Kingdom Chart Research Questions

ELC-4080

Common Core Standards

English Language Arts (Common Core State Standards) – Grades 4–6

- **RI.4.3** – Explain scientific concepts or procedures in a text, including what happened and why, based on specific information in the text. (Students read about how classification systems changed over time and explain these ideas.)
- **RI.4.4** – Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a Grade 4 topic. (Researching taxonomy introduces new terms like *domain, species, prokaryote*, etc., which students must understand in context.)
- **RI.4.7** – Interpret information presented visually, orally, or quantitatively (e.g. in charts, diagrams, time lines) and explain how it contributes to understanding the text. (Students interpret classification charts and diagrams of the domains and kingdoms and relate them to textual information.)
- **RI.4.9** – Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (Students gather facts from multiple sources about each kingdom and synthesize them in their responses.)
- **RI.5.3** – Explain the relationships or interactions between two or more ideas or concepts in a scientific or technical text, based on specific information. (For example, students explain how the concepts of *domain* and *kingdom* relate in the hierarchy of classification.)
- **RI.5.4** – Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a Grade 5 topic or subject area. (Students decode vocabulary like *unicellular, heterotroph,* etc., when reading about organism classifications.)
- **RI.5.7** – Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (Students use reference books and websites to quickly find answers to research questions about different kingdoms.)
- **RI.5.9** – Integrate information from *several* texts on the same topic to write or speak about the subject knowledgeably. (Students combine information from textbooks, articles, and charts about living things to discuss or write about the six kingdoms.)
- **RI.6.4** – Determine the meaning of words and phrases as used in a text, including technical meanings. (Students encounter technical scientific terminology and use context or reference materials to understand terms like *peptidoglycan* or *autotrophic*.)
- **RI.6.7** – Integrate information presented in different media or formats (e.g. visually, quantitatively) as well as in words to develop a coherent understanding of a topic or

issue. (Students combine information from written descriptions, classification tables, and images to form a complete understanding of the domains and kingdoms.)

- **W.4.7** – Conduct short research projects that build knowledge through investigation of different aspects of a topic. (Students independently investigate various questions about biological classification, each addressing a different aspect such as characteristics of a specific kingdom.)
- **W.4.8** – Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (Students gather facts about each kingdom from books or credible websites, take organized notes in categories, and cite their sources in their project.)
- **W.4.9** – Draw evidence from informational texts to support analysis, reflection, and research. (Students use evidence from science texts – e.g. quoting a definition or data about a kingdom – to support their answers to the research questions.)
- **W.5.7** – Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (Students in Grade 5 use multiple sources – textbooks, encyclopedias, and online articles – to research each of the six kingdoms in depth.)
- **W.5.8** – Recall relevant information from experiences or gather relevant information from print and digital sources; **summarize or paraphrase** information in notes and finished work and provide a list of sources. (Students compile notes from various sources about each kingdom, paraphrase the information in their own words, and list the sources they used.)
- **W.5.9** – Draw evidence from literary or informational texts to support analysis, reflection, and conclusion. (When writing up their findings, Grade 5 students cite specific facts or examples from reference texts – for instance, noting evidence of how fungi obtain nutrients – to support their conclusions.)
- **W.6.7** – Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate. (Sixth-grade students delve into a guiding question like “How are living things classified?” and if needed, refine their research strategy or sub-questions as they discover new information.)
- **W.6.8** – Gather relevant information from multiple print and digital sources; **assess the credibility of each source**; and quote or paraphrase the data and conclusions of others while avoiding plagiarism. (Students locate information on each kingdom from textbooks, reputable websites, or library databases, evaluate which sources are reliable, and carefully paraphrase the facts – e.g. how protists differ from bacteria – without copying text directly.)
- **W.6.9** – Draw evidence from literary or informational texts to support analysis, reflection, and conclusion. (In their written explanations, students use evidence from science texts – such as an excerpt explaining cell structure – to back up their answers to the research questions.)
- **SL.4.4** – Report on a topic or text, telling relevant facts in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas; speak clearly at an understandable pace. (Students might present one of their research questions — for example, summarizing the characteristics of the Plant Kingdom — using relevant facts and details and speaking clearly.)

- **SL.5.4** – Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and details to support main ideas or themes; speak clearly at an understandable pace. (Grade 5 students present their research findings on domains and kingdoms in a logical sequence – for instance, first overviewing the three domains, then detailing each kingdom with supporting facts.)
- **SL.6.4** – Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas; use appropriate eye contact, adequate volume, and clear pronunciation. (Students in Grade 6 share their research outcomes — for example, arguing which kingdom has the greatest biodiversity — with logical organization and clear delivery.)
- **L.4.4** – Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on Grade 4 reading and content, choosing flexibly from a range of strategies (e.g. context clues, prefixes/suffixes, glossaries). (While reading science materials, students use context and word-analysis to figure out technical terms like **"invertebrate"** or **"unicellular."**)
- **L.4.6** – Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases, including those that are basic to a particular topic. (Through this project, students learn and correctly use scientific terms such as **kingdom, species,** or **fungi** in their discussions and writing.)
- **L.5.4** – Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on Grade 5 reading and content, using context and appropriate reference materials. (Encountering more complex terms like **"microorganism"** or **"prokaryotic,"** fifth graders use context clues or dictionaries to understand these words.)
- **L.5.6** – Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases, including those that signal contrast or logical relationships (e.g. *however, similarly*). (Students expand their science vocabulary and use academic words to compare kingdoms – *"Plants are **autotrophic**, whereas Fungi are **heterotrophic**."*)
- **L.6.4** – Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on Grade 6 reading and content, *choosing flexibly from a range of strategies* (using context, analyzing meaningful word parts, or consulting reference materials). (For example, a student encountering the word **"thermophilic"** can break it down into Greek roots to understand it means "heat-loving.")
- **L.6.6** – Acquire and use accurately grade-appropriate general academic and domain-specific words; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression. (By the end of the project, sixth graders confidently use terminology like **"taxonomy," "cell nucleus,"** or **"extremophile,"** having researched their meanings and relevance.)

Mathematics (Common Core State Standards) – Grades 4–6

- **4.NBT.2** – Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form; and compare two multi-digit numbers based on the values of their digits (Students may encounter large numbers in their research, such as the estimated number of species in each kingdom. For instance, comparing **1,000,000** species

in Animalia vs **100,000** in Fungi requires understanding place value to see which is greater.)
- **5.G.4** – Classify two-dimensional figures in a hierarchy based on their properties. (As an analogy to classifying organisms, students apply logical classification skills in math by hierarchically grouping shapes. This reinforces the idea of sorting items by attributes – similar to how living things are categorized by shared characteristics.)
- **6.SP.4** – Display numerical data in plots on a number line, including dot plots, histograms, and box plots. (Students might collect and graph simple data related to their research – for example, creating a bar graph of the number of known species in each kingdom. This involves plotting data and interpreting that visual information, integrating math with science content.)

(Note: The research project is primarily science-focused, so mathematical connections are an interdisciplinary enrichment – e.g. reading large numbers or recognizing classification as a form of logical grouping.)

Science (Next Generation Science Standards) – Grades 4–6

- **4-LS1-1** – Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. (In researching different life forms, students identify how various organisms' structures – such as cell walls in plants or exoskeletons in certain animals – help them survive. This addresses structure-function relationships in living things.)
- **5-LS2-1** – Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. (While studying the kingdoms, students learn roles in ecosystems – e.g. plants as producers, or fungi and bacteria as decomposers. They can model how nutrients cycle, aligning with the concept that **matter cycles** between the living (plants, animals, fungi, bacteria) and nonliving environment.)
- **Science and Engineering Practice – Obtaining, Evaluating, and Communicating Information** (SEP 8): Students **obtain** information from books and credible websites, **evaluate** the accuracy and relevance of that information, and **communicate** their findings through written or oral reports. This practice is central to the research project, as students essentially act like scientists gathering and sharing information about living organisms.
- **Crosscutting Concept – Patterns**: Students recognize and use **patterns** in nature to classify organisms. For example, the presence or absence of a nucleus, modes of nutrition, or number of cells are patterns that help group living things into domains and kingdoms. This mirrors the cross-disciplinary concept that identifying patterns is key to understanding and organizing scientific knowledge.

Preparing Students for Middle School – Standards (Grades 7–8)

By engaging in these research questions in Grades 4–6, students are also building skills and knowledge that set them up to meet several Grade 7–8 standards:

English Language Arts (Grades 7–8)

- **W.7.7** – Conduct short research projects to answer a question, drawing on several sources **and generating additional related questions** for further research. (The elementary research activity trains students to delve into a topic deeply, which in Grade 7 expands to formulating new questions for inquiry – for instance, after researching kingdoms, a student might ask, "How do classification systems change with new discoveries?")
- **W.7.8** – Gather relevant information from multiple print and digital sources; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism. (By Grade 7, students are expected to critically evaluate sources. The foundational work in Grade 6 – where students practiced citing reliable science resources on kingdoms – directly prepares them for this standard.)
- **W.8.8** – (Similar to W.7.8) Gather and evaluate information from a variety of sources and *ensure the avoidance of plagiarism* by properly quoting and paraphrasing. (Middle school students build on their Grade 5–6 research habits, learning to formally cite sources. The elementary project's emphasis on notetaking and using one's own words addresses this skill early.)
- **W.7.9 / W.8.9** – Draw evidence from informational texts to support analysis, reflection, and research. (In middle school, students will be required to support their scientific explanations or arguments – for example, an analysis of an ecosystem or an argument about conservation – with evidence. The classification research questions give them early practice in citing facts from readings to back up their statements.)
- **SL.7.4** – Present claims and findings in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, volume, and pronunciation. (If students present their classification research now, they are honing presentation skills that will be crucial in Grade 7 when they might, for instance, present on a science fair project or explain a lab conclusion.)
- **SL.8.5** – Integrate multimedia and visual displays into presentations to clarify information, strengthen claims, and add interest. (Creating charts or slides about the domains and kingdoms in elementary school lays groundwork for the expectation in Grade 8 that students will use multimedia effectively – such as including diagrams of food webs or classification trees in a presentation.)
- **RST.6-8.4** – *(Reading in Science and Technical Subjects, Grades 6–8)* Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a scientific text. (The exposure to scientific vocabulary in the classification unit gives students a head start on the 6–8 literacy standards for science. By middle school, they will be better equipped to tackle texts about cells or heredity that use technical terms, thanks to their early practice with domain-specific vocabulary.)
- **RST.6-8.7** – Integrate quantitative or technical information expressed in words in a text with information expressed visually (e.g. in a flowchart, diagram, model, graph). (In middle school science, students might read about the classification of organisms and examine a cladogram or classification chart. The work they did in Grades 4–6 – reading descriptions of kingdoms and examining classification charts – directly prepares them for this standard, which requires combining text and visuals to deepen understanding.)

Science (Grades 7–8, NGSS)

- **MS-LS1-1** – *(Middle School Life Science)* Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. (Through the elementary research, students learned that some organisms are single-celled (bacteria, protists) and others are multi-celled (plants, animals). This provides a knowledge foundation for the Grade 7 science standard where students might use microscopes or models to investigate cells in organisms.)
- **MS-LS4-2** – Apply scientific ideas to construct an explanation for the **anatomical similarities and differences** among modern organisms to infer evolutionary relationships. (While the Grades 4–6 research focused on classification, it sets the stage for understanding in Grade 7–8 that similarities in traits indicate how organisms can be grouped and related. For example, students who learned the characteristics of vertebrates vs. invertebrates or vascular vs. non-vascular plants will later grasp how those shared features reflect evolutionary links. This NGSS standard in middle school asks students to explain common ancestry using organism similarities/differences – exactly the kind of thinking fostered by early classification activities.)
- **MS-LS2-3** – Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. (Having learned in Grade 5 about producers, consumers, and decomposers across the kingdoms, students are better prepared in Grade 7 to model ecosystems. They will understand, for instance, that bacteria and fungi (studied in their classification project) play the decomposer role, which connects to matter cycling in ecosystems – a key concept in middle school ecology.)
- **Science & Engineering Practices (Grades 6–8)** – *Practice in Planning and Carrying Out Investigations and in Obtaining/Communicating Information.* The research questions in elementary school mirror the kind of inquiry and information-gathering students will do in secondary school science. By Grade 7–8, students will be planning their own experiments or extended research projects (such as researching global biodiversity or conducting simple lab investigations). The foundational experience of carrying out a guided research project on a scientific topic in Grades 4–6 means that by middle school, they are familiar with posing questions, gathering data from references, and communicating conclusions – all essential behaviors in NGSS-aligned classrooms.