

**SCIENCE
PERFORMANCE DESCRIPTORS**

GRADES 1-5

RESPONDING TO THIS DOCUMENT

We welcome your response to this document.

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INTRODUCTION

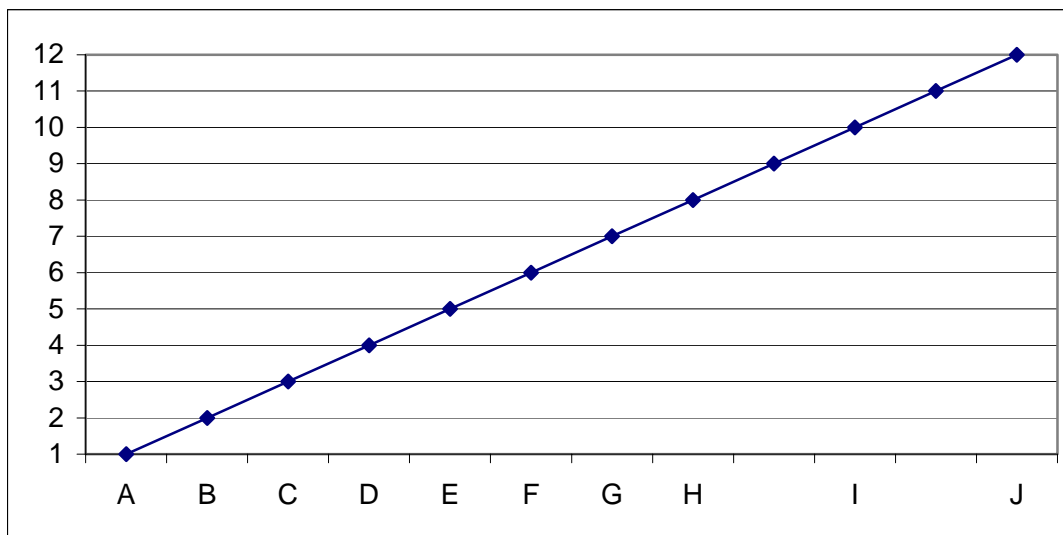
Design for Performance Standards

The Illinois Learning Standards are content standards that describe “*what*” students should know and be able to do in grades K – 12. Each content standard includes five benchmarks that describe what students should know and be able to do at early elementary, late elementary, middle/junior high, early high school, and late high school.

The challenge for the 2000-2001 school year was to produce performance standards that would indicate “*how well*” students should perform to meet the standards. To address this challenge, a number of perspectives needed to be considered. For example, the National Governors Association¹ raised two pertinent questions policymakers should consider for the design of performance standards:

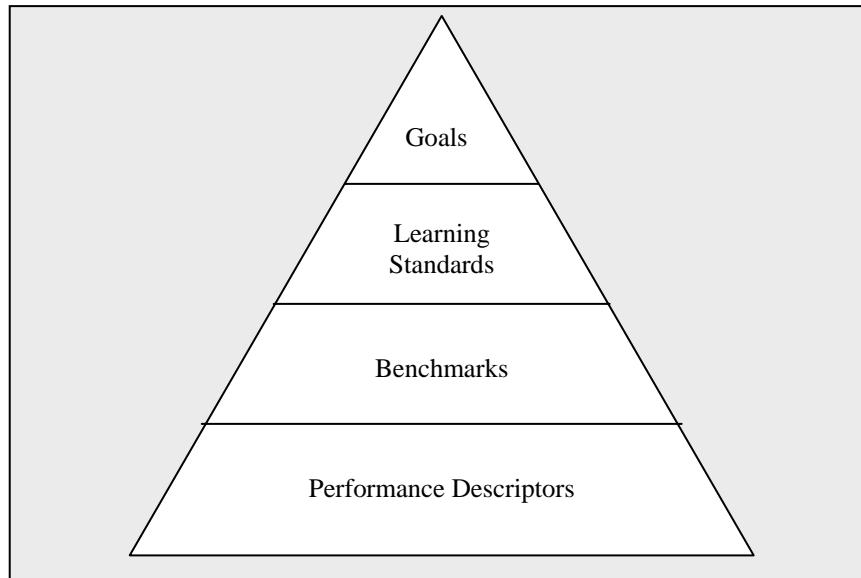
- Do the performance standards indicate the levels of performance students should attain, descriptions of performance at each level, and rules that enable educators to determine whether students have reached a given level?
- Do the performance standards include a range of work . . . to show that students can meet the standards in a variety of ways?

The performance standards describe how well students perform at various points on an educational development continuum. This continuum shows how students can demonstrate mastery of progressively more difficult content and cognitive skills over ten incremental stages of development. Performance within each stage can be assessed by the extent to which students are meeting the standards (i.e., starting, approaching, meeting, exceeding). Performance standards include four essential elements: performance descriptors, performance levels, assessment tasks, and performance examples.



¹ Ouellette, M. (2000). “Maintaining progress through systemic education reform: Performance standards,” Washington, DC: National Governors Association.

The performance standards are classroom resources for voluntary use at the local level. They are not intended to replace the Illinois Learning Standards. Instead, they supplement them by providing sufficient detail and examples to enable teachers to establish appropriate grade-level performance expectations for students. The performance descriptors are a direct outgrowth of the state goals for learning. Whereas the benchmarks filled in detail on each of the standards at five grade-level clusters, the performance descriptors provide additional detail at each grade level.



Definitions

performance standards: the knowledge and skills that students are to perform at various stages of educational development (*performance descriptors*) and the performance expectations (*performance levels and assessment tasks*) for student work (*performance exemplars*) at each of the stages.

performance descriptors: statements of how students can demonstrate the knowledge and skills they acquired.²

performance levels: descriptions of how well students have achieved the standards; that is, the range, frequency, facility, depth, creativity, and/or quality of the knowledge and skills they acquired. Students can demonstrate levels of achieving performance standards along six dimensions:

PERFORMANCE LEVEL =	RANGE +	FREQUENCY +	FACILITY +	DEPTH +	CREATIVITY +	QUALITY
Exceeding	extensively	consistently	automatically	profoundly	inventively	excellently
Meeting	fully	usually	quickly	deeply	imaginatively	well
Approaching	partially	occasionally	haltingly	cursorily	commonly	marginally
Starting	narrowly	rarely	slowly	superficially	imitatively	poorly

² New Standards. *Performance Standards*. (1997) Washington, DC: The National Center on Education and the Economy.

assessment tasks: descriptions of what students can do to demonstrate they have met the standards and a means for evaluating the levels of their performance.

performance examples: student work samples resulting from the classroom-based performance assessment tasks that illustrate performance levels.

Template For Expanded Performance Descriptors

BENCHMARKS ⇒	early elementary			late elementary		middle/ junior high			early high	late high
STAGES ⇒ PERFORMANCE LEVELS ↓	A	B	C	D	E	F	G	H	I	J
Exceeding										
Meeting										
Approaching										
Starting										

Vision for Science Performance

A major goal of Illinois science education is to develop science literate, life-long learners. Schools create learning communities where each student has multiple opportunities to gain content knowledge and apply that knowledge in a relevant manner to the local, regional and global communities. To help achieve this outcome, performance standards, which indicate how well students are expected to perform specific tasks, provide educators with logical extensions to the Illinois Goals and Learning Standards. Students who meet these performance standards will apply an extensive knowledge base of science content and scientific processes to occupations and everyday life.

Upon completion of their education, students will complete complex investigations and solve problems creatively. They will ask questions, gather evidence, seek and obtain in-depth answers, review, understand and compare findings, and communicate research to others. Students will use a variety of technologies as effective tools to facilitate their research. They will develop a variety of tools using a technological design process. Students will participate in a variety of individual activities and collaborate with other students in group activities. They will relate the scientific fields by applying knowledge gained in one field to another.

Students will understand the impact of science concepts, processes, and connections in their lives as individuals, community members, and citizens. Students will realize the constancy of the nature of science in order to question and answer their future challenges. Upon completion of their education, students will have experienced the excitement of doing science and the joy of learning.

Vision for Incrementally Improving Science Performance

Educating today's science student is an extremely complex and exciting adventure. For the sake of convenience, schools frequently place students in graduated levels called grades. However, within each classroom, students vary by age, physical development, intellectual capacity, background experience, socio-economic level, interests, performance, motivation, and learning styles.

The purpose of Science Performance Descriptors is to furnish educators with a logical and measurable continuum of performance and developmental indicators. Education will benefit by the development of descriptors that provide information about what every student needs to learn to meet Illinois Science Learning Standards and by describing how students perform while doing so. These performance descriptors provide information regarding physiological and intellectual development of students as they progress through their K-12 education. State Science Learning Standards describe what students need to know and how they will apply that knowledge in ten stages of intellectual development. Within each class and grade level, students will be functioning at a variety of stages.

This process is based on utilization of a taxonomy of cognitive-skill levels encompassing various aspects of learning from foundational, more concrete levels (knowledge, comprehension) through more complex and abstract levels (application, analysis, synthesis and evaluation). It will be useful for professional educators to understand that students are located at various stages along this continuum. These stages do not represent individual grade levels, and every classroom will contain students from multiple stages.

There are three equally important science goals. The following statements provide a vision of science performance for students who meet the standards. The performance descriptions provide a synopsis of expectations while the expansion presents a more detailed explanation. [The concepts from Goal 12 provide the context for the processes of science of Goal 11 and the connections within science and from science to technology and society described in Goal 13.](#)

Goal 11 – Understand the processes of scientific inquiry and technological design to investigate questions, conduct experiments, and solve problems. This goal encompasses scientific inquiry and methods of technological design. Students will investigate questions, conduct experiments, and solve problems. They will listen, discover, describe, observe, and research scientific inquiry and methods of technological design. As students progress across the developmental spectrum they will continue to increase their knowledge base. They will use this knowledge and comprehension to apply, analyze, synthesize, and evaluate inquiry and design processes. They will choose proper techniques, classify information, demonstrate and modify designs, record data, explain prototypes and use a variety of scientific equipment. Then, they will perform, communicate, analyze, compare, contrast, evaluate, discuss, summarize and support their investigations and designs. [The processes of science should be practiced in the context of the concepts of science found in Goal 12 and with the connections within science and from science to technology and society noted in Goal 13.](#)

Goal 12 – Understand the fundamental concepts, principles, and interconnections of the life, physical, and earth/space sciences. This goal provides fundamental concepts, principles, and interconnections of life, physical, and earth/space sciences. Knowledge of these concepts and principles allows students who meet the standards to relate new subject matter to previously learned material and provide more meaningful levels of understanding and application. They will listen to, discover, describe, and remember science content. They will discover, illustrate, rewrite, edit, and restate this content as their comprehension increases. Subsequently, they will be able to classify, build, report, sketch and use a variety of learning aids to apply content knowledge and

comprehension. Students will be able to point out, analyze, differentiate, dissect, solve, estimate, forecast, role-play, debate, recommend, summarize, and critique aspects within the content areas. [The concepts of science should be mastered using the scientific processes noted in Goal 11 and with the connections within science and from science to technology and society noted in Goal 13.](#)

Goal 13 – Understand the relationships among science, technology, and society in historical and contemporary contexts. This goal covers historical and current relationships among science, technology, and society. Students who meet the standards know and comprehend the accepted practices of science, including specifically the nature of science and scientific habits of mind, practicing safe methods, and recognizing risks and limitations of experimentation. While attempting to improve their surroundings students will know and comprehend the relationships between science, technology, and society. [Students will apply their understanding of the processes practiced from Goal 11 and the context of science, noted in Goal 12, in their own world.](#) They will examine, research, analyze, compare, contrast, and evaluate the products, policies, and processes of science in current and future contexts. Students will investigate, hypothesize, infer, predict, critique, and create informed opinions about local, regional, national, and global connections to the world of science.

Intended Use and Interpretation

The primary function of these descriptors is to provide educators with necessary tools to continue the quest of improving the quality of science education throughout Illinois. They have been written, reviewed, and analyzed by teachers and experts in the field of science education. They are intended to be used as a descriptive tool by teachers, administrators, parents, and students, and have not been created to represent a state-mandated curriculum. They can be powerful tools in determining how to best meet the needs of students from the time they enter elementary school to their graduation from high school as they become life-long learners. The purpose of this section is to explain what these descriptors are and how they can be used to facilitate the learning of science.

Exactly what are Science Expanded Performance Descriptors? Before they can be described it will be helpful to explain what already exists. There are three goals for science that are general statements of what students need to know to be successful in this learning area. These goals are followed by ten science learning standards that are specific statements of knowledge or skills needed for science. They represent what students learn as a result of their schooling. Then, there are thirty-one to thirty-seven learning benchmarks which are clustered throughout early elementary, late elementary, middle/junior high school, early high school, and late high school years. These benchmarks are indicators of student achievement and form a basis for measuring that achievement over time. The science expanded performance descriptors represent the developmental stages of student learning and show a progression through which students develop knowledge and the application of that knowledge in science education.

Each learning benchmark has ten expanded performance descriptors (Stages A, B, C, D, E, F, G, H, I, and J) that furnish educators with a logical and measurable continuum of performance and developmental indicators. They provide information about what students need to learn to meet Illinois Science Learning Standards and by describing how students perform while doing so. These performance descriptors provide

information regarding physiological and intellectual development of students as they progress through their K-12 education.

How can teachers use the Descriptors to help them teach science?

These stages are not intended to represent any one specific grade level since teachers will have students at multiple levels in any given classroom. The stages represent the developmental progression of student learning. For clarity, several stages correspond to specific levels for ISAT purposes and represent the “meets” standards and benchmarks at that level. Level C corresponds to the “meets” level for 3rd grade, level E for the 5th grade, level H to 8th grade, level I to early high school, and level J to late high school.

However, teachers should not confine themselves to one specific stage for their grade level. The teacher must look at a series of three stages to find the progression of understanding and application students should experience. The other stages are not meant to correspond to the missing grades. The following chart indicates the stage clusters teachers should look at when determining the developmental needs of their students.

Grade 1 (A-B)	Grade 2 (A-B-C)	Grade 3 (B-C-D)	Grade 4 (C-D-E)	Grade 5 (D-E-F)
Grade 6 (E-F-G)	Grade 7 (F-G-H)	Grade 8 (G-H-I)	Grade 9-10 (H-I-J)	Grade 11-12 (I-J)

How can these Expanded Performance Descriptors be used as a curriculum development tool through the continuum of the learning stages? These stages of development can help a school district devise a science curriculum that will meet state standards and subsequently improve performance of ISAT science tests. It is not the responsibility of any one grade level to cover all standards or curricula. Science curriculum development teams can study the performance descriptors and make the necessary local decisions to determine what material should be covered at each grade level and how it will be taught.

The descriptors do provide a framework for making these decisions. They are descriptive and not prescriptive. The science goals, standards, benchmarks, and performance descriptors provide the minimum amount of information which students need to know and how to apply that knowledge in a developmentally appropriate manner, but the local school districts determine how and when this material should be covered. Using the stages of development provided in this document, school district curriculum teams can develop a science curriculum that will meet state standards.

The format of the Expanded Performance Descriptors for Science is slightly different from the other learning areas in several ways. Links to other goals and standards are suggested. The links are not meant to be an all-inclusive listing, but starting points for curriculum planning. The science descriptors build on each other within each stage, as well as the descriptors from other learning areas. All of the Goal 12 descriptors denote links to the descriptors for scientific inquiry and technological design from Goal 11; most denote specific links to the scientific habits of mind, principles of safety and connections to technologies and society from Goal 13. In many cases, direct links to the other learning areas of English Language Arts, Mathematics, Social Science, Health and Physical Development, and Fine Arts are noted for the distinct purpose of showing the interconnectedness of Science to all learning.

Another distinctive formatting difference is the suggestion of curricular ideas beyond the wording of each descriptor (bold print). The sub-bulleted ideas below each bolded descriptor are possible conceptual extensions to provide clarification, definition or refinement for curricular planning.

The stages provide developmentally appropriate levels of rigor at each level. Every student, regardless of stage, is required to utilize a variety of levels of thinking while learning and applying science skills. Students are asked to know, comprehend, apply, analyze, synthesize, and evaluate whether they are in stage A, stage D, stage H, or stage J. As students progress from stage to stage, the level of difficulty increases. Remember that science descriptors incorporate what students need to know and how to apply that knowledge.

FOR EXAMPLE, in Standard 12B, students who meet this standard know and apply the concepts that describe how living things interact with each other and with their environment. The descriptors for 12B should be deeply integrated into the concepts, principles and processes of scientific inquiry and/or technological design from Goal 11, while stressing the practices, principles and relationships among science, technology and society in historical and contemporary contexts from Goal 13.

In stage A, students are applying guided scientific inquiry or technological design processes to explore how living things are dependent on one another for survival. Conceptual suggestions include identifying survival needs of plants and animals, matching groupings of animals or explaining how we adapt to our environments. Ideas about real-world applications and an understanding of conservation of natural resources noted in 13B can be naturally integrated. These conceptual understandings could be integrated with the concepts from the social science standards 16E, 17 C-D and 18C and the health and physical development standards, 22A and 22C.

By the time they reach stage D, students are applying the processes of scientific inquiry or technological design to compare the adaptations of physical features of organisms to their environments by, for instance, identifying physical features that help plants or animals survive in their environments or tracing adaptations to different environments over time. Ideas about the interactions of technology and societal decisions are suggested in standard 13B. Notations are offered to suggest integration with the concepts and processes in social science for standard 17C.

By stage H, students are applying options of the processes of scientific inquiry (including the processes of issue investigations) and/or the processes of technological design (including historic technological designs) to explore the implications of change and stability in ecosystems, to examine species demise or success within ecosystems, to study biogeography and to analyze Illinois-specific ecosystems and biomes. Suggestions to explore the interaction of resource acquisition, technological development and ecosystem impact, for instance from standard 13B are offered to strengthen these curricular concepts. These concepts and processes are linked directly to mathematics goals 7 and 10, as well as social science goals 16 and 17.

By the end of high school, in stage J, students are applying scientific inquiries (including the processes of issue investigations) and/or the processes of technological designs to research the sustainability of water, land, air and energy sources and resources. These applications should be within the context of Goal 13 by applying the appropriate

principles of safety and scientific habits of mind noted in standard 13A. The interactions of technology in science and societal situations and the societal interactions resulting from scientific discoveries and technological innovations described in standard 13B should have direct connections as well, to the concepts and processes of 12 B.

Who really wrote these descriptors and where did the ideas come from? A team of experts in science education wrote these expanded performance descriptors. They included teachers, curriculum writers, consultants, professors, and governmental science center directors. Each writer was or currently is an active educator, and all are currently involved in the promotion and improvement of science education. The descriptors were reviewed by teams of teachers from throughout the State of Illinois. All segments from early elementary to late high school were represented.

The descriptors are well grounded in solid science educational research. The two major sources of reference are *Benchmarks for Science Literacy: Project 2061* by American Association for the Advancement of Science and the *National Science Education Standards* by the National Academy of Sciences.

Final comments. Educational reform and improvement in science is an ongoing process. The major players in this movement have been, are, and will continue to be teachers; they emerged from some of the finest minds in science education and teaching. They were written by teachers, reviewed by teachers, for teachers, to be used by teachers, to improve the quality of science education for the students of Illinois.

Science Performance Descriptors

11A Students who meet the standard know and apply the concepts, principles, and processes of scientific inquiry.

Stage A	Stage B	Stage C
<p>1. Describe an observed science concept,</p> <ul style="list-style-type: none"> ○ using appropriate senses, or ○ making applicable estimations and measurements, or ○ predicting steps or sequences, or ○ describing changes in terms of starting and ending conditions using words, diagrams or graphs. (Link to 7A-B, 12A-F.) <p>2. Begin guided inquiry,</p> <ul style="list-style-type: none"> ○ asking questions using prior knowledge and observations, or ○ inferring from observations to generate new questions, or ○ developing strategies to investigate questions. (Link to 5C, 12A-F.) <p>3. Conduct guided inquiry,</p> <ul style="list-style-type: none"> ○ following appropriate procedural steps and safety precautions as directed by teacher. (Link to 12A-F, 13A.) <p>4. Collect data for guided inquiry,</p> <ul style="list-style-type: none"> ○ identifying and using instruments for gathering data, or ○ making estimates and measurements, or ○ recording observations, or ○ reading data from data-collection instruments. (Link to 6B-D, 10A, 12A-F.) <p>5. Record and store data,</p> <ul style="list-style-type: none"> ○ assembling pictures to illustrate data, or ○ organizing data on charts and pictographs, tables, journals or computers. (Link to 10A-B, 12A-F.) <p>6. Analyze and display results,</p> <ul style="list-style-type: none"> ○ recognizing and describing patterns, or ○ noting similarities and differences in patterns, or ○ predicting trends. (Link to 8A-B, 9C, 10A-B, 12A-F.) <p>7. Communicate individual and group results,</p> <ul style="list-style-type: none"> ○ identifying similar data from others, or ○ generalizing data, or ○ drawing simple conclusions, or ○ suggesting more questions to consider. (Link to 5A, 10A-B, 12A-F.) 	<p>1. Describe observed science event,</p> <ul style="list-style-type: none"> ○ sequencing processes or steps, or ○ choosing/proposing causes or effects based on observations, or ○ using measurable and descriptive attributes and units. (Link to 7A-C, 12A-F, 20A and 23C.) <p>2. Begin guided inquiry investigations about objects, events, and/or organisms that can be tested,</p> <ul style="list-style-type: none"> ○ asking pertinent questions, or ○ predicting conditions that can influence change, or ○ determining simple steps to follow to investigate selected question(s). (Link to 12A-F.) <p>3. Conduct guided inquiry,</p> <ul style="list-style-type: none"> ○ assembling proper materials and equipment, or ○ following appropriate procedural steps and safety precautions. (Link to 12A-F, 13A.) <p>4. Collect data for investigations,</p> <ul style="list-style-type: none"> ○ choosing and using appropriate instruments and units. ○ recording data on classroom charts, tables, journals or on computers, or ○ sorting or modifying pictures or drawings that illustrate data. (Link to 7A-C, 10A, 12A-F.) <p>5. Analyze results investigation,</p> <ul style="list-style-type: none"> ○ organizing data on graphs or charts, or ○ constructing reasonable and accurate explanations from data, or ○ applying qualitative and quantitative terminology that describes observed data patterns. (Link directly to 8B,10A, 12A-F.) <p>6. Communicate results of individual and group investigation,</p> <ul style="list-style-type: none"> ○ matching similar data from other data sources, or ○ identifying reasons for differences or discrepancies in the data, or ○ selecting data that can be used to predict future events or data trends, or ○ generating questions for possible future inquiry investigations. (Link directly to 5A-C, 7A-C, 8C, 10A-C, 12A-F.) 	<p>1. Describe an observed (cause and effect) science experience or situation,</p> <ul style="list-style-type: none"> ○ using the appropriate attributes, units and tools, or ○ classifying observations into characteristic, sequential or cause-and-effect categories, or ○ describing phenomenon in terms of starting and ending conditions, types of changes. (Link directly to 7A-C, 12A-F, 20A.) <p>2. Devise inquiry investigation,</p> <ul style="list-style-type: none"> ○ brainstorming possible questions for investigation consideration, or ○ prioritizing questions for inquiry, or ○ wording questions into appropriate hypotheses, ○ choosing the procedural steps, or ○ creating data collection format to address selected hypothesis. (Link to 5A, 7A-C, 12A-F, 13A.) <p>3. Collect data from inquiry investigations,</p> <ul style="list-style-type: none"> ○ selecting and using the appropriate data-gathering instruments, or measurable unit, or ○ reading and recording data into student-created tables, charts, or journals. (Link directly to 7A-C, 12A-F, 10A.) <p>4. Analyze results or data pattern,</p> <ul style="list-style-type: none"> ○ noting similarities and differences, or ○ summarizing for cause or effect, or ○ constructing reasonable and accurate explanations of data, or ○ identifying reasons why similar investigations may not always have the same results. (Link to 10A-C, 12A-F, 13A.) <p>5. Communicate conclusions from individual and group results,</p> <ul style="list-style-type: none"> ○ displaying appropriate data analysis tables and charts, or ○ describing patterns from personal and group data, or ○ proposing causes or effects from data comparisons, or ○ suggesting additional questions from analyzed procedures, similarities, discrepancies, or conclusions. (Link directly to 5A, 10A, 12A-F.)
<p>Grade 1 (A-B) Grade 2 (A-B-C) Grade 3 (B-C-D) Grade 4 (C-D-E) Grade 5 (D-E-F)</p>		

Science Performance Descriptors

11A Students who meet the standard know and apply the concepts, principles, and processes of scientific inquiry.

Stage D	Stage E	Stage F		
<p>1. Formulate contextual inquiry questions,</p> <ul style="list-style-type: none"> ○ brainstorming questions, or ○ converting questions into hypothesis statements, or ○ researching associated scientific knowledge and skills, or ○ identifying simple independent and dependent variables to be investigated. <p>(Link to 3A, 5A, 7A-C, 12A-F.)</p> <p>2. Propose procedural steps to investigate inquiry hypothesis,</p> <ul style="list-style-type: none"> ○ applying logical sequence for investigatory process, or ○ constructing applicable data tables, or ○ selecting necessary materials and equipment, or ○ identifying appropriate safety measures to follow. <p>(Link to 12A-F, 13A.)</p> <p>3. Conduct inquiry investigation,</p> <ul style="list-style-type: none"> ○ collecting quantitative and qualitative data from trials, or ○ using applicable metric units, or ○ observing appropriate and necessary safety precautions, or ○ validating data for accuracy. <p>(Link to 7A-B, 8B, 10B, 12A-F, 13A.)</p> <p>4. Construct charts and visualizations to display data,</p> <ul style="list-style-type: none"> ○ choosing appropriate display media for data analysis, or ○ incorporating available/appropriate technology. <p>(Link to 10A, 12A-F.)</p> <p>5. Analyze data trends,</p> <ul style="list-style-type: none"> ○ summarizing inferences, or ○ explaining data points including outliers and discrepancies, or ○ synthesizing collected data as evidence for explanations. <p>(Link to 8A-B, 10A, 12A-F.)</p> <p>6. Communicate investigation hypothesis, procedure, and explanations,</p> <ul style="list-style-type: none"> ○ presenting the results of observations and explanations orally and in written format, or ○ generating further questions for investigation to verify or refute hypothesis or explanation. <p>(Link directly to 5A-C, 9C; 10A-B, 12A-F.)</p>	<p>1 Construct an inquiry hypothesis that can be investigated,</p> <ul style="list-style-type: none"> ○ researching pertinent context, or ○ proposing the logical sequence of steps, or ○ securing the appropriate materials and equipment, or ○ determining data-collection strategies and format for approved investigation. <p>(Link to 5A, 12A-F, 13A.)</p> <p>2. Conduct scientific inquiry investigation,</p> <ul style="list-style-type: none"> ○ observing safety precautions and following procedural steps accurately over multiple trials. <p>(Link to 12A-F, 13A.)</p> <p>3. Collect qualitative and quantitative data from investigation,</p> <ul style="list-style-type: none"> ○ using available technologies, or ○ determining the necessary required precision, or ○ validating data for accuracy. <p>(Link to 7A-C, 12A-F, 13A.)</p> <p>4. Organize and display data,</p> <ul style="list-style-type: none"> ○ determining most appropriate visualization strategies for collected data, or ○ using graphs (i.e., double bar, double line, stem and leaf plots) and technologies. <p>(Link to 8B, 9C, 12A-F, 13A.)</p> <p>5. Analyze data to produce reasonable explanations,</p> <ul style="list-style-type: none"> ○ comparing and summarizing data from multiple trials, ○ interpreting trends, or ○ evaluating conflicting data, or ○ determining sources of error. <p>(Link to 7A-C, 9C, 10, 12A-F.)</p> <p>6. Communicate analysis and conclusions from investigation,</p> <ul style="list-style-type: none"> ○ interpreting graphs and charts, or ○ preparing oral, and/or written conclusions for peer review, or ○ generating additional questions that can be tested. <p>(Link to 5A-C, 10A-B, 12A-F, 13A.)</p>	<p>1 Formulate hypotheses,</p> <ul style="list-style-type: none"> ○ generating if-then, cause-effect statements and predictions, or ○ choosing and explaining selection of the controlled variables. <p>(Link to 5A, 7A-C, 9, 10, 12A-F, 23C.)</p> <p>2 Design and conduct scientific investigation,</p> <ul style="list-style-type: none"> ○ incorporating appropriate safety precautions, available technology and equipment, or ○ researching historic and current foundations for similar studies, or ○ replicating all processes in multiple trials. <p>(Link to 5, 12A-F, 13A-B.)</p> <p>3. Collect and organize data accurately,</p> <ul style="list-style-type: none"> ○ using consistent measuring and recording techniques with necessary precision, or ○ using appropriate metric units, or ○ documenting data accurately from collecting instruments, or ○ graphing data appropriately. <p>(Link to 7A, 8B-C, 10A-B, 12A-F.)</p> <p>4. Interpret and represent results of analysis to produce findings,</p> <ul style="list-style-type: none"> ○ differentiating observations that support or refute a hypothesis, or ○ identifying the unexpected data within the data set, or ○ proposing explanations for discrepancies in the data set. <p>(Link to 12A-F, 13A.)</p> <p>5. Report the process and results of an investigation,</p> <ul style="list-style-type: none"> ○ using available technologies for presentations, or ○ distinguishing observations that support the original hypothesis, or ○ analyzing a logical proof or explanation of findings, or ○ generating additional questions which address procedures, similarities, discrepancies or conclusions for further investigations. <p>(Link to 5A-C, 12A-F, 13A.)</p>		
Grade 1 (A-B)	Grade 2 (A-B-C)	Grade 3 (B-C-D)	Grade 4 (C-D-E)	Grade 5 (D-E-F)

Science Performance Descriptors

11B Students who meet the standard know and apply the concepts, principles, and processes of technological design.

Stage A	Stage B	Stage C
<p>1. Propose ideas for solutions to technological design questions,</p> <ul style="list-style-type: none"> ○ asking questions about concept (e.g., how to demonstrate that sound is produced by vibrating objects), or ○ identifying criteria for measuring success of design, or ○ prioritizing possible solutions from given list. <p>(Link to 12A-F, 13A-B.)</p> <p>2. Select a possible solution which addresses the design question,</p> <ul style="list-style-type: none"> ○ choosing materials from teacher-generated options, or ○ determining the order of assembly steps, or ○ identifying the variables for testing criteria factors, or ○ proposing procedural steps to test design, or ○ sketching the projected final design. <p>(Link to 12A-F, 13A-B.)</p> <p>3. Construct the selected technological solution,</p> <ul style="list-style-type: none"> ○ using the materials and tools provided, or ○ recording observational data for design process. <p>(Link to 12A-F, 13A-B.)</p> <p>4. Test for design success based on teacher-generated criteria,</p> <ul style="list-style-type: none"> ○ conducting multiple trials, or ○ collecting data from tests using appropriate measurement methods. <p>(Link to 10A-B, 12A-F, 13A-B.)</p> <p>5. Communicate results of design tests,</p> <ul style="list-style-type: none"> ○ comparing data from student trials to evaluate design success, or ○ reporting the procedures followed, or ○ evaluating best design to solve technological design question, or ○ proposing modifications for design solution in additional trials. <p>(Link to 10A-B, 12A-F, 13A-B.)</p>	<p>1. Propose ideas for solutions to technological design problem,</p> <ul style="list-style-type: none"> ○ asking questions about causes and effects of concept to model or test (e.g., how to test 'if-then' effects of magnets, batteries, sound or buoyancy), or ○ identifying criteria for measuring success of design, or ○ prioritizing possible solutions from given list. <p>(Link to 12A-F, 13A-B.)</p> <p>2. Begin a design solution,</p> <ul style="list-style-type: none"> ○ choosing procedural steps for construction and testing from teacher-generated options, or ○ suggesting the variables for testing criteria factors, or ○ sketching the projected final design. <p>(Link to 7A-C, 12A-F, 13A-B.)</p> <p>3. Construct the selected technological design,</p> <ul style="list-style-type: none"> ○ using the materials and tools provided, or ○ recording anecdotal data from design process, or ○ evaluating construction success. <p>(Link to 12A-F, 13A-B.)</p> <p>4. Test for design success based on teacher-or student-generated criteria,</p> <ul style="list-style-type: none"> ○ conducting multiple trials, or ○ collecting data from tests using appropriate measurement methods. <p>(Link to 7A-C, 12A-F, 13A-B.)</p> <p>5. Communicate results of design tests,</p> <ul style="list-style-type: none"> ○ presenting group results which include data from student trials to evaluate design success in testing scientific principle, procedures followed, suggestions for second round of design, or ○ evaluating best design to solve technological problem. <p>(Link to 5A, 10A-B, 12A-F, 13A-B.)</p>	<p>1. Describe an observed cause and effect technological design dilemma,</p> <ul style="list-style-type: none"> ○ generating critical and creative questions associated with design dilemma (e.g., how to test the effect of friction, or how light is reflected, or how toy cars accelerate), or ○ recording observations into sequential or cause and effect categories, or ○ describing dilemma in terms of starting conditions, types of changes and ending conditions. <p>(Link to 12A-F.)</p> <p>2. Begin design investigation of cause and effect dilemma,</p> <ul style="list-style-type: none"> ○ describing design conditions of the phenomenon that can be influenced by change, or ○ brainstorming possible questions related to causes and effects of phenomenon, or ○ prioritizing design options for design investigation, or ○ generating success criteria, or ○ choosing the procedural steps to address selected design plan. <p>(Link to 12A-F.)</p> <p>3. Construct design prototype,</p> <ul style="list-style-type: none"> ○ selecting the appropriate materials, or ○ designing necessary data tables for addressing success criteria, or ○ using materials and tools provided. <p>(Link to 12A-F, 13A.)</p> <p>4. Collect data from prototype testing,</p> <ul style="list-style-type: none"> ○ recording multiple incremental data sets and procedural observations, or ○ keeping accurate procedural journals and drawings. <p>(Link to 10A-B, 12A-F, 13A.)</p> <p>5. Display and analyze results,</p> <ul style="list-style-type: none"> ○ summarizing individual data patterns, or ○ constructing reasonable and accurate explanations of data, or ○ identifying reasons why different designs can accomplish the same effect differently. <p>(Link to 7A-C, 12A-F, 13A.)</p> <p>6. Communicate design conclusions from individual and group results,</p> <ul style="list-style-type: none"> ○ describing patterns from data tables, or ○ evaluating designs according to design success criteria, or ○ generating design modifications from analyzed procedures, similarities, discrepancies, or conclusions. <p>(Link to 7A-C, 10A-B, 12A-F.)</p>
<p>Grade 1 (A-B) Grade 2 (A-B-C) Grade 3 (B-C-D) Grade 4 (C-D-E) Grade 5 (D-E-F)</p>		

Science Performance Descriptors

11B Students who meet the standard know and apply the concepts, principles, and processes of technological design.

Stage D	Stage E	Stage F		
<p>1. Identify a contextual technological design dilemma,</p> <ul style="list-style-type: none"> ○ brainstorming design questions for consideration (e.g., how pendulums work, how heat is transmitted), or ○ researching associated knowledge and skills, or ○ identifying independent and dependent variables. <p>(Link to 12A-F.)</p> <p>2. Begin investigations into technological design,</p> <ul style="list-style-type: none"> ○ identifying design parameters, or ○ brainstorming design options and necessary materials, or ○ sketching design plans, or ○ determining logical sequence for design procedures, or ○ generating success criteria indicators, ranges and graphic display options, or ○ identifying appropriate safety measures to follow. <p>(Link to 12A-F, 13A.)</p> <p>3. Construct design prototype,</p> <ul style="list-style-type: none"> ○ selecting necessary materials and equipment, or ○ following procedural steps and necessary safety measures. <p>(Link to 12A-F, 13A-B.)</p> <p>4. Construct charts and visualizations to display data,</p> <ul style="list-style-type: none"> ○ selecting appropriate graphic display of data, or ○ recording appropriate quantitative and qualitative data from multiple trials, or ○ incorporating technology. <p>(Link to 10A, 12A-F, 13A-B.)</p> <p>5. Analyze data to evaluate design selection or adaptability,</p> <ul style="list-style-type: none"> ○ synthesizing collected data, or ○ comparing designs, processes, sources of error and success criteria. <p>(Link to 8A-B, 10A-B, 12A-F, 13A-B.)</p> <p>6. Communicate design solution, procedure, and explanations,</p> <ul style="list-style-type: none"> ○ preparing graphs and charts to report the results, or ○ generating future design modifications, or ○ suggesting alternative applications for design. <p>(Link directly to 5A-C, 9C, 10A-B, 12A-F, 13A-B.)</p>	<p>1. Identify an innovative technological design from ordinary surroundings or circumstances,</p> <ul style="list-style-type: none"> ○ brainstorming common design questions (e.g., how to squeeze toothpaste better, how to fly a better paper airplane), or ○ researching background information, or ○ suggesting the appropriate materials, equipment, data-collection strategies and success factors for approved investigation. <p>(Link to 12A-F.)</p> <p>2. Construct selected technological innovation,</p> <ul style="list-style-type: none"> ○ sketching design, or ○ proposing the logical sequence of steps for construction, or ○ collecting appropriate materials, supplies, and safety equipment, or ○ completing assembly of innovation. <p>(Link to 7A-C, 12A-F, 13A.)</p> <p>3. Test prototype,</p> <ul style="list-style-type: none"> ○ conducting multiple trials, or ○ collecting reliable and precise data, or ○ recording observations. <p>(Link to 7, 10, 12A-F, 13A-B.)</p> <p>4. Analyze data,</p> <ul style="list-style-type: none"> ○ comparing and summarizing data, or ○ interpreting trends, or ○ evaluating conflicting data, or ○ determining sources of error. <p>(Link to 7, 10, 12A-F, 13A-B.)</p> <p>5. Communicate design findings,</p> <ul style="list-style-type: none"> ○ selecting graphs and charts that effectively report the data, or ○ preparing oral and written investigation conclusions, or ○ generating alternative design modifications which can be tested from original investigated question. <p>(Link to 5A-C, 10A-B, 12A-F.)</p>	<p>1. Formulate proposals for technological designs which model or test scientific principles,</p> <ul style="list-style-type: none"> ○ generating investigation ideas to apply curricular science principles (e.g., how to test phase changes of substances or acceleration in free fall, or effect of ice/glaciers on rocks), or ○ brainstorming pertinent variables, or ○ researching historic designs, or ○ conducting peer review and choice for design and criteria selection. <p>(Link to 12A-F, 16.)</p> <p>2. Plan and construct technological design,</p> <ul style="list-style-type: none"> ○ incorporating the safety and procedural guidelines into the construction plan, or ○ maximizing resource capabilities. <p>(Link to 12A-F, 13A-B.)</p> <p>3. Collect and record data accurately,</p> <ul style="list-style-type: none"> ○ using consistent (metric) measuring and recording techniques with necessary precision, or ○ documenting data from collecting instruments accurately in selected format. <p>(Link to 7, 10A-B, 12A-F, 13A-B.)</p> <p>4. Interpret and represent results of analysis to produce findings,</p> <ul style="list-style-type: none"> ○ comparing data sets for supporting or refuting scientific principle, or ○ evaluating multiple criteria for overall design success, or ○ proposing explanations for sources of error in the data set for process or product design flaws. <p>(Link to 7, 10B, 12A-F, 13A-B.)</p> <p>5. Communicate the results of design investigation,</p> <ul style="list-style-type: none"> ○ presenting an oral and/or written report, or ○ explaining the test of the scientific principle, or ○ using available technologies, or ○ relating anecdotal and quantitative observations, or ○ generating additional design modifications which can be tested later. <p>(Link to 5A-C, 12A-F, 13A-B.)</p>		
Grade 1 (A-B)	Grade 2 (A-B-C)	Grade 3 (B-C-D)	Grade 4 (C-D-E)	Grade 5 (D-E-F)

Science Performance Descriptors

12A Students who meet the standard know and apply concepts that explain how living things function, adapt, and change.

Stage A	Stage B	Stage C
<p>1. Apply scientific inquiries or technological designs to introduce basic needs, characteristics and component parts of living things,</p> <ul style="list-style-type: none"> ○ comparing living and non-living things, or ○ describing basic needs and characteristics of living things, or ○ sorting the common key structures and functions for animal and plant groupings, or ○ classifying common animals by size, color, family units, and shape, and explaining the rationale for the grouping, or ○ distinguishing common physical characteristics or structures for groupings of animals or plants with regard to seasonal, age changes and parent characteristics. <p>(Link to 8A, 11A-B, 12B, 20A, 23A-B.)</p>	<p>1. Apply scientific inquiries or technological designs to explore common and diverse structures and functions of living things,</p> <ul style="list-style-type: none"> ○ describing how plants and animals obtain energy, or ○ categorizing animals by structures for food-getting and movement, or ○ comparing how plants and animals live and reproduce, or ○ associating common plant products with plant structures and functions, or ○ comparing common and distinctive plants' or animals' growth cycles, structures and functions. <p>(Link to 8A, 11A-B, 12B, 20A, 23C.)</p>	<p>1. Apply scientific inquiries or technological designs to explore past and present life forms and their adaptations,</p> <ul style="list-style-type: none"> ○ classifying plant and animal groupings according to simple taxonomy guides or characteristics (e.g., locomotion, color, habitat, reproduction), or ○ categorizing body structures of living organisms to those from fossil studies, or ○ suggesting why changes over time for individuals and groupings of plants and animals happened, or ○ matching the basic organs and functions of major human body systems. <p>(Link to 11A-B, 12B, 23A-C.)</p>
<p>Grade 1 (A-B) Grade 2 (A-B-C) Grade 3 (B-C-D) Grade 4 (C-D-E) Grade 5 (D-E-F)</p>		

Science Performance Descriptors

12A Students who meet the standard know and apply concepts that explain how living things function, adapt, and change.

Stage D	Stage E	Stage F
<p>1. Apply scientific inquiries or technological designs to explore the patterns of change in life cycles of plants and animals,</p> <ul style="list-style-type: none"> ○ comparing the stages within simple life cycles, or ○ examining and comparing microscopic and macroscopic life forms and their structures, or ○ making generalizations of observed patterns. <p>(Link to 8A-B, 11A-B, 12B, 23A, 23C.)</p> <p>2. Apply scientific inquiries or technological designs to explore the similarities and differences of generations of offspring,</p> <ul style="list-style-type: none"> ○ comparing and contrasting specific characteristics of offspring with their parents from immaturity to maturity (e.g., teeth, coloration, metamorphosis variations), or ○ linking characteristics (e.g., habit of walking, kind of teeth, use of appendages) among animals to changes over time. <p>(Link to 11A-B.)</p> <p>3. Apply scientific inquiries or technological designs to examine the nature of inheritance in structural and functional features of plants and animals,</p> <ul style="list-style-type: none"> ○ applying general rules of probability to predict characteristics of offspring from selected parents, or ○ comparing body structures (or functions) from animal fossils that are no longer evident in contemporary animals. <p>(Link to 10C, 11A-B, 12B.)</p> <p>4. Apply scientific inquiries or technological designs to examine the nature of learned behavior in animals,</p> <ul style="list-style-type: none"> ○ distinguishing specific characteristics as learned or inherited in various examples, or ○ conducting simple surveys relating to learned behaviors or attitudes of classmates. <p>(Link to 10B, 11A-B, 12B, 23C.)</p>	<p>1. Apply scientific inquiries or technological designs to explore the patterns of change and stability at the micro- and macroscopic levels of organisms (including humans),</p> <ul style="list-style-type: none"> ○ comparing the stages of simple life cycles and energy requirements, or ○ identifying structures and their functions in cells, tissues, organs, systems and organisms (including humans). <p>(Link to 11A-B, 12B, 23B, 23C.)</p> <p>2. Apply scientific inquiries or technological designs to distinguish the similarities and differences of offspring in organisms (including humans),</p> <ul style="list-style-type: none"> ○ comparing specific characteristics of offspring with their parents, or ○ predicting possible genetic combinations from selected parental characteristics. <p>(Link to 10C, 11A-B, 12B.)</p> <p>3. Apply scientific inquiries or technological designs to examine the nature of inheritance in structural and functional features of organisms (including humans),</p> <ul style="list-style-type: none"> ○ describing genetic and environmental influences on the features of organisms, or ○ distinguishing between inherited and acquired characteristics, or ○ explaining how cells respond to genetic and environmental influences. <p>(Link to 11A-B, 12B, 22C.)</p> <p>4. Apply scientific inquiries or technological designs to examine the nature of learned behavior or responses in all organisms (including humans),</p> <ul style="list-style-type: none"> ○ distinguishing characteristics as learned or inherited, or ○ conducting simple surveys relating to learned behaviors of classmates, and/or family members. <p>(Link to 10B-C, 11A-B, 12B, 22B, 24B-C.)</p>	<p>1. Apply scientific inquiries or technological designs to examine the cellular unit,</p> <ul style="list-style-type: none"> ○ recognizing how cells function independently to keep the organism alive at the single cell level and dependently at specialized levels, or ○ comparing the metabolic and reproductive processes, structures and functions of single and multi-cellular organisms. <p>(Link to 11A-B, 22A-F, 23A-C.)</p> <p>2. Apply scientific inquiries or technological designs to examine the patterns of change and stability over time,</p> <ul style="list-style-type: none"> ○ investigating the development of organisms and their environmental adaptations over broad time periods, or ○ comparing the physical characteristics of two to three generations of familial characteristics. <p>(Link to 11A-B, 12B, 23A-C.)</p> <p>3. Apply scientific inquiries or technological designs to explore the basic roles of genes and chromosomes in transmitting traits over generations,</p> <ul style="list-style-type: none"> ○ describing how physical traits are transmitted through sexual or asexual reproductive processes, or ○ charting 'pedigree' probabilities for transmissions, or ○ identifying examples of selective breeding for particular traits, or ○ analyzing how familiar human diseases are related to genetic mutations. <p>(Link to 11A-B.)</p> <p>4. Apply scientific inquiries or technological designs to examine stimulus-response reactions in organisms,</p> <ul style="list-style-type: none"> ○ comparing growth responses in plants, or ○ comparing simple locomotive or metabolic responses in simple or complex life forms. <p>(Link to 11A-B.)</p>
<p>Grade 1 (A-B) Grade 2 (A-B-C) Grade 3 (B-C-D) Grade 4 (C-D-E) Grade 5 (D-E-F)</p>		

Science Performance Descriptors

12B Students who meet the standard know and apply concepts that describe how living things interact with each other and with their environment.

Stage A	Stage B	Stage C
<p>1. Apply scientific inquiries or technological designs to explore the relationships of living things to their environment,</p> <ul style="list-style-type: none"> ○ identifying the common characteristics of habitats, or ○ matching the needs of organisms in local and global habitats. <p>(Link to 11A-B, 12A, 13B, 17A, 17D.)</p> <p>2. Apply scientific inquiries or technological designs to explore how living things are dependent on one another for survival,</p> <ul style="list-style-type: none"> ○ identifying the survival needs of plants and animals, or ○ matching groupings of animals (e.g., lion's pride, gaggle of geese, herds, packs), or ○ predicting what would happen to organisms when their environmental resources are changed (i.e., seasonally or climatically), or ○ explaining how humans adapt to their environments. <p>(Link to 11A-B, 12A, 13B, 16E, 17C-D, 18C, 22A, 22C.)</p>	<p>1. Apply scientific inquiries or technological designs to explore the impact of plants and animals in their changing environments,</p> <ul style="list-style-type: none"> ○ identifying factors that affect animal and plant growth and reproduction, or ○ matching plant and animal adaptations to changing seasons or climatic changes. <p>(Link to 11A-B, 12A, 13B, 17A.)</p> <p>2. Apply scientific inquiries or technological designs to examine how plants and animals (including humans) survive together in their ecosystems,</p> <ul style="list-style-type: none"> ○ describing the food chains or webs in various ecosystems, or ○ identifying local habitats, or ○ identifying predator/prey and parasite/host relationships. <p>(Link to 11A-B, 12A, 16E, 17C, 22A.)</p>	<p>1. Apply scientific inquiries or technological designs to explore past and current ecosystems,</p> <ul style="list-style-type: none"> ○ matching fossils of extinct organisms to their probable past ecosystems, or ○ comparing extinct organisms and their past ecosystems to plants and animals that live in current comparable ecosystems. <p>(Link to 11A-B, 12A, 16E, 17C.)</p> <p>2. Apply scientific inquiries or technological designs to examine the interdependence of organisms in ecosystems,</p> <ul style="list-style-type: none"> ○ identifying adaptations that help animals survive in specific or multiple environments, or ○ describing the interaction between living and non-living factors in an ecosystem, or ○ predicting what can happen to organisms if they lose different environmental resources or ecologically related groups of organisms. <p>(Link to 11A-B, 12A, 13B, 16E, 17C, 22A.)</p>
<p>Grade 1 (A-B) Grade 2 (A-B-C) Grade 3 (B-C-D) Grade 4 (C-D-E) Grade 5 (D-E-F)</p>		

Science Performance Descriptors

12B Students who meet the standard know and apply concepts that describe how living things interact with each other and with their environment.

Stage D	Stage E	Stage F
<p>1. Apply scientific inquiries or technological designs to examine relationships among organisms in their environment,</p> <ul style="list-style-type: none"> ○ diagramming a simple relationship between plants and/or animals (i.e., predator/prey, parasite/host, consumer/producer) commonly found in local habitats, or ○ describing simple food chains and webs in various habitats, or ○ considering habitat changes due to changes in moisture, temperature, or seasons, or ○ contrasting the behavioral patterns and adaptations of organisms from different ecosystems. <p>(Link to 11A-B, 12A, 13B.)</p> <p>2. Apply scientific inquiries or technological designs to compare the adaptations of physical features of organisms to their environments,</p> <ul style="list-style-type: none"> ○ identifying the physical features that help plants or animals survive in their environments, or ○ reporting on a specific plant or animal which has adapted to different environments over time. <p>(Link to 11A-B, 12A, 13B, 17C.)</p>	<p>1. Apply scientific inquiries or technological designs to categorize organisms (including humans) by their energy relationships in their environments,</p> <ul style="list-style-type: none"> ○ classifying organisms by their position in a food web, or ○ grouping organisms according to their adaptive internal and/or external features, or ○ contrasting food webs within and among different biomes, or ○ identifying the biotic and abiotic factors associated with specific habitats, or ○ making simple inferences to the closed systems of other planets. <p>(Link to 11A-B, 12A, 12C, 13B, 22A.)</p> <p>2. Apply scientific inquiries or technological designs to explain competitive, adaptive and survival potential of species in different local or global ecosystems,</p> <ul style="list-style-type: none"> ○ identifying survival characteristics of organisms, or ○ explaining abiotic or biotic factors which threaten health or survival of populations or species (including humans), or ○ identifying theories explaining mass extinctions. <p>(Link to 11A-B, 12A, 13A-B, 16E, 17C-D.)</p>	<p>1. Apply scientific inquiries or technological designs to study the impact of multiple factors that affect organisms in a habitat,</p> <ul style="list-style-type: none"> ○ describing how behaviors are influenced by internal and external factors, or ○ sketching the interrelationships among/between the land, water and air components to life in the system, or ○ predicting the consequences of the disruption of a food pyramid, or ○ identifying the interrelationships and variables that affect population sizes and behaviors, or ○ identifying different niches and relationships found among organisms in an Illinois habitat. <p>(Link to 11A-B, 12A, 13B, 16E, 17C-D.)</p> <p>2. Apply scientific inquiries or technological designs to apply the competitive, adaptive and survival potential of organisms,</p> <ul style="list-style-type: none"> ○ describing how fossils are used to determine patterns of evolution, or ○ observing how plant and animal characteristics help organisms survive in their environments, or ○ analyzing how environmental factors threaten or enhance the survival potential of populations. <p>(Link to 11A-B, 12A, 13B, 16E, 17C-D, 22A.)</p>
<p>Grade 1 (A-B) Grade 2 (A-B-C) Grade 3 (B-C-D) Grade 4 (C-D-E) Grade 5 (D-E-F)</p>		

Science Performance Descriptors

12C Students who meet the standard know and apply concepts that describe properties of matter and energy and the interactions between them.

Stage A	Stage B	Stage C
<p>1. Apply scientific inquiries or technological designs to examine forms of energy,</p> <ul style="list-style-type: none"> ○ exploring sources and types of energy in familiar situations, or ○ experimenting with sounds by vibrating different materials, or ○ exploring ways that heat, light and sound are produced naturally and artificially. <p>(Link to 11A-B, 12D, 13A-B.)</p> <p>2. Apply scientific inquiries or technological designs to explore the states and properties of matter,</p> <ul style="list-style-type: none"> ○ comparing solids, liquids and gases and how they change states, or ○ sorting objects by similar large-scale physical properties. <p>(Link to 11A-B, 12D, 13A-B.)</p>	<p>1. Apply scientific inquiries or technological designs to demonstrate energy sources,</p> <ul style="list-style-type: none"> ○ constructing and testing simple electrical circuits with batteries, or ○ demonstrating how sound is produced by vibrating objects, or ○ analyzing which energy sources power different objects. <p>(Link to 11A-B, 12D, 13A-B.)</p> <p>2. Apply scientific inquiries or technological designs to compare qualitative and quantitative properties of matter,</p> <ul style="list-style-type: none"> ○ identifying component materials in objects, or ○ classifying objects or materials according to variable masses, volumes, temperatures, and states, or constants such as texture, odor, magnetism and buoyancy. <p>(Link to 7A-B, 11A-B, 12D, 13A-B.)</p>	<p>1. Apply scientific inquiries or technological designs to examine the flow of energy,</p> <ul style="list-style-type: none"> ○ measuring variations of heat absorption or reflection in objects, or ○ comparing qualitative data about friction, or ○ contrasting the transmission of sound through different materials, or ○ describing how energy in different forms affects common objects in common events, or ○ experimenting with the reflection of light, or ○ analyzing simple wave studies. <p>(Link to 11A-B, 12D, 13A.)</p> <p>2. Apply scientific inquiries or technological designs to analyze simple properties and changes,</p> <ul style="list-style-type: none"> ○ matching examples of physical and chemical properties to common substances (e.g., mixtures, solutions, solids, liquids, gases), or ○ categorizing common changes according to physical and chemical groupings, or ○ explaining common examples of changes in terms of their physical or chemical nature. <p>(Link to 7A-C, 11A-B, 12D, 13A-B.)</p>
<p>Grade 1 (A-B) Grade 2 (A-B-C) Grade 3 (B-C-D) Grade 4 (C-D-E) Grade 5 (D-E-F)</p>		

Science Performance Descriptors

12C Students who meet the standard know and apply concepts that describe properties of matter and energy and the interactions between them.

Stage D	Stage E	Stage F
<p>1. Apply scientific inquiries or technological designs to compare the properties of various kinds of energy,</p> <ul style="list-style-type: none"> ○ demonstrating how light travels in a straight line and can be reflected, refracted, or absorbed, or ○ experimenting with a variety of ways that heat can be produced, transmitted or absorbed, or ○ examining how sound can be detected in animals, or ○ exploring how sound is transmitted in different objects, or ○ identifying various sources of power in community resources, or ○ exploring heat distribution in the classroom or building, or ○ explaining the interrelationships among light, heat, sound, chemical, electrical and mechanical energy. <p>(Link to 11A-B, 12D, 13A-B.)</p> <p>2 Apply scientific inquiries or technological designs to associate the properties of common elements, common compounds, and simple mixtures,</p> <ul style="list-style-type: none"> ○ categorizing heterogeneous and homogeneous samples, or ○ analyzing the physical and chemical properties of these samples, or ○ distinguishing the energy requirements to separate physical and chemical combinations. <p>(Link to 11A-B, 12D, 13A-B.)</p>	<p>2. Apply scientific inquiries or technological designs to explore energy,</p> <ul style="list-style-type: none"> ○ demonstrating how mirrors, prisms, diffraction gratings and filters direct light patterns, or ○ diagramming how electricity can be produced from different sources of energy, or ○ explaining how electrical energy can be converted to light, heat, sound, and magnetic energy, or ○ analyzing common examples of potential and kinetic energy, or ○ comparing insulation, conduction, convection, and radiation of heat. <p>(Link to 11A-B, 12D, 13A-B.)</p> <p>2 Apply scientific inquiries or technological designs to distinguish the properties of matter,</p> <ul style="list-style-type: none"> ○ separating components of mixtures by solubility, magnetic properties and densities, or ○ analyzing compound samples by quantitative methods, or ○ graphing the temperature variations associated with phase changes of simple substances, or ○ categorizing the properties of common elements into a graphic format. <p>(Link to 10C, 11A-B, 12D-E, 13A-B.)</p>	<p>1. Apply scientific inquiries or technological designs to demonstrate the interactions of energy forms,</p> <ul style="list-style-type: none"> ○ explaining how interactions of matter and energy affect the changes of state, or ○ tracing electrical current in simple direct and alternating circuits, or ○ diagramming how sound, heat and light energy forms are detected by humans and other organisms. <p>(Link to 11A-B, 12A, 12D, 13A-B.)</p> <p>2 Apply scientific inquiries or technological designs to explore the basic structure of matter</p> <ul style="list-style-type: none"> ○ illustrating the structure of elements and simple compounds, or ○ measuring the masses of chemical reactants and products to show that the sum equals the parts, or ○ investigating the compressibility and expansion of gases at colder and hotter temperatures, or ○ analyzing the electrical nature of charges, attraction, and repulsion. <p>(Link to 11A-B, 12D, 13A-B.)</p>
<p>Grade 1 (A-B) Grade 2 (A-B-C) Grade 3 (B-C-D) Grade 4 (C-D-E) Grade 5 (D-E-F)</p>		

Science Performance Descriptors

12D Students who meet the standard know and apply concepts that describe force and motion and the principles that explain them.

Stage A	Stage B	Stage C
<p>1. Apply scientific inquiries or technological designs to explore simple forces around us,</p> <ul style="list-style-type: none"> ○ describing how push or pull may affect the motion of objects, or ○ classifying materials by their magnetic attraction or repulsion, or ○ sorting examples of simple machines. <p>(Link to 7A, 8A-B, 8D, 9A, 11A-B, 12C, 13A-B.)</p> <p>2. Apply scientific inquiries or technological designs to explore the simple concepts of motion,</p> <ul style="list-style-type: none"> ○ changing the position and motion of objects, or ○ showing simple inertia and momentum in real-world applications. <p>(Link to 7A, 8A-B, 8D, 9A, 11A-B, 12C, 13A-B.)</p>	<p>1. Apply scientific inquiries or technological designs to compare and contrast common forces around us</p> <ul style="list-style-type: none"> ○ dramatizing the ways that forces cause action and reaction behaviors of common objects, or ○ distinguishing the work of simple machines, or ○ describing the attraction and repulsion of magnetic and electrical fields, or ○ sorting examples of natural or man-made forces. <p>(Link to 7A, 8A-B, 8D, 9A, 11A-B, 12C, 13A-B.)</p> <p>2. Apply scientific inquiries or technological designs to make connections between the basic concepts of motion to real world applications,</p> <ul style="list-style-type: none"> ○ describing how gravity affects motion, or ○ demonstrating the rate, time and distance factors and units for speed, or ○ describing examples of inertia and momentum in the classroom, playground and at home. <p>(Link to 7A, 8A-B, 8D, 9A, 11A-B, 12C, 13A-B.)</p>	<p>1. Apply scientific inquiries or technological designs to explain the concepts of motion,</p> <ul style="list-style-type: none"> ○ dramatizing rate, time and distance factors for objects in constant motion, or accelerating in a straight line (on flat or inclined surfaces) and/or in circular paths. <p>(Link to 7A, 8A-B, 8D, 9A, 11A-B, 12C, 13A-B.)</p> <p>2. Apply scientific inquiries or technological designs to explain the characteristics of forces,</p> <ul style="list-style-type: none"> ○ comparing examples of gravitational pull on earth, ○ introducing the concepts associated with weightlessness (or more exactly, in continuous free fall) in space flight, ○ diagramming the directions of forces affecting motion in common examples, or ○ exploring how simple machines work. <p>(Link to 7A, 8A-B, 8D, 9A, 11A-B, 12C, 13A-B.)</p>
<p>Grade 1 (A-B) Grade 2 (A-B-C) Grade 3 (B-C-D) Grade 4 (C-D-E) Grade 5 (D-E-F)</p>		

Science Performance Descriptors

12D Students who meet the standard know and apply concepts that describe force and motion and the principles that explain them.

Stage D	Stage E	Stage F
<p>1. Apply scientific inquiries or technological designs to introduce constant, variable and periodic motion,</p> <ul style="list-style-type: none"> ○ describing examples of motions in everyday situations, or ○ exploring pendulum variations of length, mass and initial energy inputs, or ○ creating student-action models to demonstrate motions in classroom or playground activities, such as walking and running in straight lines and in circular paths. <p>(Link to 7A, 8A-B, 8D, 9A, 11A-B, 12C, 13A-B.)</p> <p>2. Apply scientific inquiries or technological designs to analyze forces,</p> <ul style="list-style-type: none"> ○ collecting and graphing mathematical data on mechanical advantage using simple machines, or ○ comparing the relationships of weight and mass on Earth, the moon or other planets, or ○ exploring the effect of friction in common examples. <p>(Link to 7A, 8A-B, 8D, 9A, 11A-B, 12C, 13A-B.)</p>	<p>1. Apply scientific inquiries or technological designs to explore constant, variable and periodic motion,</p> <ul style="list-style-type: none"> ○ tracing and measuring motion of vehicles (e.g., cars, bicycles, skates) in terms of position, direction, acceleration and speed in straight line, circular and inclined paths, or ○ introducing the concepts of harmonic and oscillating motion in everyday examples, or ○ applying the concepts of natural frequency. <p>(Link to 7A, 8A-B, 8D, 9A, 11A-B, 12C, 13A-B.)</p> <p>2. Apply scientific inquiries or technological designs to analyze actions and reactions,</p> <ul style="list-style-type: none"> ○ examining initial and final forces, or ○ manipulating simple direct and inverse proportions to forces, or ○ explaining thrust, weight, lift and drag in flight, or ○ analyzing gears and gear ratios to do work, or ○ demonstrating Newton's Laws of Motion in terms of space flight. <p>(Link 7A, 8A-B, 8D, 9A, 11A-B, 12C, 13A-B.)</p>	<p>1. Apply scientific inquiries or technological designs to examine gravitational forces,</p> <ul style="list-style-type: none"> ○ correlating how an object's mass and distances affect weight in Earth and planetary examples, or ○ identifying the effects of the Sun's gravitational force in the solar system, or ○ predicting direct and inverse proportional trends from data of gravitational attraction. <p>(Link to 7A, 8A-B, 8D, 9A, 11A-B, 12C, 12F, 13A-B.)</p> <p>2. Apply scientific inquiries or technological designs to incorporate the impact of force on motion,</p> <ul style="list-style-type: none"> ○ associating Newton's three laws of motion to mass, distance and acceleration, or ○ making metric mathematical calculations of average speed, velocity and acceleration, or ○ comparing resistance and friction factors in electrical, magnetic, fluid and physical systems. <p>(Link to 7A, 8A-B, 8D, 9A, 11A-B, 12C, 13A-B.)</p>
<p>Grade 1 (A-B) Grade 2 (A-B-C) Grade 3 (B-C-D) Grade 4 (C-D-E) Grade 5 (D-E-F)</p>		

Science Performance Descriptors

12E Students who meet the standard know and apply concepts that describe the features and processes of Earth and its resources.

Stage A	Stage B	Stage C
<p>1. Apply scientific inquiries or technological designs to introduce the Earth's land, water and atmospheric components,</p> <ul style="list-style-type: none"> ○ sorting pictures of different land features, or ○ identifying the basic features of globes or maps, or ○ classifying major sources or uses of water, or ○ sketching atmospheric features seen in the sky over time. <p>(Link to 9A, 11A-B, 13A-B, 17A-B.)</p> <p>2. Apply scientific inquiries or technological designs to introduce weather and seasonal changes,</p> <ul style="list-style-type: none"> ○ collecting daily weather data, or ○ predicting local weather conditions based on collected data, or ○ associating seasonal variations of weather data, or ○ creating pictographs or other graphic displays of local weather patterns. <ul style="list-style-type: none"> ● (Link to 6A, 11A-B, 13A-B, 17A, 17C.) <p>3. Apply scientific inquiries or technological designs to classify renewable and non-renewable natural resources,</p> <ul style="list-style-type: none"> ○ sorting different examples of simple natural resources, or ○ identifying the origin of these examples with their recyclable possibilities, or ○ setting and working toward a possible recycling or reusing goal for classroom application effort. <p>(Link to math, 11A-B, 13A-B, 17B.)</p>	<p>1. Apply scientific inquiries or technological designs to demonstrate the properties of Earth's basic materials,</p> <ul style="list-style-type: none"> ○ describing different types and uses of Earth's rocks, soils and minerals, or ○ identifying major sources/locations of water on the planet, or ○ identifying major Earth and atmospheric features from photographs including those from satellites. <p>(Link to 9A, 11A-B, 13A-B, 17A.)</p> <p>2. Apply scientific inquiries or technological designs to examine the natural processes that change Earth's surface,</p> <ul style="list-style-type: none"> ○ modeling erosion processes in various soil compositions, or ○ comparing different water flow models for weathering impact, or ○ identifying water cycle in local weather conditions and features. <ul style="list-style-type: none"> ● (Link to 11A-B, 13A-B, 17A.) <p>3. Apply scientific inquiries or technological designs to examine various renewable or non-renewable resources,</p> <ul style="list-style-type: none"> ○ comparing different paper, glass or plastic composition examples, or ○ collecting data about paper, glass or plastic consumption at school over time, or ○ predicting futuristic resource uses and availabilities. <p>(Link to 7A-C, 10B, 11A-B, 13A-B, 17B.)</p>	<p>1. Apply scientific inquiries or technological designs to analyze Earth's land, water and atmosphere as systems,</p> <ul style="list-style-type: none"> ○ classifying samples of the major rock families, or ○ sorting soil types based on their formation and composition, or ○ illustrating nature's oxygen and water cycles, or ○ identifying the major components of air. <p>(Link to 11A-B, 13A-B, 17B, 22C.)</p> <p>2. Apply scientific inquiries or technological designs to examine weather patterns,</p> <ul style="list-style-type: none"> ○ observing local, state, regional or national weather patterns, or ○ identifying topographic features which affect weather patterns, or ○ comparing simple models of Earth tilt and revolution to major seasonal changes, or ○ predicting future weather conditions. <p>(Link to 7A-C, 9C, 11A-B, 13A-B, 17C.)</p> <p>3. Apply scientific inquiries or technological designs to compare natural resource availability,</p> <ul style="list-style-type: none"> ○ creating tests for decomposition of paper, glass or plastic samples, or ○ mapping natural resources from around the world (Mideast oil, Illinois coal, US pine lumber, etc.), or ○ evaluating impact of reducing, recycling or reusing projects at home and at school. <p>Link to 11A-B, 13A-B, 15A, 17B, 22C.)</p>
<p>Grade 1 (A-B) Grade 2 (A-B-C) Grade 3 (B-C-D) Grade 4 (C-D-E) Grade 5 (D-E-F)</p>		

Science Performance Descriptors

12E Students who meet the standard know and apply concepts that describe the features and processes of Earth and its resources.

Stage D	Stage E	Stage F
<p>1. Apply scientific inquiries or technological designs to examine the Earth’s land, water and atmospheric conditions,</p> <ul style="list-style-type: none"> ○ describing erosion/weathering in terms of impact on features on Earth, or ○ diagramming the water cycle to explain changes that occur in the atmosphere during different weather conditions, or ○ predicting atmospheric conditions from cloud, barometric, and other observations. <p>(Link to 7A-C, 10A-B, 11A-B, 13A-B.)</p> <p>2. Apply scientific inquiries or technological designs to analyze the natural weather patterns,</p> <ul style="list-style-type: none"> ○ describing short- to long-term changes in Earth’s climate, or ○ suggesting possible causes of climatic changes and effects on biotic communities, or ○ evaluating evidence that human activities have long-term effects on global climate. <p>(Link to 7A-C, 10A-B, 11A-B, 13A-B, 17B, 22D.)</p> <p>3. Apply scientific inquiries or technological designs to evaluate natural resource supplies,</p> <ul style="list-style-type: none"> ○ mapping availabilities of these resources, or ○ examining the human causes of diminished supplies of resources. <p>(Link to 7A-C, 10A-B, 11A-B, 13A-B, 15A, 16C, 17B, 22D.)</p>	<p>1. Apply scientific inquiries or technological designs to analyze global topographic features</p> <ul style="list-style-type: none"> ○ modeling the effect of glaciation on a surface with applications to Illinois topography, or ○ using satellite pictures, various topographic and thematic maps to indicate demographic, economic and weather patterns, and/or their interrelationships to each other. <p>(Link 9A, 11A-B, 13A-B, 17A.)</p> <p>2. Apply scientific inquiries or technological designs to analyze weather and climatic conditions,</p> <ul style="list-style-type: none"> ○ comparing historic and current precipitation, barometric, and temperature records, and trends, or ○ projecting future trends based on past and current records, or ○ making inferences about cloud formations and weather conditions. <p>(Link to 10A-B, 11A-B, 13A-B, 15D, 17A.)</p> <p>3. Apply scientific inquiries or technological designs to examine long-term global, national and local renewable and nonrenewable resource supplies,</p> <ul style="list-style-type: none"> ○ explaining how historic economic choices have affected resource supplies, or ○ focusing on comparative historic and projected water supplies and demands such as those for the local community, Illinois, the nation, and/or the world. <p>(Link to 10A-B, 11A-B, 13A-B, 15A, 16A-B, 16D, 17A-B, 22C.)</p>	<p>1. Apply scientific inquiries or technological designs to examine the large-scale dynamic forces, events and processes that affect Earth’s land and populations,</p> <ul style="list-style-type: none"> ○ demonstrating tectonic movements related to earthquakes, tsunamies and volcanoes, or ○ researching past, current and projected Earth system phenomena that affect populations. <p>(Link to 10A-B, 11A-B, 13A-B, 16A, 16E, 17A-B, 17D.)</p> <p>2. Apply scientific inquiries or technological designs to examine the large-scale dynamic forces, events and processes that affect Earth’s water/atmospheric systems and populations,</p> <ul style="list-style-type: none"> ○ researching hurricane paths, global temperature trends, ocean temperatures and their effects on populations, or ○ researching past, current and projected Earth system phenomena that affect populations, or ○ exploring the concepts associated with the ‘greenhouse effect’ on Earth. <p>(Link to 10A-B, 11A-B, 13A-B, 16A, 16E, 17A-B, 17D.)</p> <p>3. Apply scientific inquiries or technological designs to relate various pollution and resource relationships,</p> <ul style="list-style-type: none"> ○ examining community and national policies for regulating recycling, pollution, and production of resources, or ○ evaluating biodegradability of natural and synthetic materials according to composition and risk/benefits. <p>(Link to 10A-B, 11A-B, 13A-B, 16C, 22C.)</p>
<p>Grade 1 (A-B) Grade 2 (A-B-C) Grade 3 (B-C-D) Grade 4 (C-D-E) Grade 5 (D-E-F)</p>		

Science Performance Descriptors

12F Students who meet the standard know and apply concepts that explain the composition and structure of the universe and Earth's place in it.

Stage A	Stage B	Stage C
<p>1. Apply scientific inquiries or technological designs to explore the familiar objects of the solar system,</p> <ul style="list-style-type: none"> ○ identifying the easily visible components, or ○ exploring their relative sizes using scale models, or ○ recording daily and/or nightly moon sightings, or ○ introducing space mission studies. (Link to 6D, 7A-B, 11A-B, 12C, 12E, 13A-B.) <p>2. Apply scientific inquiries or technological designs to explore the explanations of the daily and annual patterns of the Earth's motion,</p> <ul style="list-style-type: none"> ○ recording observations of the daily path of the sun over time, or ○ comparing shadows during a day, or ○ observing the daily and seasonal differences of the day and night sky. (Link to 7A, 9A, 11A-B, 12E, 13A-B, 17A-B.) 	<p>1. Apply scientific inquiries or technological designs to describe the main bodies in the solar system,</p> <ul style="list-style-type: none"> ○ identifying the sizes, distances, and relationships of them, or ○ relating Earth's dependence on the Sun for heat and light, or ○ modeling the phases of the Moon, or ○ suggesting how and why people have studied and explained the solar system through time. (Link to 7A, 8A-B, 9A-B, 11A-B, 12C, 13A-B, 16C-E, 17A.) <p>2. Apply scientific inquiries or technological designs to explain the seasonal and annual motions of the Earth and other planets in relation to the Sun,</p> <ul style="list-style-type: none"> ○ modeling the Earth's motion in relation to the Sun during the day, night, year, or ○ introducing the comparative orbits of planets in the solar system, or ○ relating the moon's orbit to its observed phases, or ○ using constellation models to explain apparent changes in the night sky. (Link to 7A, 8A-B, 9A-B, 11A-B, 12C, 13A-B, 16C-E, 17A.) 	<p>1. Apply scientific inquiries or technological designs to compare the main bodies of the solar system,</p> <ul style="list-style-type: none"> ○ describing the surface conditions and composition of the planets, or ○ modeling the impact of meteorites on solar system bodies, or ○ introducing gravitational force of bodies, or ○ researching how 21st century scientists study the solar system. (Link to 7A, 8A, 9A, 11A-B, 12C, 13A-B, 16C-E, 17A.) <p>2. Apply scientific inquiries or technological designs to examine the Earth's motions in space,</p> <ul style="list-style-type: none"> ○ modeling the three-dimensional rotation and revolution of Earth in its orbit, including its axial tilt to introduce the explanation of seasons and solar/lunar eclipses, or ○ addressing historical misconceptions of the Earth's place in the universe. (Link to 11A-B, 13A-B, 16C-D.)
<p>Grade 1 (A-B) Grade 2 (A-B-C) Grade 3 (B-C-D) Grade 4 (C-D-E) Grade 5 (D-E-F)</p>		

Science Performance Descriptors

12F Students who meet the standard know and apply concepts that explain the composition and structure of the universe and Earth's place in it.

Stage D	Stage E	Stage F
<p>1. Apply scientific inquiries or technological designs to study celestial objects in space,</p> <ul style="list-style-type: none"> ○ comparing planetary objects' composition and distances, or ○ introducing the categories of stars and their characteristics, or ○ explaining how planets change their position in the sky relative to the stars, or ○ outlining the kinds of space research advances, risks and benefits. <p>(Link to 7A-B, 8A-B, 9A, 10A, 11A-B, 12C-D, 13A-B, 16D-E, 17A.)</p> <p>2. Apply scientific inquiries or technological designs to document the natural cycles and patterns in the solar system,</p> <ul style="list-style-type: none"> ○ using models of planetary orbits to predict the planets' changing positions, the Moon's changing phases, Earth's changing seasons, the visible constellations' paths, or ○ introducing the relationship of solar system cycles to planning for space flights. <p>(Link to 7A-B, 8A-B, 9A, 10A, 11A-B, 12C-D, 13A-B, 16D-E, 17A.)</p>	<p>1. Apply scientific inquiries or technological designs to introduce concepts that explain planetary, interplanetary and stellar characteristics and cycles,</p> <ul style="list-style-type: none"> ○ generalizing the composition and features of the inner and outer planets, asteroids, comets, and different star types, or ○ applying orbital concepts for seasonal positions of constellations, or ○ applying apparent motions in the sky to use the sky as a clock, compass or calendar, or ○ explaining how the planets change their position in the sky relative to the stars over time using varying astronomic images. <p>(Link to 11A-B, 13A-B.)</p> <p>2. Apply scientific inquiries or technological designs to introduce the concepts of gravitation in the solar system and beyond,</p> <ul style="list-style-type: none"> ○ identifying the general applications of gravitational forces on Earth and in near and far space examples, or ○ explaining continuous free fall in space flight, or ○ applying solar system cycles to trajectories in space flight and research. <p>(Link to 11A-B, 13A-B.)</p>	<p>1. Apply scientific inquiries or technological designs to analyze the solar system and planetary characteristics,</p> <ul style="list-style-type: none"> ○ comparing gravitational, atmospheric, and compositional energy factors necessary for planetary habitation, or ○ describing evidence for presence of water beyond Earth, or ○ predicting factors and materials necessary for interplanetary travel and study. <p>(Link to 11A-B, 13A-B.)</p> <p>2. Apply scientific inquiries or technological designs to examine the features of the universe,</p> <ul style="list-style-type: none"> ○ introducing the calculations associated with the scale of the universe in terms of the speed of light, or ○ describing the star groupings according to masses, color, apparent color, distances and brightness, or ○ identifying these characteristics about our star and its layers, or ○ comparing the capabilities of different kinds of telescopes and imaging technologies. <p>(Link to 6A-B, 10A-B, 11A-B, 13A-B.)</p>
<p>Grade 1 (A-B) Grade 2 (A-B-C) Grade 3 (B-C-D) Grade 4 (C-D-E) Grade 5 (D-E-F)</p>		

Science Performance Descriptors

13A Students who meet the standard know and apply accepted practices of science.

Stage A	Stage B	Stage C
<p>1. Apply the appropriate principles of safety,</p> <ul style="list-style-type: none"> ○ using established classroom safety, order and cleanliness rules during science inquiry or design investigations, or ○ applying general science rules in home and playground settings, or ○ role-playing what should be done in case of fire, or ○ explaining when and why electricity can be harmful and helpful, or ○ reinforcing decision-making skills related to the promotion and protection of individual health. <p>(Link to 11A-B, 12A-F, 24B.)</p> <p>2. Apply scientific habits of mind,</p> <ul style="list-style-type: none"> ○ valuing the importance of recording scientific data accurately and honestly in inquiry and design investigations, or ○ comparing observations by different students observing the same activity, or ○ proposing reasons for differences in observations, or ○ reporting data from repeated observations across timed intervals. <p>(Link to 11A-B, 12A-F.)</p>	<p>1. Apply the appropriate principles of safety,</p> <ul style="list-style-type: none"> ○ explaining the dangers of electricity to applicable classroom and home situations, or ○ refraining from tasting unknown substances, or ○ mapping pathways to leave classroom or home in case of fire or severe weather situations, or ○ identifying safety hazards associated with classroom science inquiry or design investigations. <p>(Link to 11A-B, 12A-F, 24A-B.)</p> <p>2. Apply scientific habits of mind,</p> <ul style="list-style-type: none"> ○ proposing ways to test student-generated predictions for science-conceptual relationships, ○ practicing how scientists generate questions for possible studies, or ○ relating knowledge that was gained through careful, repeated observations by classmates, or ○ distinguishing hypotheses from guesses. <p>(Link to 11A-B, 12A-F, 13B.)</p>	<p>1. Apply the appropriate principles of safety,</p> <ul style="list-style-type: none"> ○ identifying materials, equipment, and safety rules that apply in inquiry and design investigations, or ○ identifying proper storage locations for some dangerous chemicals that can be found at home or school, or ○ following established procedures for simple investigations, including following appropriate equipment and clean-up requirements. <p>(Link to 11A-B, 12A-F, 22A.)</p> <p>2. Apply scientific habits of mind,</p> <ul style="list-style-type: none"> ○ comparing data sets from classroom observations and timed intervals, or ○ summarizing knowledge that was gained through careful observations, or ○ generating questions and strategies to test science concepts using critical and creative thinking, or ○ defining and identifying hypotheses, predictions, laws and theories. <p>(Link to 11A-B, 12A-F, 13B.)</p>
<p>Grade 1 (A-B) Grade 2 (A-B-C) Grade 3 (B-C-D) Grade 4 (C-D-E) Grade 5 (D-E-F)</p>		

Science Performance Descriptors

13A Students who meet the standard know and apply accepted practices of science.

Stage D	Stage E	Stage F
<p>1. Apply the appropriate principles of safety,</p> <ul style="list-style-type: none"> ○ identifying tools and proper steps for use of scientific equipment, or ○ using equipment and materials in a safe and proper manner when conducting inquiry or design investigations, or ○ caring for classroom animal collections properly, or ○ identifying ways and places that chemicals can be properly stored, or ○ stating general rules to follow in case dangerous chemicals are ingested or inhaled, or ○ predicting potential causes of accidents at school, home, and in the community, or ○ following classroom rules for preparation, procedures and clean-up. <p>(Link to 11A-B, 12A-F, 22A.)</p> <p>2. Apply scientific habits of mind,</p> <ul style="list-style-type: none"> ○ recognizing the necessity of controlled variables in inquiry and design investigations, or ○ identifying faulty procedural steps which could cause different results, or ○ recording observations accurately and honestly, or ○ generating questions and strategies to test science concepts using critical and creative thinking, or ○ contrasting hypotheses, predictions, laws, theories and assumptions. <p>(Link to 11A-B, 12A-F, 13B.)</p>	<p>1. Apply appropriate principles of safety,</p> <ul style="list-style-type: none"> ○ wearing appropriate safety gear during inquiry or design investigations, or ○ demonstrating how to use a fire extinguisher, or ○ identifying safety procedures for preparation, process and conclusion of science investigations to minimize safety hazards, or ○ recognizing potential poisonous plants or substances in classroom, outdoor or home settings, or ○ role-playing safe reactions to safety crisis situations. <p>(Link to 11A-B, 12A-F, 22A.)</p> <p>2. Apply scientific habits of mind,</p> <ul style="list-style-type: none"> ○ explaining why similar investigations should but may not produce similar results, or ○ identifying circumstances which distort how variables interact, or ○ labeling accurate observations fully and carefully, or ○ generating questions and strategies to test science concepts using critical and creative thinking. <p>(Link to 11A-B, 12A-F, 13B.)</p>	<p>1. Apply appropriate principles of safety,</p> <ul style="list-style-type: none"> ○ outlining safety precautions, clean-up and disposal procedures, as well as specimen care and handling for inquiry or design investigations, or ○ role-playing responses for individual or group reactions in threatening weather, hazardous chemical contamination, or other unsafe situations, or ○ conducting safety tests or surveys about potential safety hazards in the classroom, school building, or home. <p>(Link to 10F, 11A-B, 12A-F, 22A.)</p> <p>2. Apply scientific habits of mind,</p> <ul style="list-style-type: none"> ○ generating questions and strategies to test science concepts using critical and creative thinking, or ○ researching historic examples of valid and faulty hypothesis generation and investigations, or ○ contrasting the scientific methods of observational and experimental investigations, or ○ proposing how and why more than one possible conclusion should be considered and can be drawn from scientific investigations. <p>(Link to 11A-B, 12A-F, 13B.)</p> <p>3. Analyze cases of scientific studies,</p> <ul style="list-style-type: none"> ○ studying historic examples of valid inquiry investigations associated with the life, environmental, physical, earth, and space sciences, or ○ contrasting faulty studies with deviations from established scientific methods, or ○ contrasting the scientific methods between observational, remote and experimental investigations, or ○ suggesting how societal influences have affected scientific inquiry positively and negatively. <p>(Link to 11A-B, 12A-F, 13B.)</p>
<p>Grade 1 (A-B) Grade 2 (A-B-C) Grade 3 (B-C-D) Grade 4 (C-D-E) Grade 5 (D-E-F)</p>		

Science Performance Descriptors

13B Students who meet the standard know and apply concepts that describe the interaction between science, technology, and society.

Stage A	Stage B	Stage C
<p>1. Apply the use of appropriate scientific tools in inquiry or design investigations,</p> <ul style="list-style-type: none"> ○ using instruments for measuring length and temperature, or ○ recording values with accuracy. (Link to 6D, 7A-B, 8B-C, 11A-B, 12A-F.) <p>2. Explore the contributions of men and women in the life, environmental, physical, earth and space sciences,</p> <ul style="list-style-type: none"> ○ identifying individuals and their discoveries or inventions, or ○ explaining how scientists have advanced our knowledge in real life. (Link to 12A-F, 16B, 16E, 22B.) <p>3. Describe ways that science and technology are found in real-world situations,</p> <ul style="list-style-type: none"> ○ identifying familiar jobs and careers from science fields, or ○ inferring the impact of science and technologies in their lives, or ○ identifying how technologies make work easier, faster or more efficient, or ○ describing ways that scientists are working to solve problems. (Link to 12A-F, 14D, 15A, 15C, 15E, 16B-C, 17C, 22B-C.) <p>4. Demonstrate an understanding of conservation and the need to protect natural resources,</p> <ul style="list-style-type: none"> ○ identifying types and causes of pollution, or ○ listing materials that can be recycled, or ○ suggesting ideas for reducing, reusing, or recycling renewable resources. (Link to 12E, 15C-D, 16C.) 	<p>1. Apply the use of appropriate scientific technologies in inquiry and design investigations,</p> <ul style="list-style-type: none"> ○ selecting appropriate technologies for measuring and recording data, or ○ comparing accuracy of estimations and precise measurements, or ○ sequencing appropriate steps for instructed use of equipment, or ○ investigating the technology of measuring time in history (Link to 6D, 7A-B, 8B-C, 11A-B, 12A-F.) <p>2. Correlate careers and avocations in life, environmental, physical, earth and space sciences to important historical events and ordinary daily life,</p> <ul style="list-style-type: none"> ○ studying applicable personal interest stories, or ○ reporting on specific examples of how scientists or technologists have affected society. (Link to 12A-F, 16B, 16E, 22B.) <p>3. Describe the science connections to the fields of transportation, medicine, agriculture, sanitation, communication,</p> <ul style="list-style-type: none"> ○ associating these fields to pertinent life, environmental, physical, earth and space science concepts, or ○ describing ways sciences and technology have affected societal problems in the past, present and projected future, or ○ identifying types and causes of pollutions, or ○ applying the practices of reducing, reusing, or recycling renewable resources. (Link to 12A-F, 14D, 15A, 15C, 15E, 16B-C, 17C, 22B-C.) 	<p>1. Apply uses of scientific technologies in scientific investigations and innovations,</p> <ul style="list-style-type: none"> ○ comparing tools for measuring, or ○ collecting and recording data for accuracy and precision, or ○ examining how to care for animals in these investigations, or ○ researching how advances in technologies have altered how scientists measure, collect and record data. (Link to 6D, 7A-B, 8B-C, 11A-B, 12A-F.) <p>2. Researching global examples of life, environmental, physical, earth and space scientific and technologic advances,</p> <ul style="list-style-type: none"> ○ exploring historic and current discoveries and innovations, or ○ investigating impact of different scientific discoveries, and/or technologic advances on world population and environmental conditions. (Link to 11A-B, 12A-F, 16B, 16E, 22B.) <p>3. Explore the basic occupational categories for direct connections to science and technology,</p> <ul style="list-style-type: none"> ○ identifying science processes, skills and concepts that apply in the career interest areas (e.g., agriculture and natural resources, business and administrative services, arts and communication, family and human services, industrial and scientific technology and health care), or ○ researching past, present and projected future influences of science and technology in job skills, hobbies and home application. (Link to 12A-F, 14D, 15A, 15C, 15E, 16B-C, 17C, 22B-C.) <p>4. Associate linkages between conservation and natural resource availabilities to historic and current technological changes,</p> <ul style="list-style-type: none"> ○ identifying causes of pollution in various global and local cases, their effects on plant and animal life, or ○ projecting ways to prevent or reduce pollution. (Link to 12A-F, 14D, 15A, 15E, 16B-C, 17C, 22B-C.)
Grade 1 (A-B)	Grade 2 (A-B-C)	Grade 3 (B-C-D)
		Grade 4 (C-D-E)
		Grade 5 (D-E-F)

Science Performance Descriptors

13B Students who meet the standard know and apply concepts that describe the interaction between science, technology, and society.

Stage D	Stage E	Stage F
<p>1. Apply scientific technologies,</p> <ul style="list-style-type: none"> ○ incorporating appropriate data collection, storage, retrieval and communication capabilities in classroom investigations, or ○ describing how these technologies have enabled scientists to observe phenomenon beyond the capabilities of unaided human senses (radar, microscopy, etc.). <p>(Link to 11A-B, 12A-F, 13A.)</p> <p>2. Associate the interactions of technology in science and societal situations,</p> <ul style="list-style-type: none"> ○ comparing and contrasting its impact, risks and benefits in historical and current physical environmental settings, or ○ evaluating available data models of this impact, or ○ displaying graphically the influences of these interactions in the lives and careers of people, or ○ investigating ways that technology has changed local, national or global environments. <p>(Link to 10A, 12A-F, 13A, 16D, 17C, 22B, 22C.)</p> <p>3 Associate the interactions of societal decisions in science and technology innovations and discoveries,</p> <ul style="list-style-type: none"> ○ comparing how personal or community choices affect local, regional and global environments in historic, current or projected future settings, or ○ explaining the changes in society brought about by the space program, or ○ role-playing public or personal informed decision-making about energy choices, resource availability, conservation, etc. <p>(Link to 12A-F, 13A, 15, 16, 17, 22.)</p>	<p>1. Apply scientific technologies,</p> <ul style="list-style-type: none"> ○ collecting, storing, retrieving, and communicating data in classroom research and investigations, or ○ researching the progression of technological advances in pure and applied scientific investigations and innovations. <p>(Link to 8, 10, 11A-B, 12A-F, 13A.)</p> <p>2. Investigate the interactions of technology in science and societal situations,</p> <ul style="list-style-type: none"> ○ displaying graphically the improvements and their impact in local and global agriculture, transportation, health, sanitation, engineering, and manufacturing settings over time, or ○ explaining different perceptions about discoveries, innovations, and trends in places, events, and regions. <p>(Link to 8, 10, 11A-B, 12A-F, 13A, 15, 16, 17.)</p> <p>3. Investigate the interactions of societal decisions in science and technology innovations and discoveries,</p> <ul style="list-style-type: none"> ○ exploring the family, local, national, or global impact of them, or ○ examining conceptual, mathematical and policy implications of energy conservation programs for classrooms, schools, homes and communities, or ○ describing the changes in tools, careers, resource use and productivity over the centuries. <p>(Link to 12A-F, 13A, 15, 16, 17.)</p>	<p>1. Apply scientific technologies,</p> <ul style="list-style-type: none"> ○ incorporating technology and probe ware into classroom research, investigations, and contextual studies, or ○ projecting possible technological advances in the near and long-term future. <p>(Link to 11A-B, 12A-F, 13A.)</p> <p>2. Research the interactions of technology in science and societal situations,</p> <ul style="list-style-type: none"> ○ explaining ways that ecosystems have been changed as results of technological innovations, or ○ inferring technological impact in published medical, economic, and population statistics (e.g., birth/death rates, disease transmission), or ○ explaining how changes in transportation, communication, production, and other technologies affect the location of economic activities. <p>(Link to 11A-B, 12A-F, 13A.)</p> <p>3. Analyze the societal interactions resulting from scientific discoveries and technological innovations,</p> <ul style="list-style-type: none"> ○ researching the scientific milestones that have revolutionized thinking over time, or ○ grouping technological innovations to historic time periods and changes in communities and countries, or ○ comparing public perceptions about the costs and impact of pure science research and applied science solutions. <p>(Link to 11A-B, 12A-F, 13A.)</p>
<p>Grade 1 (A-B) Grade 2 (A-B-C) Grade 3 (B-C-D) Grade 4 (C-D-E) Grade 5 (D-E-F)</p>		

RELATIONSHIP OF PERFORMANCE DESCRIPTORS TO NATIONAL AND STATE STANDARDS

The Illinois Science Performance Descriptors were compared to: The state science standards of Arizona, California, Delaware, Indiana, Massachusetts, North Carolina, New Jersey, Rhode Island, and Texas; The National Science Education Benchmarks; and the American Association for the Advancement of Science Benchmarks.

Comparison of Illinois Science Performance Descriptors to Nine Other States

The academic rigor of the Illinois performance descriptors is commensurate with the rigor of those states receiving an “A” score from the Fordham report. There exists a distinction between academic rigor and detail specificity of performance standards. That is, those states having substantially more detailed performance descriptors (e.g., NJ, RI, and TX) were not any more or less academically rigorous than our Illinois performance descriptors. Primary variability was observed in the level of detail and content specificity rather than in the levels of academic rigor of specific performance indicators. The overall conclusion is that the Illinois performance descriptors are comparable in a very favorable way to those descriptors of the states receiving “A” scores from the Fordham report and the AFT reviews.

Illinois State Science Standards as Compared to National Science Education Benchmarks and AAAS Benchmarks

State standards at the elementary level seem to be more comprehensive and detailed in their description of concepts and content. For example, state Standard 12F (early elementary) is quite a bit more detailed than NSES Content Standard D. This holds true for several of the state standards at the early and late elementary levels. State Goal 13B is more comprehensive and does not have a true match to a NSES Standard, however the concept of the goal is matched. At the middle school level all three of the standards align well with each other. Again, it can be said that the Illinois State Standards are more detailed, and the National and AAAS standards are more general. With regards to the Early High School and Late High School standards, they are very comparable to the NSES and AAAS standards with a few exceptions. State standard 12 does not seem to be as detailed as the National standards. (All goals are met with regards to their specific concepts.)

It would appear that the Illinois State performance descriptors align with the National Science Education Standards, and in fact, these parallel each other rather well. The Illinois State Standards, on the other hand, seem to be more rigorous, and even include more definitive content than the AAAS Benchmarks. There does not seem to be any omission of basic skills or educational content areas in the Illinois Standards.

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