesson to use the feature and how. For example, in Unit 4, Evolutionary Processes, Chapter 20.2, Determining Evolutionary Relationships, the materials suggest the "Link to Learning" hyperlink to website interactivity exploring evolutionary relationships among species be used following the lesson content of Limitations of Phylogenetic Trees. The "Link to Learning" can also be assigned using the "Lesson Launch" queue in the "Classes" page planner.
- In the materials, the "Preface" provides specific teacher guidance for digital and online assessment tools. For example, the "Preface" indicates that the online "Review Questions" should be used to help prepare students to demonstrate their knowledge by responding to the multiple-choice format questions of standardized tests. This format allows students and teachers to closely monitor student progress following sections and/or chapters.
- There is an "Assign" feature in each chapter that allows for asynchronous and synchronous instruction. For example, in Chapter 20.2, Determining Evolutionary Relationships in Unit 4, Evolutionary Processes displays icons in the right-hand corner of the screen. A teacher clicks on the icon to either make an assignment within the class assignment page or select the "Lesson Launch" queue for in-class teaching or synchronous student engagement. There is a "Learn more" link to provide guidance for teachers.
- There is guidance in Unit 3, Genetics, Chapter 16.2, Prokaryotic Gene Regulation, to support the instructional use of videos in "Link to Learning." The videos provide additional descriptions and explanations about concepts of gene regulation in prokaryotes, making the content easier to understand. Additional guidance informs the teacher to pause the video at strategic points to allow discussion, questioning, and clarification for students.
- The materials provide teacher guidance for the use of embedded technology to support and enhance student learning with the additional materials of OpenStax. The "Preface" under the "Teacher's Guide" includes a section on "Lesson Implementation and Practice, Assessment, and Progress Monitoring" that provides the teacher with the support needed to enhance student learning. There is also a "Pedagogical" section that explains how each section of the units can enhance student learning with "STEM Connections, Career Connections, Scientific Methods, and Evolution Connections."

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Materials are available to parents and caregivers to support student engagement with digital technology and online components.

- The materials are available to parents and caregivers to support student engagement with digital technology and online components. The learning platform can be accessed regardless of physical location. In the “Preface,” the “Family Materials” section suggests family materials can be assigned through the “Chapter Summary” section. There are options to assign the summary digitally to the student or provide a printed document in order to share the information with the caregiver. Students can utilize the chapter summaries as discussion starters as they share their knowledge of Biology with their families and caregivers. This design allows students to access materials at home and provides parents and caregivers the opportunity to access the content to support student engagement.
- The materials are available to parents and caregivers to support student engagement with digital technology and online components. From the “Classes” page, “Reports” based on summative and formative assessments can be downloaded by individual students to share progress with the parents following sections and/or chapters.
- The materials are available to parents and caregivers to support student engagement with digital technology and online components within the “Preface” for family engagement with the learning of the student. There is more parent involvement support in OpenStax.
- There are materials available to parents and caregivers to support student engagement with digital technology and online components. On the material's website, you will find the “Student Resource” tab where parents and caregivers can find the “Student Getting Started, Reading and Note Taking Guide, and Student Solutions Manual,” which will all help them support student engagement.