

NJAS Science Standards Alignment Rubric

Nature Journaling Activity System aligned to the Next Generation Science Standards* | TK through grade 12, plus adult learners

A free companion to the NJAS Educator Guides. New Mettle Farms, LLC.

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1. About this rubric

This rubric shows how the Nature Journaling Activity System (NJAS) connects to the Next Generation Science Standards (NGSS). It is written for teachers, program leaders, families and nature guides who need to document how NJAS sessions support science learning.

NGSS describes science learning in three dimensions. Every alignment table in this rubric lists all three:

- **Science and Engineering Practices (SEP):** what scientists and engineers do, such as asking questions, carrying out investigations and analyzing data.
- **Crosscutting Concepts (CCC):** big ideas that connect all fields of science, such as patterns, and cause and effect.
- **Disciplinary Core Ideas (DCI):** the key ideas in life science, earth and space science, physical science, and engineering.

Each grade band also lists the **Performance Expectations (PE)** that NJAS sessions build toward. A PE describes what learners should be able to do by the end of a grade or grade band.

How to read the alignment. NJAS sessions *build toward* the performance expectations listed. They give learners repeated practice with the science practices and crosscutting concepts through observation, drawing, questioning, counting and measuring. Full mastery of a PE also depends on the school or program's own science learning across the year.

California. California adopted the NGSS as the California Next Generation Science Standards (CA NGSS). The codes and wording in this rubric are the same.

2. Reference codes

SEP and CCC numbers follow *A Framework for K–12 Science Education* (National Research Council, 2012).

Science and Engineering Practices (SEP)	Crosscutting Concepts (CCC)
SEP 1 Asking Questions and Defining Problems	CCC 1 Patterns
SEP 2 Developing and Using Models	CCC 2 Cause and Effect
SEP 3 Planning and Carrying Out Investigations	CCC 3 Scale, Proportion, and Quantity
SEP 4 Analyzing and Interpreting Data	CCC 4 Systems and System Models
SEP 5 Using Mathematics and Computational Thinking	CCC 5 Energy and Matter
SEP 6 Constructing Explanations and Designing Solutions	CCC 6 Structure and Function
SEP 7 Engaging in Argument from Evidence	CCC 7 Stability and Change
SEP 8 Obtaining, Evaluating, and Communicating Information	

Reading a PE code. In **4-LS1-1**, "4" is the grade, "LS1" is the core idea (Life Science 1: From Molecules to Organisms), and the final "1" is the expectation number. Band codes cover more than one grade: **K-2-ETS1-1** covers kindergarten through grade 2, **3-5-ETS1-1** covers grades 3 to 5, and **MS** and **HS** stand for middle school (grades 6–8) and high school (grades 9–12).

DCI	Name	DCI	Name
LS1.A	Structure and Function	LS4.C	Adaptation
LS1.B	Growth and Development of Organisms	LS4.D	Biodiversity and Humans
LS1.C	Organization for Matter and Energy Flow in Organisms	ESS1.B	Earth and the Solar System
LS2.A	Interdependent Relationships in Ecosystems	ESS2.D	Weather and Climate
LS2.C	Ecosystem Dynamics, Functioning, and Resilience	ESS3.A	Natural Resources
LS3.A	Inheritance of Traits	ESS3.C	Human Impacts on Earth Systems
LS3.B	Variation of Traits	PS3.B	Conservation of Energy and Energy Transfer
ETS1.A	Defining and Delimiting Engineering Problems	ETS1.B	Developing Possible Solutions
ETS1.C	Optimizing the Design Solution		

3. The NJAS routines and the science practices

NJAS is built on four locked routines: Notice, Wonder, Remember and Measure. They are New Mettle Farms' adaptation of the See, Think, Wonder routine from Project Zero at the Harvard Graduate School of Education. Each routine is anchored to one question that stays the same at every age, which gives learners steady practice with the same science practices from TK through adulthood.

Routine	Question	Primary practices	Primary crosscutting concepts
NOTICE	What do you notice?	SEP 2 Models (drawings), SEP 3 Investigations (observation), SEP 8 Communicating	CCC 1 Patterns, CCC 6 Structure and Function
WONDER	What do you wonder?	SEP 1 Asking Questions, SEP 3 Investigations, SEP 8 Obtaining Information	CCC 2 Cause and Effect, CCC 3 Scale, Proportion, and Quantity
REMEMBER	What does this remind you of?	SEP 4 Analyzing Data, SEP 7 Argument from Evidence, SEP 8 Communicating	CCC 1 Patterns, CCC 4 Systems and System Models
MEASURE	How could you measure this?	SEP 3 Investigations, SEP 4 Analyzing Data, SEP 5 Mathematics	CCC 3 Scale, Proportion, and Quantity, CCC 7 Stability and Change
Kits (build-it and how-to activities)	How could we build or solve this?	SEP 6 Designing Solutions	CCC 6 Structure and Function

4. Alignment by grade band

Each table shows the codes for one NGSS grade band. The SEP and CCC numbers stay steady across bands; the core ideas and performance expectations grow with the learner.

Grades K–2 (with TK)

TK learners. The NGSS begin at kindergarten, so transitional kindergarten has no NGSS performance expectations. In California, TK science is described in the *California Preschool/Transitional Kindergarten Learning Foundations* (Science domain: Science and Engineering Practices, Life Science, Earth and Space Science, Physical Science, and Engineering). TK learners use NJAS with the Early Learners Guide: an adult reads aloud and writes the learner's words, and learners explore the same practices listed for kindergarten.

Unit	SEP	CCC	DCI	Performance Expectations
NOTICE	2, 3, 8	1, 6	LS1.C; ESS2.D	K-LS1-1; K-ESS2-1
WONDER	1, 3, 8	2, 3	LS1.B; LS2.A	1-LS1-2; 2-LS2-1
REMEMBER	4, 7, 8	1, 4	LS3.A; LS3.B; LS4.D; ESS3.A; ESS3.C	1-LS3-1; 2-LS4-1; K-ESS3-1; K-ESS3-3
MEASURE	3, 4, 5	3, 7	ESS2.D; ESS1.B; PS3.B	K-ESS2-1; 1-ESS1-2; K-PS3-1
Kits	6	6	LS1.A; ETS1.A; ETS1.B	1-LS1-1; K-2-ETS1-1; K-2-ETS1-2

Grades 3–5

Unit	SEP	CCC	DCI	Performance Expectations
NOTICE	2, 3, 8	1, 6	LS1.A; ESS2.D	4-LS1-1; 3-ESS2-1
WONDER	1, 3, 8	2, 3	LS1.A	4-LS1-1
REMEMBER	4, 7, 8	1, 4	LS3.A; LS3.B; LS4.C; ESS3.C	3-LS3-1; 3-LS4-3; 5-ESS3-1
MEASURE	3, 4, 5	3, 7	ESS2.D; ESS1.B; LS1.B	3-ESS2-1; 5-ESS1-2; 3-LS1-1
Kits	6	6	ETS1.A; ETS1.B	3-5-ETS1-1; 3-5-ETS1-2

Grades 6–8 (middle school)

Grade 6 is part of the NGSS middle school band. Programs serving sixth graders use this table.

Unit	SEP	CCC	DCI	Performance Expectations
NOTICE	2, 3, 8	1, 6	LS1.B	MS-LS1-4
WONDER	1, 3, 8	2, 3	LS1.B	MS-LS1-5
REMEMBER	4, 7, 8	1, 4	LS2.A; LS2.C; LS4.D	MS-LS2-2; MS-LS2-5
MEASURE	3, 4, 5	3, 7	LS2.A; ESS2.D	MS-LS2-1; MS-ESS2-5
Kits	6	6	ETS1.A; ETS1.B	MS-ETS1-1; MS-ETS1-2

Grades 9–12 (high school)

Unit	SEP	CCC	DCI	Performance Expectations
NOTICE	2, 8	4, 6	LS1.A	HS-LS1-2
WONDER	1, 3, 8	2	LS4.C	HS-LS4-5
REMEMBER	4, 7, 8	1, 4, 7	LS2.C; LS4.D	HS-LS2-6; HS-LS2-7
MEASURE	4, 5	3, 7	LS2.A; LS2.C; LS3.B	HS-LS2-2; HS-LS3-3
Kits	6	6	ETS1.C	HS-ETS1-2

5. Performance expectations cited

Full PE wording from the NGSS. Each code links to its full standard, with clarification statements and assessment boundaries, at nextgenscience.org.

Grades K–2

Code	Performance expectation
K-LS1-1	Use observations to describe patterns of what plants and animals (including humans) need to survive.
K-ESS2-1	Use and share observations of local weather conditions to describe patterns over time.
K-PS3-1	Make observations to determine the effect of sunlight on Earth’s surface.
K-ESS3-1	Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.
K-ESS3-3	Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.
1-LS1-1	Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.
1-LS1-2	Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.
1-LS3-1	Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.
1-ESS1-2	Make observations at different times of year to relate the amount of daylight to the time of year.
2-LS2-1	Plan and conduct an investigation to determine if plants need sunlight and water to grow.
2-LS4-1	Make observations of plants and animals to compare the diversity of life in different habitats.
K-2-ETS1-1	Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
K-2-ETS1-2	Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Grades 3–5

Code	Performance expectation
3-ESS2-1	Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.
3-LS1-1	Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.
3-LS3-1	Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.
3-LS4-3	Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

Code	Performance expectation
4-LS1-1	Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
5-ESS1-2	Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.
5-ESS3-1	Obtain and combine information about ways individual communities use science ideas to protect the Earth’s resources and environment.
3-5-ETS1-1	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
3-5-ETS1-2	Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

Grades 6–8

Code	Performance expectation
MS-LS1-4	Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
MS-LS1-5	Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
MS-LS2-1	Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
MS-LS2-2	Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
MS-LS2-5	Evaluate competing design solutions for maintaining biodiversity and ecosystem services.
MS-ESS2-5	Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.
MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

Grades 9–12

Code	Performance expectation
HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
HS-LS2-2	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
HS-LS2-6	Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

Code	Performance expectation
HS-LS2-7	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
HS-LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
HS-LS4-5	Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.
HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

6. How the practices grow across grade bands

This table summarizes how each science practice develops from kindergarten to grade 12, based on NGSS Appendix F, and shows what it looks like in an NJAS session.

Practice	K–2	3–5	6–8	9–12
SEP 1 Asking Questions	Asks questions based on what they observe.	Asks questions that can be investigated, and predicts outcomes.	Asks questions that can be tested in the field, and identifies the evidence needed.	Asks testable and research questions that come from careful observation.
SEP 2 Models	Draws pictures and diagrams to show a specimen and its parts.	Uses labeled drawings and magnified views to describe structures.	Uses drawings and diagrams to show parts that work together.	Uses scaled field sketches and diagrams to show how systems interact.
SEP 3 Investigations	Makes observations and simple measurements to compare.	Makes observations and measurements in the same way each time.	Plans an investigation and names what will change and what stays the same.	Plans and carries out an investigation and checks the accuracy of the data.
SEP 4 Analyzing Data	Records what they see in drawings, words and numbers.	Puts data in tables and bar graphs to find patterns.	Makes and reads graphs to describe change.	Analyzes data across time and sites to support an explanation.
SEP 5 Mathematics	Counts and uses numbers to describe and compare.	Measures and graphs length, temperature and time.	Uses ratios and rates to describe change.	Uses statistics and rates of change.
SEP 6 Designing Solutions	Builds a simple tool to solve a problem.	Compares more than one design for a tool.	Tests and improves a design using criteria.	Designs, tests and refines a solution to a real problem.
SEP 7 Argument from Evidence	Tells the difference between an opinion and what they saw.	Supports a claim with evidence from their journal.	Writes and speaks an argument backed by evidence.	Evaluates the claims, evidence and reasoning of others.
SEP 8 Information	Gets information from picture books and shares it with drawings and words.	Finds facts in a field guide and names the source.	Compares several sources and judges which can be trusted.	Critically evaluates expert and citizen-science sources.

7. NJAS skills rubric by grade band

The rubric has 12 skills, three for each routine, plus sharing ideas, which runs through every session. Each row lists the practices and crosscutting concepts it builds. The grade bands match the NJAS Educator Guides.

Using the rubric. Observe learners during the session and look at their journal pages. Find the band column for your group:

Working toward: the learner does part of the description, or needs help. **Meeting:** the learner does what the description says. **Extending:** the learner can do the next band's description.

The rubric describes growth. It is not meant for grades or scores.

NOTICE: What do you notice?

Skill	NGSS	TK–1 (Early Learners)	Grades 1–2	Grades 3–4	Grades 5–6	Grades 7–12
Observing & drawing	SEP 2, 3; CCC 6	Points to and names parts; draws a few big shapes with help	Draws the main shapes of a specimen	Adds details and a magnified view	Draws accurate size, proportion and detail	Makes scaled field sketches with shading and proportion
Labels & describing words	SEP 8; CCC 6	Names a part out loud; the adult writes the label	Adds 1–3 labels, with help	Labels 3 or more parts with correct names	Uses precise names and more than one describing word	Uses scientific vocabulary in labels and notes
Counting & recording	SEP 5; CCC 1	Counts objects one at a time, with help	Counts pairs and groups; uses tally marks in groups of five	Skip-counts; records counts in a tally table	Compares counts; makes a simple bar graph	Records data in tables and looks for patterns

WONDER: What do you wonder?

Skill	NGSS	TK–1 (Early Learners)	Grades 1–2	Grades 3–4	Grades 5–6	Grades 7–12
Asking questions	SEP 1; CCC 2	Asks a question out loud; the adult writes it in a bubble	Asks what, where and why questions	Asks why and how questions, using starters	Asks questions that can be tested	Asks investigation-ready and research questions
Changing perspective	SEP 3; CCC 3	Looks up close and far away; turns the specimen over	Draws the front and the back	Draws the top, side and underneath	Explains what each view shows	Chooses views and scale to show a structure or a change
Using sources	SEP 8	Listens to a fact read from a picture book	Shares a fact an adult reads aloud	Finds one fact and writes its source	Compares two sources and checks whether they agree	Judges how reliable expert and citizen-science sources are

REMEMBER: What does this remind you of?

Skill	NGSS	TK–1 (Early Learners)	Grades 1–2	Grades 3–4	Grades 5–6	Grades 7–12
Making connections	SEP 8; CCC 1	Says what the specimen reminds them of	Tells one way it is the same as something they know, and one way it is different	Explains what is the same and different, with details	Connects to facts, data or earlier journal pages	Connects the specimen to the larger system it belongs to
Caring for nature	SEP 7; CCC 4	Looks first and asks before touching, with reminders	Asks before touching	Follows the specimen rules; chooses to draw, photograph or collect	Explains why a specimen should stay where it is	Makes care decisions backed by evidence
Texture, pattern & color	SEP 4; CCC 1	Makes a rubbing with help; finds a pattern that repeats	Uses 2 kinds of marks to show texture	Matches texture and layers 2 colors	Uses several textures with precise describing words	Uses texture, value and color to record detail accurately

MEASURE: How could you measure this?

Skill	NGSS	TK–1 (Early Learners)	Grades 1–2	Grades 3–4	Grades 5–6	Grades 7–12
Measuring with units	SEP 5; CCC 3	Compares bigger and smaller, longer and shorter	Compares longer and shorter; measures in whole inches	Measures in inches and feet; reads °F; writes AM or PM	Measures to the half inch; calculates change; uses N, E, S, W	Chooses tools and units; records precise measurements
Tracking change	SEP 3, 4; CCC 7	Notifies a change between two visits, with prompts	Draws before and after	Records the date, number and unit each time	Graphs change over time and describes the pattern	Calculates how fast things change and keeps seasonal records
Evidence & explanation	SEP 7, 8; CCC 2	Points to what changed	Tells what changed	Writes a sentence with a number and a unit	Uses data and an expert source to explain a change	Writes a claim backed by evidence and reasoning

Every routine: sharing ideas

Skill	NGSS	TK–1 (Early Learners)	Grades 1–2	Grades 3–4	Grades 5–6	Grades 7–12
Sharing ideas	SEP 8	Shares one word or picture with the group	Shares one idea with the group	Shares an idea and points to the evidence	Responds to a classmate's idea with a question or connection	Leads a discussion

Writing a measurement (all bands): number + unit + date, for example "3 in tall on Oct 14." No number without a unit.

8. Adult learners

The NGSS end at grade 12. Adult journalers, such as families, docents, volunteers and community naturalists, use the same eight science practices as lifelong habits. The Adult Guide uses these practices without grade-band levels.

Practice	What it looks like for adult journalers
SEP 1 Asking Questions	Keeps a running list of questions from each visit and returns to them over time.
SEP 2 Models	Makes field sketches with labels, magnified views and scale.
SEP 3 Investigations	Revisits the same spot to observe and measure in the same way each time.
SEP 4 Analyzing Data	Compares records across days and seasons to find patterns.
SEP 5 Mathematics	Records measurements with units, counts and estimates, and calculates change.
SEP 6 Designing Solutions	Builds simple field tools, such as a shadow stick or measuring strip.
SEP 7 Argument from Evidence	Separates what was observed from what is inferred, and backs ideas with journal evidence.
SEP 8 Information	Checks field guides and expert sources, cites them, and may share observations with citizen-science projects.

Sources & Acknowledgments

The NJAS routines Notice, Wonder, Remember and Measure are New Mettle Farms' adaptation of the See, Think, Wonder routine from Project Zero at the Harvard Graduate School of Education.

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