**Grades 4-8 Integrated STEAM Science Curriculum** **Aligned with NGSS and Student-Centered Approaches**

### **Curriculum focuses on the following elements:**

NGSS alignment

Scientific illustrations

Student-centered learning

Exploration and observations

Student reflection journals

Warm-ups and exit tickets

Formal and informal assessments

Choice boards

5E lesson model

Project-based learning

Nature observations

Model creation

Dissections

STEAM learning

LEGO building

Engineering

Introductory robotics

### **Free Choice Science Day (Integrated per grade)**

### Purpose: Encourage student autonomy, creativity, and fun with science while reinforcing concepts.

### Frequency: Once per month or once per grading period.

### Options for Students:

### Makers Corner: Build models, experiment kits, LEGO challenges, robotics tinkering.

### Science Games: Grade-appropriate board/card/digital games reinforcing scientific ideas.

### Puzzles: Science-themed crossword puzzles, logic puzzles, or jigsaw puzzles.

### Trivia: Team or individual trivia on recent or past science topics.

### Exploration: Self-directed experiments or nature observations.

### Reflection: Journal prompts about what they chose, what they learned, and what interested them.

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### **Grade 4 Science Curriculum**

**NGSS Focus:** Earth Systems, Waves, Structure and Function, and Energy

**Core Instructional Features:**

* **PBL Theme:** "Design a Nature Explorer's Toolkit"
* **5E Framework Example:**
  + *Engage:* Observe animal adaptations through nature walk
  + *Explore:* Conduct experiments on sound waves
  + *Explain:* Discuss energy transfer using models
  + *Elaborate:* Create a sound-based communication device using LEGOs
  + *Evaluate:* Peer review of toolkit prototypes

**Integrated Elements:**

* Nature Observations: Field notebooking on local plants and animals
* Model Creation: Build food web dioramas
* Dissections: Virtual plant dissections (flower parts)
* Scientific Illustrations: Sketch habitats and life cycles
* STEAM: LEGO-powered weather station
* Robotics: Simple line-following robot programmed to mimic animal movement

**Free Choice Science Day:**

* **Frequency:** Once per month
* **Activities:**
  + Makers Corner: Build simple machines or animal models with LEGO
  + Science Games: Animal adaptation matching, sound wave puzzles
  + Puzzles: Weather pattern crosswords, life cycle jigsaws
  + Trivia: Plant and animal facts, energy basics
  + Reflection Journals: What I built, played, and learned today

**Assessment & Student Reflection:**

* Student journals with weekly reflections
* Warm-ups: "What if…" science prompts
* Exit tickets: Key concept summary
* Rubrics for project presentations
* Informal checks: Think-pair-share, science talks
* Choice board: Investigations on energy use in the home/school

### **Grade 5 Science Curriculum**

**NGSS Focus:** Matter and Its Interactions, Earth's Systems, and Space Systems

**Core Instructional Features:**

* **PBL Theme:** "Mission to a New Planet"
* **5E Framework Example:**
  + *Engage:* Watch rocket launch videos
  + *Explore:* Investigate properties of matter
  + *Explain:* Construct explanations for erosion
  + *Elaborate:* Use LEGO to design Mars rovers
  + *Evaluate:* Present mission plans to class

**Integrated Elements:**

* Nature Observations: Earth surface changes near school (erosion)
* Model Creation: Earth-moon-sun system using styrofoam and string
* Dissections: Flower and seed dissections
* Scientific Illustrations: Draw phases of the moon and weather maps
* STEAM: Build 3D-printed model of a sustainable settlement on Mars
* Robotics: Code sensors to simulate planetary terrain detection

**Free Choice Science Day:**

* **Frequency:** Once per month
* **Activities:**
  + Makers Corner: Design Mars rover models or simple circuits
  + Science Games: Solar system board games, erosion challenges
  + Puzzles: Earth systems logic puzzles, phases of the moon crossword
  + Trivia: Matter properties and space system questions
  + Reflection Journals: What I explored and why it interests me

**Assessment & Student Reflection:**

* Daily warm-ups on science phenomena
* Student reflection journals with rubric check-ins
* Exit tickets focusing on scientific vocabulary
* Choice board: Solar system model, erosion experiment, or sustainability research
* Peer feedback protocols

### **Grade 6 Science Curriculum**

**NGSS Focus:** Earth's Place in the Universe, Weather and Climate, Energy

**Core Instructional Features:**

* **PBL Theme:** "Design a Climate-Resilient City"
* **5E Framework Example:**
  + *Engage:* Current events on climate change
  + *Explore:* Collect temperature, wind, and rainfall data
  + *Explain:* Develop models of atmospheric convection
  + *Elaborate:* Design LEGO infrastructure for flood resistance
  + *Evaluate:* Class presentations with rubrics

**Integrated Elements:**

* Nature Observations: Weather logs over time
* Model Creation: Water cycle in a bottle
* Dissections: Plant leaf structure analysis
* Scientific Illustrations: Label diagrams of clouds and weather systems
* STEAM: Engineering weather-proof structures
* Robotics: Sensors to detect water levels and automate flood response

**Free Choice Science Day:**

* **Frequency:** Once per grading period
* **Activities:**
  + Makers Corner: Design and build climate-resilient LEGO structures
  + Science Games: Energy transfer card games, water cycle puzzles
  + Puzzles: Weather system riddles, convection current logic games
  + Trivia: Climate change and atmospheric science
  + Reflection Journals: Ideas I tried and how they worked

**Assessment & Student Reflection:**

* Warm-ups: Predict weather outcomes
* Journals: Reflection on climate engineering ideas
* Choice boards for climate challenges
* Exit tickets for review
* Rubrics: Scientific reasoning, design, creativity
* Informal assessments through group check-ins

### **Grade 7 Science Curriculum**

**NGSS Focus:** Chemical Reactions, Cells and Body Systems, Ecosystems

**Core Instructional Features:**

* **PBL Theme:** "Create a Model Organism for a Future Ecosystem"
* **5E Framework Example:**
  + *Engage:* Explore extremophiles through videos
  + *Explore:* Microscope labs on cells
  + *Explain:* Use models to show cell processes
  + *Elaborate:* Create organism models with LEGO and clay
  + *Evaluate:* Scientific posters with illustrations and peer review

**Integrated Elements:**

* Nature Observations: Compare native and invasive species
* Model Creation: Body systems using clay and LEGO
* Dissections: Frog (optional/alternative: virtual)
* Scientific Illustrations: Cells and organs
* STEAM: 3D-printed organ prototypes
* Robotics: Simulate nerve impulses with light signals

**Free Choice Science Day:**

* **Frequency:** Once per grading period
* **Activities:**
  + Makers Corner: Create cell and body system models with LEGO and clay
  + Science Games: Genetics board games, chemical reaction challenges
  + Puzzles: Ecosystem food web jigsaw, cell organ crossword
  + Trivia: Extremophiles, cell function, and ecosystem facts
  + Reflection Journals: Favorite part of the day and questions I still have

**Assessment & Student Reflection:**

* Warm-ups: Cell analogy challenges
* Exit tickets: Digestive system flash facts
* Reflection journals with weekly science metaphors
* Choice boards: Organ system brochure, ecosystem storyboard
* Rubrics for creativity, accuracy, collaboration

### **Grade 8 Science Curriculum**

**NGSS Focus:** Forces and Motion, Genetics, Evolution, and Earth's History

**Core Instructional Features:**

* **PBL Theme:** "Engineer for the Future of Humanity"
* **5E Framework Example:**
  + *Engage:* Explore CRISPR, genetic tech
  + *Explore:* Design experiments with magnets and motion
  + *Explain:* Use Punnett squares and evolution simulations
  + *Elaborate:* Build catapults with LEGO to explore force
  + *Evaluate:* Host a science fair with rubrics

**Integrated Elements:**

* Nature Observations: Fossil record models and rock layer studies
* Model Creation: DNA double helix models
* Dissections: Cow eye or organ models
* Scientific Illustrations: Genetic trees, biome maps
* STEAM: Build trebuchets to explore kinetic energy
* Robotics: Use sensors to track motion and apply Newton’s Laws

**Free Choice Science Day:**

* **Frequency:** Once per grading period
* **Activities:**
  + Makers Corner: Engineer catapults or build DNA models with various materials
  + Science Games: Evolution trivia, physics motion puzzles
  + Puzzles: Genetic tree mapping, Newton’s laws riddles
  + Trivia: Genetics, evolution, and forces/motion concepts
  + Reflection Journals: What I designed, learned, and would do differently

**Assessment & Student Reflection:**

* Warm-ups: Science myths vs facts
* Exit tickets: Concept check-ins
* Student-designed rubrics for inquiry projects
* Choice boards for evolution timeline, genetic traits survey, or invention redesign
* Reflection journals with semester goal tracking
* Formal assessments: Performance tasks, presentations, simulations

### **Universal Tools and Practices Across Grades 4-8:**

* Student-Centered Learning: Empower inquiry, curiosity, and self-direction
* Exploration & Observational Learning: Hands-on field-based tasks
* Scientific Illustration Practice: Ongoing sketching and labeling of phenomena
* Assessment Strategies: Mix of formative, summative, peer/self-assessment
* Choice Boards: For differentiation and student agency
* Technology Integration: Simulations, coding apps, and microcontrollers
* Reflection Journals: Used weekly with prompts and goal-setting
* 5E Lesson Format: Core structure for all instructional design

# **Supplemental Guide: Free Choice Science Days**

**Grades 4–8**

## **Overview**

**Free Choice Science Days** provide students with opportunities to explore science topics in ways that spark their creativity, build problem-solving skills, and deepen engagement through hands-on, playful, and student-driven activities.

* **Frequency:**
  + Grades 4 & 5: Once per month
  + Grades 6, 7 & 8: Once per grading period
* **Goals:**
  + Foster student autonomy and choice
  + Reinforce science content through games, puzzles, and makerspace challenges
  + Encourage reflection on learning and interests
  + Promote collaboration and fun in science

## **Structure of a Free Choice Science Day**

|  |  |  |
| --- | --- | --- |
| **Segment** | **Description** | **Time Estimate** |
| Introduction | Overview of options and expectations | 10-15 minutes |
| Free Choice Time | Students select and engage in activities | 45-60 minutes |
| Reflection | Journaling or sharing learning experiences | 10-15 minutes |
| Wrap-Up | Optional group trivia or discussion | 10 minutes |

## **Grade-Specific Activity Suggestions**

### **Grade 4**

* **Makers Corner:**
  + Build simple machines (levers, pulleys) with LEGO
  + Create animal habitats with craft materials
* **Science Games:**
  + Animal adaptation matching cards
  + Sound wave “guess the source” game
* **Puzzles:**
  + Weather pattern crossword
  + Life cycle jigsaw puzzles
* **Trivia Topics:**
  + Plant and animal facts
  + Basic energy concepts
* **Reflection Prompts:**
  + What did you build or play today?
  + What new thing did you learn?
  + What would you like to explore next?

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### **Grade 5**

* **Makers Corner:**
  + Design Mars rover models using LEGO or recycled materials
  + Build simple electric circuits
* **Science Games:**
  + Solar system board games
  + Erosion challenge games
* **Puzzles:**
  + Earth systems logic puzzles
  + Phases of the moon crossword
* **Trivia Topics:**
  + Matter properties
  + Space system facts
* **Reflection Prompts:**
  + Which activity interested you most?
  + What surprised you?
  + How could you apply what you learned?

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### **Grade 6**

* **Makers Corner:**
  + Build climate-resilient LEGO buildings
  + Create water cycle models in a bottle
* **Science Games:**
  + Energy transfer card games
  + Water cycle puzzles
* **Puzzles:**
  + Weather system riddles
  + Convection current logic puzzles
* **Trivia Topics:**
  + Climate change science
  + Atmospheric phenomena
* **Reflection Prompts:**
  + What was challenging about your activity?
  + What new idea did you explore?
  + How does this relate to your daily life?

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### **Grade 7**

* **Makers Corner:**
  + Create cell and body system models using LEGO and clay
  + Design an organism for a future ecosystem
* **Science Games:**
  + Genetics board games
  + Chemical reaction challenges
* **Puzzles:**
  + Ecosystem food web jigsaw
  + Cell organ crossword
* **Trivia Topics:**
  + Extremophiles
  + Cell function and ecosystems
* **Reflection Prompts:**
  + What part of your model or game did you enjoy most?
  + What questions do you still have?
  + How can you share what you learned with others?

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### **Grade 8**

* **Makers Corner:**
  + Engineer catapults to explore forces and motion
  + Build DNA models with various materials
* **Science Games:**
  + Evolution trivia
  + Physics motion puzzles
* **Puzzles:**
  + Genetic tree mapping
  + Newton’s laws riddles
* **Trivia Topics:**
  + Genetics and evolution
  + Forces and motion concepts
* **Reflection Prompts:**
  + What design did you create and why?
  + What was the most surprising fact you learned?
  + How can you improve your design next time?

## **Materials & Resources Suggestions**

* LEGO sets and robotics kits
* Craft supplies (clay, pipe cleaners, cardboard)
* Science board/card games (custom or commercially available)
* Printable puzzles and crosswords
* Trivia question banks (online or teacher-created)
* Journals or digital reflection tools

## **Tips for Successful Free Choice Science Days**

* Provide clear instructions and choice options in advance
* Allow students to work alone or in small groups
* Encourage respectful collaboration and sharing
* Use reflection journals to track learning and interests over time
* Rotate activities periodically to maintain engagement
* Use student feedback to improve future days