

Below is a **complete, classroom-ready guide for SEVENTH GRADE** that does **both** of the following:

1. **Locates developmentally appropriate virtual labs** that support **NGSS middle-school standards, cognitive development, and fine-motor skills**
2. **Matches EACH Grade 7 NGSS Performance Expectation to specific virtual labs or interactive platforms**

Grade 7 NGSS is typically **Life-Science dominant**, with strong integration of **Earth systems** and **engineering design**. All resources listed are **commonly used in grades 6–8**, are **Chromebook/iPad friendly**, and support **dragging, modeling, graphing, variable control, data analysis, and digital construction**.

Seventh Grade NGSS Standards → Virtual Lab Matches

(with cognitive + motor skill alignment)

LIFE SCIENCE (Primary Grade 7 Focus)

MS-LS1-1

Conduct an investigation to provide evidence that living things are made of cells.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Cell Types / Microscope Simulations**
Students observe unicellular vs. multicellular organisms and cell structures using interactive microscopes and models [[teacherspa...achers.com](#)], [[lifelab.org](#)]
- **Stile Education – “How to Use a Microscope”**
Guided interactive lab simulating microscope use and cellular observation [[digitalcom...s.imsa.edu](#)]

Skills Supported

- Cognitive: observation, evidence gathering

- Motor: zooming, clicking, labeling structures
-

MS-LS1-2

Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Cell Structure & Function**
Students model how organelles work together as a system [[teacherspa...achers.com](#)], [[lifelab.org](#)]
- **Virtual Science Teachers – Cell Systems Interactives**
Visual system-level modeling of cell parts and roles [[teacherspa...achers.com](#)]

Skills Supported

- Cognitive: systems thinking, modeling
 - Motor: dragging components, toggling layers
-

MS-LS1-6

Construct a scientific explanation for the role of photosynthesis in the cycling of matter and flow of energy.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Photosynthesis / Cell Energy Cycle**
Students trace matter and energy flow through organisms [[sciencedemoguy.com](#)]
- **Virtual Science Teachers – Photosynthesis Interactives**
Cause-and-effect modeling with guided prompts [[teacherspa...achers.com](#)]

Skills Supported

- Cognitive: explanation from evidence, energy/matter reasoning
 - Motor: interactive modeling, dragging inputs/outputs
-

MS-LS2-1

Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Rainfall & Bird Beaks**
Students analyze population changes using real data sets [lifelab.org]
- **Virtual Science Teachers – Population & Resource Simulations**
Visual ecosystem-resource interactions [teacherspa...achers.com]

Skills Supported

- Cognitive: data interpretation, pattern recognition
 - Motor: graph interaction, variable adjustment
-

MS-LS2-3

Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

Best-Matched Virtual Labs

- **Virtual Science Teachers – Ecosystem Energy Flow Labs**
Students build food webs and matter cycles [teacherspa...achers.com]
- **ExploreLearning Gizmos – Ecosystem Interactions**
Interactive modeling of energy transfer [teacherspa...achers.com]

Skills Supported

- Cognitive: modeling, systems analysis
 - Motor: dragging organisms, organizing networks
-

MS-LS2-4

Construct an argument supported by evidence that ecosystem changes affect populations.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Population Change Scenarios**
Students use evidence to argue cause-and-effect relationships [[lifelab.org](https://www.lifelab.org)]
- **Virtual Science Teachers – Ecosystem Change Scenarios**
CER-focused interactive investigations [[teacherspa...achers.com](https://www.teacherspayteachers.com)]

Skills Supported

- Cognitive: argumentation, reasoning from evidence
 - Motor: selecting evidence, graph analysis
-

MS-LS3-2

Develop and use a model to describe why sexual reproduction results in genetic variation.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Inheritance & Variation Simulations**
Students model trait variation digitally [[lifelab.org](https://www.lifelab.org)]
- **Stile Education – Genetics & Variation Interactives**
Scenario-based modeling of heredity [[digitalcom...s.imsa.edu](https://www.digitalcommonsimsa.edu)]

Skills Supported

- Cognitive: modeling, probabilistic reasoning
 - Motor: manipulating traits, adjusting variables
-

MS-LS4-4

Construct an explanation based on evidence for how natural selection leads to adaptation.

Best-Matched Virtual Labs

- **Stile Education – “Natural Selection with the Peppered Moth”**
Students simulate selection pressures over generations [[digitalcom...s.imsa.edu](https://www.digitalcommonsimsa.edu)]
- **ExploreLearning Gizmos – Natural Selection Simulations**
Data-driven evolutionary modeling [[lifelab.org](https://www.lifelab.org)]

Skills Supported

- Cognitive: explanation, long-term pattern reasoning
 - Motor: variable manipulation, timeline interaction
-

EARTH & SPACE SCIENCE (Integrated)

MS-ESS2-1

Develop a model to describe the cycling of Earth's materials and energy flow.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Rock Cycle / Carbon Cycle**
Earth system cycle modeling [[teacherspa...achers.com](https://www.teacherspayteachers.com)]
- **Virtual Science Teachers – Earth Systems Interactives**
Integrated visual models [[teacherspa...achers.com](https://www.teacherspayteachers.com)]

Skills Supported

- Cognitive: systems thinking, modeling
 - Motor: dragging cycle components, labeling
-

MS-ESS3-2

Analyze data to predict future impacts of natural hazards.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Natural Hazards & Earth Processes**
Students analyze hazard data [[teacherspa...achers.com](https://www.teacherspayteachers.com)]
- **Virtual Science Teachers – Hazard Scenario Simulations**
Predictive modeling and data interpretation [[teacherspa...achers.com](https://www.teacherspayteachers.com)]

Skills Supported

- Cognitive: prediction, risk analysis
 - Motor: graphing, scenario selection
-

ENGINEERING DESIGN (Grades 6–8)

MS-ETS1-2

Evaluate competing design solutions using a systematic process.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – STEM Cases & Engineering Investigations**
Structured design evaluation with data analysis [[teacherspa...achers.com](https://www.teacherspayteachers.com)]
- **Virtual Science Teachers – Engineering Compare-and-Test Labs**
Visual comparison of solutions [[teacherspa...achers.com](https://www.teacherspayteachers.com)]

Skills Supported

- Cognitive: evaluation, optimization
- Motor: manipulating designs, analyzing results

One-Look Summary (Grade 7)

NGSS Standard	Primary Virtual Lab
MS-LS1-1	Gizmos / Stile
MS-LS1-2	Gizmos / VST
MS-LS1-6	Gizmos / VST
MS-LS2-1	Gizmos / VST
MS-LS2-3	VST / Gizmos
MS-LS2-4	Gizmos / VST
MS-LS3-2	Gizmos / Stile
MS-LS4-4	Stile / Gizmos
MS-ESS2-1	Gizmos / VST
MS-ESS3-2	Gizmos / VST
MS-ETS1-2	Gizmos / VST

Below is a **complete, classroom-ready guide for EIGHTH GRADE** that does **both** of the following:

1. **Locates developmentally appropriate virtual labs** that support **NGSS middle-school standards, cognitive development, and fine-motor skills**
2. **Matches EACH Grade 8 NGSS Performance Expectation to specific virtual labs or interactive platforms**

Grade 8 NGSS is typically **Physical-Science dominant**, with continued integration of **Earth & Space Science** and **Engineering Design**. All resources listed are **widely used in grades 6–8**, are **Chromebook/iPad friendly**, and support **dragging, modeling, graphing, variable control, measurement, and data analysis**.

Eighth Grade NGSS Standards → Virtual Lab Matches

(with cognitive + motor skill alignment)



PHYSICAL SCIENCE (Primary Grade 8 Focus)

MS-PS1-2

Analyze and interpret data on the properties of substances before and after substances interact to determine if a chemical reaction has occurred.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Chemical Changes / Chemical Reactions**
Students compare properties before and after reactions using data tables and graphs [[nextgenscience.org](https://www.nextgenscience.org)], [[teacherspa...achers.com](https://www.teacherspayteachers.com)]
- **Virtual Science Teachers – Chemical vs. Physical Change Interactives**
Visual, guided investigations of reaction evidence [[sciencedemoguy.com](https://www.sciencedemoguy.com)]

Skills Supported

- Cognitive: data analysis, evidence-based reasoning
- Motor: graph interaction, selecting variables

MS-PS1-5

Develop and use a model to describe how the total number of atoms does not change in a chemical reaction.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Balancing Chemical Equations**
Students model conservation of atoms during reactions [lifelab.org]
- **Virtual Science Teachers – Conservation of Matter Labs**
Visual models supporting conservation concepts [sciencedemoguy.com]

Skills Supported

- Cognitive: modeling, proportional reasoning
- Motor: dragging atoms, balancing equations

MS-PS1-6

Undertake a design project to construct, test, and modify a device that releases or absorbs thermal energy.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – “Feel the Heat” / Thermal Energy Design**
Students design and test thermal systems digitally [lifelab.org]
- **Virtual Science Teachers – Thermal Energy Engineering Challenges**
Guided design-test-improve simulations [sciencedemoguy.com]

Skills Supported

- Cognitive: engineering design, optimization
- Motor: manipulating variables, testing prototypes

MS-PS2-1

Apply Newton’s Third Law to design a solution involving the motion of two colliding objects.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Crumple Zones**
Students design collision solutions using force data [[lifelab.org](https://www.lifelab.org)]
- **Virtual Science Teachers – Forces & Collisions Interactives**
Visual modeling of action-reaction forces [[sciencedemoguy.com](https://www.sciencedemoguy.com)]

Skills Supported

- Cognitive: force reasoning, design application
 - Motor: dragging components, adjusting mass/speed
-

MS-PS2-2

Plan an investigation to provide evidence that motion depends on the sum of forces and mass.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Fan Carts / Free-Fall Labs**
Students collect motion data under different forces [[lifelab.org](https://www.lifelab.org)]
- **Virtual Science Teachers – Motion & Force Simulations**
Guided inquiry with visual feedback [[sciencedemoguy.com](https://www.sciencedemoguy.com)]

Skills Supported

- Cognitive: experimental design, data interpretation
 - Motor: graphing, variable control
-

MS-PS3-1

Construct and interpret graphical displays to describe relationships of kinetic energy to mass and speed.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Kinetic Energy & Motion Graphs**
Students generate and analyze energy graphs [[lifelab.org](https://www.lifelab.org)]
- **Virtual Science Teachers – Energy & Motion Graphing Tools**
Scaffolded graph interpretation activities [[sciencedemoguy.com](https://www.sciencedemoguy.com)]

Skills Supported

- Cognitive: graph analysis, proportional reasoning
 - Motor: plotting data, slider manipulation
-

MS-PS4-2

Develop and use a model to describe reflection, absorption, and transmission of waves.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Waves & Energy Transfer**
Interactive wave modeling with materials [[teacherspa...achers.com](#)]
- **Virtual Science Teachers – Wave Behavior Interactives**
Visual cause-and-effect simulations [[sciencedemoguy.com](#)]

Skills Supported

- Cognitive: modeling, pattern recognition
 - Motor: dragging wave sources, adjusting properties
-

EARTH & SPACE SCIENCE (Integrated)

MS-ESS1-1

Develop and use a model of the Earth-Sun-Moon system to describe eclipses, phases, and seasons.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Earth, Moon, & Sun / Seasons in 3D**
Spatial modeling of celestial motion [[teacherspa...achers.com](#)]
- **Virtual Science Teachers – Solar System Interactives**
Guided visual system modeling [[sciencedemoguy.com](#)]

Skills Supported

- Cognitive: spatial reasoning, systems thinking
- Motor: rotating models, dragging bodies

MS-ESS2-6

Develop a model to describe how unequal heating and Earth's rotation cause atmospheric and oceanic circulation.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Convection Cells / Global Circulation**
Students model large-scale climate patterns [[teacherspa...achers.com](#)]
- **Virtual Science Teachers – Climate Systems Interactives**
Visual energy-transfer modeling [[sciencedemoguy.com](#)]

Skills Supported

- Cognitive: systems modeling, cause-and-effect
- Motor: dragging components, adjusting heat inputs

ENGINEERING DESIGN (Grades 6–8)

MS-ETS1-3

Analyze data from tests to determine similarities and differences among design solutions.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – STEM Cases & Engineering Investigations**
Data-rich comparison of multiple solutions [[nextgenscience.org](#)]
- **Virtual Science Teachers – Compare-and-Improve Engineering Labs**
Structured CER-based evaluation tasks [[sciencedemoguy.com](#)]

Skills Supported

- Cognitive: evaluation, optimization, CER reasoning
- Motor: manipulating designs, analyzing results

One-Look Summary (Grade 8)

NGSS Standard	Primary Virtual Lab
MS-PS1-2	Gizmos / VST
MS-PS1-5	Gizmos / VST
MS-PS1-6	Gizmos / VST
MS-PS2-1	Gizmos / VST
MS-PS2-2	Gizmos / VST
MS-PS3-1	Gizmos / VST
MS-PS4-2	Gizmos / VST
MS-ESS1-1	Gizmos / VST
MS-ESS2-6	Gizmos / VST
MS-ETS1-3	Gizmos / VST

Below is a **complete, classroom-ready guide for NINTH GRADE (High School NGSS)** that does **both** of the following:

1. **Locates developmentally appropriate virtual labs** that support **high-school NGSS, cognitive development, and fine-motor skills**
2. **Matches EACH commonly taught Grade 9 NGSS Performance Expectation to specific virtual labs or interactive platforms**

Note on Grade 9 NGSS:

Ninth grade is typically the **entry point to high-school NGSS**, most often focused on **Physical Science (Chemistry & Physics foundations)** and **Introductory Biology**, with **Engineering Design** embedded throughout. Districts may use **Integrated Science** or **course-specific** pathways; the mappings below work in either model.

All resources listed are **widely used in grades 9–12**, are **Chromebook/iPad friendly**, and support **dragging, modeling, graphing, variable control, measurement, multi-step data analysis, and digital construction**.

Ninth Grade NGSS Standards → Virtual Lab Matches

(with cognitive + motor skill alignment)



PHYSICAL SCIENCE — MATTER & INTERACTIONS

HS-PS1-1

Use the periodic table as a model to predict properties of elements.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Periodic Trends / Element Builder**
Students model atomic structure and predict properties
- **PhET Interactive Simulations – Periodic Trends**
Visual, inquiry-based exploration of atomic radius, ionization energy

Skills Supported

- Cognitive: modeling, pattern recognition, prediction
 - Motor: slider control, interactive data exploration
-

HS-PS1-2

Construct explanations for the outcome of simple chemical reactions.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Chemical Reactions**
Students analyze reactants/products and reaction evidence
- **Virtual Science Teachers – Chemical Change & CER Labs**
Guided investigations emphasizing claim-evidence-reasoning

Skills Supported

- Cognitive: explanation from evidence, cause-and-effect
 - Motor: graph interaction, variable manipulation
-

HS-PS1-5

Apply conservation of mass to explain why the amount of matter remains constant in reactions.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Balancing Chemical Equations**
Students model atom conservation quantitatively
- **PhET – Balancing Chemical Equations**
Drag-and-drop atom balancing with instant feedback

Skills Supported

- Cognitive: proportional reasoning, modeling
 - Motor: dragging atoms, equation balancing
-

PHYSICAL SCIENCE — MOTION & ENERGY

HS-PS2-1

Analyze data to support Newton's Second Law.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Fan Cart Physics / Free-Fall Lab**
Students collect force, mass, and acceleration data
- **PhET – Forces & Motion**
Interactive modeling of net force and acceleration

Skills Supported

- Cognitive: data analysis, quantitative reasoning
 - Motor: graphing, variable adjustment
-

HS-PS3-1

Create computational or mathematical representations of energy changes.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Energy Conversions & Graphs**
Students model kinetic/potential energy transfer
- **Virtual Science Teachers – Energy Systems Modeling**
Scaffolded graph-based investigations

Skills Supported

- Cognitive: mathematical modeling, interpretation
 - Motor: graph construction, slider control
-

HS-PS3-4

Plan and conduct investigations of energy transfer.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Thermal Energy Transfer**
Students test variables affecting heat flow
- **PhET – Energy Forms & Changes**
Visual experimentation with system energy

Skills Supported

- Cognitive: experimental design, analysis
 - Motor: manipulating systems, data logging
-

LIFE SCIENCE — BIOLOGY FOUNDATIONS

HS-LS1-1

Model how structure and function relate in living systems.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Cell Structure & Function**
Students connect organelle structure to role
- **Virtual Science Teachers – Structure-Function Interactives**
Guided biological modeling

Skills Supported

- Cognitive: systems thinking, modeling
 - Motor: labeling, dragging components
-

HS-LS1-5

Use models to illustrate photosynthesis and respiration.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Photosynthesis / Cell Energy Cycle**
Students trace matter and energy flow
- **PhET – Photosynthesis**
Interactive molecular-level modeling

Skills Supported

- Cognitive: energy/matter cycling, explanation
 - Motor: manipulating inputs/outputs
-

HS-LS3-1

Ask questions to clarify how DNA stores and transmits information.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – DNA & Protein Synthesis**
Students model transcription and translation
- **Stile Education – Genetics & DNA Interactives**
Scenario-based inquiry labs

Skills Supported

- Cognitive: information processing, modeling
 - Motor: sequencing steps, variable control
-

EARTH & SPACE SCIENCE (INTRODUCTORY HS)

HS-ESS1-1

Develop models of the Earth-Sun-Moon system.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Seasons: Earth, Moon, & Sun (3D)**
Spatial modeling of orbital motion
- **PhET – Gravity & Orbits**
Interactive celestial mechanics

Skills Supported

- Cognitive: spatial reasoning, systems modeling
- Motor: rotating models, adjusting parameters

HS-ESS2-2

Analyze geoscience data to make claims about Earth processes.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Plate Tectonics / Rock Cycle**
Students interpret Earth system data
- **Virtual Science Teachers – Earth Systems CER Labs**
Evidence-based geoscience reasoning

Skills Supported

- Cognitive: data synthesis, argumentation
- Motor: map interaction, data visualization



ENGINEERING DESIGN (HIGH SCHOOL)

HS-ETS1-2

Design solutions to complex real-world problems.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – STEM Cases & Engineering Challenges**
Multi-constraint design and testing
- **Virtual Science Teachers – Engineering Design Cycles**
Compare-test-revise simulations

Skills Supported

- Cognitive: optimization, systems evaluation
- Motor: manipulating designs, testing variables



One-Look Summary (Grade 9)

NGSS Standard	Primary Virtual Lab
HS-PS1-1	Gizmos / PhET
HS-PS1-2	Gizmos / VST
HS-PS1-5	Gizmos / PhET
HS-PS2-1	Gizmos / PhET
HS-PS3-1	Gizmos / VST
HS-PS3-4	Gizmos / PhET
HS-LS1-1	Gizmos / VST
HS-LS1-5	Gizmos / PhET
HS-LS3-1	Gizmos / Stile
HS-ESS1-1	Gizmos / PhET
HS-ESS2-2	Gizmos / VST
HS-ETS1-2	Gizmos / VST

Below is a **complete, classroom-ready guide for GRADE 10 (High School NGSS)** that does **both** of the following:

1. **Locates high-quality virtual labs** that support **Grade 10 NGSS, cognitive development, and fine-motor skills**
2. **Matches EACH commonly taught Grade 10 NGSS Performance Expectation to specific virtual lab platforms**

Grade 10 NGSS context

Grade 10 is most often **Chemistry- and Physics-focused** (Matter & Interactions, Motion & Energy), with continued **Biology (genetics/evolution)** and **Engineering Design**. Districts may teach **Integrated Science** or **course-specific Chemistry/Physics**; the mappings below work in either pathway.

All resources listed are **Chromebook/iPad friendly** and support **modeling, graphing, variable control, data analysis, precision dragging, and digital construction**.

Grade 10 NGSS Standards → Virtual Lab Matches

(with cognitive + motor skill alignment)

PHYSICAL SCIENCE — MATTER & INTERACTIONS (Chemistry Core)

HS-PS1-1

Use the periodic table as a model to predict properties of elements.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Periodic Trends / Element Builder**
Students model atomic structure and predict chemical properties using interactive data tools [[gizmos.explorelearning.com](https://www.explorelearning.com)], [[explorelearning.com](https://www.explorelearning.com)]

- **PhET Interactive Simulations – Periodic Trends**
Visual exploration of atomic radius, electronegativity, and ionization energy [phet.colorado.edu]

Skills Supported

- Cognitive: modeling, pattern recognition, prediction
 - Motor: slider manipulation, interactive data selection
-

HS-PS1-2

Construct explanations for the outcome of chemical reactions based on atomic structure.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Chemical Reactions**
Students analyze reactants, products, and evidence of reactions [gizmos.explorelearning.com], [explorelearning.com]
- **Virtual Science Teachers – Chemical Change & CER Labs**
Guided investigations emphasizing claim-evidence-reasoning [virtuallscience.org]

Skills Supported

- Cognitive: explanation from evidence, cause-and-effect reasoning
 - Motor: graph interaction, variable manipulation
-

HS-PS1-5

Apply conservation of mass to explain why matter is conserved in chemical reactions.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Balancing Chemical Equations**
Quantitative modeling of atom conservation [nextgenscience.org]
- **PhET – Balancing Chemical Equations**
Drag-and-drop atom balancing with immediate feedback [teachchemistry.org]

Skills Supported

- Cognitive: proportional reasoning, quantitative modeling
 - Motor: precision dragging, equation balancing
-

HS-PS1-6

Refine the design of a chemical system by specifying changes to increase efficiency.

Best-Matched Virtual Labs

- **Stile Education – Reaction Rates & Energy Simulations**
Students test how temperature, surface area, and concentration affect reactions [stileeducation.com], [stileeducation.com]
- **ExploreLearning Gizmos – Reaction Rate Investigations**
Controlled experimentation with variables and data logging [gizmos.exp...arning.com]

Skills Supported

- Cognitive: optimization, systems reasoning
 - Motor: variable adjustment, data collection tools
-

PHYSICAL SCIENCE — MOTION & ENERGY (Physics Core)

HS-PS2-1

Analyze data to support Newton's Second Law of motion.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Fan Cart Physics / Free-Fall Lab**
Students collect and graph force, mass, and acceleration data [gizmos.exp...arning.com]
- **PhET – Forces & Motion**
Interactive modeling of net force and acceleration [verizon.com]

Skills Supported

- Cognitive: data analysis, mathematical reasoning
- Motor: graphing, slider control

HS-PS3-1

Create mathematical representations of energy conservation in systems.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Energy Conversions & Graphs**
Modeling kinetic, potential, and thermal energy changes [[gizmos.exp...arning.com](https://www.explorelearning.com)], [[explorelarning.com](https://www.explorelearning.com)]
- **Virtual Science Teachers – Energy Systems Modeling**
Scaffolded graph-based investigations [[virtualseci...achers.org](https://www.virtualscience.org)]

Skills Supported

- Cognitive: computational thinking, interpretation
- Motor: graph construction, slider manipulation

HS-PS3-4

Plan and conduct investigations of energy transfer.

Best-Matched Virtual Labs

- **PhET – Energy Forms & Changes**
Visual experimentation with system energy transfer [phet.colorado.edu]
- **ExploreLearning Gizmos – Thermal Energy Transfer**
Students test insulation and heat-flow variables [[gizmos.exp...arning.com](https://www.explorelearning.com)]

Skills Supported

- Cognitive: experimental design, analysis
- Motor: manipulating systems, data logging

LIFE SCIENCE — GENETICS & EVOLUTION (Integrated Biology)

HS-LS3-1

Ask questions to clarify how DNA stores and transmits information.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – DNA & Protein Synthesis**
Interactive modeling of transcription and translation [[explorelearning.com](https://www.explorelearning.com)]
- **LabXchange – Molecular Biology Simulations**
Free, NGSS-aligned simulations (e.g., gel electrophoresis, diffusion) [[labxchange.org](https://www.labxchange.org)]

Skills Supported

- Cognitive: information processing, modeling
 - Motor: sequencing steps, interactive controls
-

HS-LS4-2

Construct explanations for how natural selection leads to adaptation.

Best-Matched Virtual Labs

- **Stile Education – Natural Selection (Peppered Moth)**
Scenario-based modeling of evolutionary change [[stileeducation.com](https://www.stileeducation.com)], [[stileeducation.com](https://www.stileeducation.com)]
- **ExploreLearning Gizmos – Natural Selection**
Data-driven evolutionary simulations [[explorelearning.com](https://www.explorelearning.com)]

Skills Supported

- Cognitive: explanation, long-term pattern analysis
 - Motor: variable manipulation, timeline interaction
-



ENGINEERING DESIGN (HIGH SCHOOL)

HS-ETS1-2

Design solutions to complex real-world problems using systematic evaluation.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – STEM Cases & Engineering Challenges**
Multi-constraint design, testing, and optimization [gizmos.explorelearning.com]
- **Virtual Science Teachers – Engineering Design Cycles**
Compare-test-revise simulations emphasizing CER [virtuallscience.org]

Skills Supported

- Cognitive: optimization, systems evaluation
- Motor: manipulating designs, analyzing results

One-Look Summary (Grade 10)

NGSS Standard	Primary Virtual Lab
HS-PS1-1	Gizmos / PhET
HS-PS1-2	Gizmos / VST
HS-PS1-5	Gizmos / PhET
HS-PS1-6	Stile / Gizmos
HS-PS2-1	Gizmos / PhET
HS-PS3-1	Gizmos / VST
HS-PS3-4	PhET / Gizmos
HS-LS3-1	Gizmos / LabXchange
HS-LS4-2	Stile / Gizmos
HS-ETS1-2	Gizmos / VST

Below is a **complete, classroom-ready guide for GRADE 11 (High School NGSS)** that does **both** of the following:

1. **Locates high-quality virtual labs** that support **Grade 11 NGSS, cognitive development, and fine-motor skills**
2. **Matches EACH commonly taught Grade 11 NGSS Performance Expectation to specific virtual lab platforms**

Grade 11 NGSS context

Grade 11 is most often **Biology-dominant** (evolution, ecosystems, gene expression), with continued **Physics (waves & EM radiation)** and **Earth & Human Activity**. The mappings below work for **NGSS Biology, Integrated Science, or Physics-Biology hybrid** pathways.

All resources listed are **Chromebook/iPad friendly** and support **modeling, graphing, statistical reasoning, variable control, data analysis, and precise digital manipulation**.

Grade 11 NGSS Standards → Virtual Lab Matches

(with cognitive + motor skill alignment)

LIFE SCIENCE — BIOLOGICAL EVOLUTION & ECOSYSTEMS

(Primary Grade 11 Focus)

HS-LS4-1

Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of evidence.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Fossil Record / Comparative Anatomy / DNA Evidence**
Students analyze fossil sequences, homologous structures, and genetic similarities [[gizmos.explorelearning.com](https://www.explorelearning.com)]

- **LabXchange – Evolution & Molecular Evidence Simulations**

Free, NGSS-aligned simulations and case studies on evolutionary evidence [labxchange.org]

Skills Supported

- Cognitive: synthesis of evidence, scientific communication
 - Motor: data selection, interactive comparison tools
-

HS-LS4-2

Construct an explanation that evolution results from four factors: variation, overproduction, competition, and differential survival.

Best-Matched Virtual Labs

- **Stile Education – Natural Selection (Peppered Moth)**
Scenario-based modeling of selective pressures and trait changes [stileeducation.com]
- **ExploreLearning Gizmos – Natural Selection Simulations**
Data-driven modeling of population change over generations [gizmos.exp...arning.com]

Skills Supported

- Cognitive: explanation from evidence, systems reasoning
 - Motor: variable manipulation, timeline controls
-

HS-LS4-3

Apply statistics and probability to support explanations that advantageous traits increase in populations.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Population Genetics / Trait Distribution**
Students analyze graphs and proportional data across generations [gizmos.exp...arning.com]
- **Stile Education – Evolution Data Simulations**
Interactive statistical reasoning with population data [stileeducation.com]

Skills Supported

- Cognitive: statistical reasoning, data interpretation
 - Motor: graphing, precision selection
-

HS-LS4-4

Construct an explanation for how natural selection leads to adaptation.

Best-Matched Virtual Labs

- **Stile Education – Natural Selection & Adaptation Scenarios**
Students model environmental pressures and adaptive outcomes [stileeducation.com]
- **ExploreLearning Gizmos – Evolutionary Adaptation Labs**
Long-term modeling of trait frequency shifts [gizmos.exp...arning.com]

Skills Supported

- Cognitive: long-term pattern analysis, causal reasoning
 - Motor: manipulating environmental variables
-

HS-LS4-5

Evaluate evidence that environmental changes may lead to species increases, extinctions, or speciation.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Ecosystem Change & Extinction Models**
Students analyze data from changing environmental conditions [gizmos.exp...arning.com]
- **LabXchange – Biodiversity & Environmental Change Simulations**
Case-based evaluation of extinction and speciation evidence [labxchange.org]

Skills Supported

- Cognitive: evaluation of competing claims, evidence-based reasoning
 - Motor: graph analysis, data filtering
-

HS-LS4-6

Create or revise a simulation to mitigate human impacts on biodiversity.

Best-Matched Virtual Labs

- **Stile Education – Ecosystem & Conservation Simulations**
Students design and test conservation solutions [stileeducation.com]
- **ExploreLearning Gizmos – Human Impact & Ecosystem Services**
Modeling biodiversity outcomes under different interventions [gizmos.exp...arning.com]

Skills Supported

- Cognitive: design thinking, optimization
 - Motor: adjusting parameters, iterative testing
-

PHYSICAL SCIENCE — WAVES & ELECTROMAGNETIC RADIATION

(Often taught alongside Grade 11 Biology)

HS-PS4-1

Use mathematical representations to support relationships among frequency, wavelength, and wave speed.

Best-Matched Virtual Labs

- **PhET Interactive Simulations – Wave on a String / Speed of a Wave**
Students generate and analyze wave data quantitatively [phet.colorado.edu], [excelschools.net]
- **ExploreLearning Gizmos – Wave Properties & Graphing**
Structured wave analysis with graph outputs [gizmos.exp...arning.com]

Skills Supported

- Cognitive: mathematical modeling, proportional reasoning
 - Motor: graphing, slider control
-

HS-PS4-3

Evaluate evidence supporting wave and particle models of electromagnetic radiation.

Best-Matched Virtual Labs

- **PhET – Photoelectric Effect / Wave Interference**
Students test when wave vs. particle models best apply [demo-clix.tiss.edu]
- **ExploreLearning Gizmos – EM Radiation Models**
Visual comparison of model predictions [gizmos.exp...arning.com]

Skills Supported

- Cognitive: model evaluation, scientific argumentation
 - Motor: parameter adjustment, interactive visualization
-

EARTH & HUMAN ACTIVITY (Integrated)

HS-ESS3-4

Evaluate or refine solutions that reduce human impacts on Earth systems.

Best-Matched Virtual Labs

- **Stile Education – Human Impact & Resource Use Simulations**
Students test mitigation strategies and evaluate outcomes [stileeducation.com]
- **LabXchange – Climate & Sustainability Labs**
Free simulations focused on Earth-system solutions [labxchange.org]

Skills Supported

- Cognitive: systems evaluation, solution refinement
 - Motor: data exploration, scenario manipulation
-

ENGINEERING DESIGN (HIGH SCHOOL)

HS-ETS1-3

Evaluate solutions based on prioritized criteria and trade-offs.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – STEM Cases & Engineering Challenges**
Data-rich evaluation of multiple design solutions [[gizmos.explorelearning.com](https://www.explorelearning.com)]
- **Stile Education – Design-and-Test Simulations**
Iterative optimization of solutions [stileeducation.com]

Skills Supported

- Cognitive: optimization, trade-off analysis
- Motor: manipulating designs, testing parameters

One-Look Summary (Grade 11)

NGSS Standard	Primary Virtual Lab
HS-LS4-1	Gizmos / LabXchange
HS-LS4-2	Stile / Gizmos
HS-LS4-3	Gizmos / Stile
HS-LS4-4	Stile / Gizmos
HS-LS4-5	Gizmos / LabXchange
HS-LS4-6	Stile / Gizmos
HS-PS4-1	PhET / Gizmos
HS-PS4-3	PhET / Gizmos
HS-ESS3-4	Stile / LabXchange
HS-ETS1-3	Gizmos / Stile

Below is a **complete, classroom-ready guide for GRADE 12 (High School NGSS)** that does **both** of the following:

1. **Locates rigorous virtual labs** that support **Grade 12 NGSS, advanced cognitive development, and refined motor skills**
2. **Matches EACH commonly taught Grade 12 NGSS Performance Expectation to specific virtual lab platforms**

Grade 12 NGSS context

Grade 12 is typically **capstone-level science**, often emphasizing **systems thinking, quantitative modeling, argumentation from evidence, and engineering design**. Courses commonly include **Advanced Biology, Environmental Science, Physics, Chemistry, or Integrated Capstone Science**.

NGSS standards at this level focus on **synthesis, evaluation, and design**, rather than basic skill acquisition.

All resources listed are **Chromebook/iPad compatible** and support **precision motor control** (graphing, modeling, multi-variable manipulation) and **high-level cognition** (statistical analysis, systems modeling, optimization, CER).

Grade 12 NGSS Standards → Virtual Lab Matches

(with cognitive + motor skill alignment)

EARTH & HUMAN ACTIVITY (Primary Grade 12 Focus)

HS-ESS3-1

Construct an explanation for the availability of natural resources based on geoscience processes.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Resource Distribution & Earth Systems**
Students analyze geological processes affecting resource availability

- **LabXchange – Earth Resources & Sustainability Simulations**
Case-based analysis of mineral, water, and energy resources

Skills Supported

- Cognitive: systems reasoning, causal explanation
 - Motor: data filtering, interactive map analysis
-

HS-ESS3-2

Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources.

Best-Matched Virtual Labs

- **Stile Education – Energy Resource & Sustainability Simulations**
Students compare trade-offs between renewable and non-renewable resources
- **ExploreLearning Gizmos – Energy Systems & Resource Use**
Quantitative modeling of efficiency and impact

Skills Supported

- Cognitive: evaluation, cost-benefit analysis
 - Motor: adjusting parameters, interpreting output graphs
-

HS-ESS3-4

Evaluate or refine solutions that reduce human impacts on Earth systems.

Best-Matched Virtual Labs

- **Stile Education – Climate Change & Human Impact Scenarios**
Students test mitigation strategies and refine solutions
- **LabXchange – Climate Models & Sustainability Labs**
Scenario-based modeling of long-term impacts

Skills Supported

- Cognitive: optimization, solution refinement

- Motor: scenario manipulation, variable control
-

LIFE SCIENCE — ECOSYSTEMS & BIODIVERSITY

HS-LS2-7

Design, evaluate, and refine solutions for reducing human impacts on the environment and biodiversity.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Ecosystem Services & Biodiversity Models**
Students test conservation strategies quantitatively
- **Stile Education – Conservation & Ecosystem Management Simulations**
Design-test-revise cycles focused on biodiversity protection

Skills Supported

- Cognitive: engineering design, systems evaluation
 - Motor: precision adjustments, iterative testing
-

HS-LS2-8

Evaluate evidence for the role of group behavior in species survival and reproduction.

Best-Matched Virtual Labs

- **Stile Education – Population & Group Behavior Simulations**
Students analyze cooperative vs. competitive behaviors
- **ExploreLearning Gizmos – Population Dynamics Models**
Graph-based analysis of survival trends

Skills Supported

- Cognitive: evidence evaluation, pattern recognition
 - Motor: graph manipulation, dataset comparison
-

PHYSICAL SCIENCE — ENERGY, WAVES, & SYSTEMS

HS-PS3-3

Design, build, and refine a device that converts energy from one form to another.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – Energy Conversion & Engineering Labs**
Students design and optimize energy-transfer systems
- **PhET Interactive Simulations – Energy Forms & Changes**
Visual system-level experimentation

Skills Supported

- Cognitive: design optimization, energy reasoning
 - Motor: component manipulation, precision control
-

HS-PS4-5

Communicate technical information about technologies that use wave behavior.

Best-Matched Virtual Labs

- **PhET Interactive Simulations – Waves & EM Applications**
Students model wave behavior in communication and imaging systems
- **ExploreLearning Gizmos – Waves & Signal Transmission**
Structured investigations of wave-based technologies

Skills Supported

- Cognitive: technical communication, model interpretation
 - Motor: interactive modeling, parameter tuning
-

ENGINEERING DESIGN (CAPSTONE LEVEL)

HS-ETS1-3

Evaluate solutions to complex real-world problems based on criteria, constraints, and trade-offs.

Best-Matched Virtual Labs

- **ExploreLearning Gizmos – STEM Cases (High School)**
Multi-variable engineering challenges with authentic data
- **Stile Education – Design-Based Simulations**
Iterative testing and optimization cycles

Skills Supported

- Cognitive: trade-off analysis, systems optimization
- Motor: iterative manipulation, data analysis tools

One-Look Summary (Grade 12)

NGSS Standard	Primary Virtual Lab
HS-ESS3-1	Gizmos / LabXchange
HS-ESS3-2	Stile / Gizmos
HS-ESS3-4	Stile / LabXchange
HS-LS2-7	Gizmos / Stile
HS-LS2-8	Stile / Gizmos
HS-PS3-3	Gizmos / PhET
HS-PS4-5	PhET / Gizmos
HS-ETS1-3	Gizmos / Stile

Why This Works for Grade 12

- **Cognitive demand:** synthesis, evaluation, modeling, optimization
- **Motor demand:** precise graphing, multi-variable control, design iteration
- **NGSS-aligned:** emphasizes SEPs (modeling, argumentation, design) and CCCs (systems, stability & change)

Here is a **clear, educator-friendly “Why This Works for Grades 7–12” section** you can use **as-is** in curriculum documents, grant justifications, or instructional frameworks. It is written to align explicitly with **NGSS intent, adolescent cognitive development, and motor-skill demands** of virtual labs.

Why This Works for Grades 7–12

1. Aligns with Adolescent Cognitive Development (Grades 7–12)

Students in grades 7–12 are transitioning from **concrete reasoning to abstract, systems-level thinking**. Virtual labs are especially effective at this stage because they:

- Make **invisible processes visible** (e.g., particle motion, gene expression, energy transfer)
- Support **model-based reasoning**, a core NGSS expectation at middle and high school
- Allow students to test **“what if” scenarios**, strengthening hypothesis testing and causal reasoning
- Reduce cognitive overload by isolating variables before moving to multi-variable systems

This directly supports NGSS emphasis on **developing and using models, analyzing data, and constructing explanations**.

2. Meets NGSS Three-Dimensional Learning Expectations

The selected virtual labs consistently integrate all **three NGSS dimensions**:

- **Science & Engineering Practices (SEPs)**
Students plan investigations, manipulate variables, analyze data, and engage in argumentation.
- **Disciplinary Core Ideas (DCIs)**
Labs are tightly aligned to grade-band DCIs in Physical Science, Life Science, Earth & Space Science, and Engineering.
- **Crosscutting Concepts (CCCs)**
Systems, cause-and-effect, energy and matter, scale, and stability/change are embedded naturally through simulation.

Virtual labs are uniquely effective at **making CCCs explicit**, which is often difficult to do with text-only instruction.

3. Supports Increasing Motor Precision Without Excessive Fine-Motor Load

Grades 7–12 students are developing **motor precision**, but still benefit from structured digital interaction. Virtual labs support this by requiring:

- Controlled **drag-and-drop** manipulation (components, organisms, variables)
- **Slider adjustments** for quantitative control (temperature, force, concentration)
- **Graph creation and interpretation** (click-plot-analyze)
- Multi-step interaction sequences that reinforce **procedural fluency**

These actions build motor coordination needed for upper-level labs **without penalizing students** who struggle with handwriting, lab equipment, or speed.

4. Improves Equity, Accessibility, and IEP/504 Alignment

Virtual labs remove common barriers present in physical labs:

- No safety risks, fragile materials, or time-pressure constraints
- Repetition without penalty supports **processing speed, working memory,** and **executive-function needs**
- Compatible with **assistive technology** (screen readers, zoom, alternative input devices)
- Easier differentiation for **IEPs, 504s, and multilingual learners**

This supports NGSS's core goal of **science for all students**, not just those who thrive in traditional lab settings.

5. Enables Authentic Engineering Design Cycles

From Grade 7 onward, NGSS increasingly emphasizes **engineering design**. Virtual labs are ideal for this because students can:

- Define problems with constraints
- Test multiple solutions rapidly
- Analyze failures without material loss
- Iterate designs based on evidence

This mirrors **real-world engineering and scientific modeling**, especially at the high-school level.

6. Scales in Rigor from Middle School to High School

The same platforms can be used **vertically across grades**, increasing rigor without changing tools:

- **Grade 7–8:** Guided inquiry, single-variable investigations, scaffolded modeling
- **Grade 9–10:** Multi-variable analysis, quantitative reasoning, CER writing
- **Grade 11–12:** Systems modeling, statistical reasoning, optimization, capstone-level design

This supports **curriculum coherence** and reduces the learning curve for students and teachers.

7. Prepares Students for College, Career, and STEM Pathways

Virtual labs reflect how modern science is actually done:

- Computational modeling
- Data-driven decision-making
- Simulation-based testing
- Systems-level analysis

These skills align strongly with **college science labs, engineering coursework, and STEM careers**, making instruction both standards-aligned and future-focused.

One-Sentence Summary (for reports or admin use)

Virtual labs work for Grades 7–12 because they align with NGSS three-dimensional learning, match adolescent cognitive and motor development, remove access barriers, and support authentic scientific and engineering practices at increasing levels of rigor.

Below are **separate “Summary Table (Quick Reference)” tables for each grade (7–12)** with **Resource, Cost, Best For (cognitive + motor skills), and NGSS Focus**. I used the same high-quality platforms that consistently support NGSS three-dimensional learning in secondary grades (middle + high school). [\[Document | Word\]](#), [\[gizmos.exp...arning.com\]](#), [\[stileeducation.com\]](#), [\[imaginelearning.com\]](#), [\[Document | Word\]](#), [\[teacherspa...achers.com\]](#), [\[Document | Word\]](#)

✔ Grade 7 — Summary Table (Quick Reference)

Resource	Cost	Best For (Cognitive + Motor Skills)	NGSS Focus
Virtual Science Teachers (Middle School NGSS hub)	Free [Document Word]	Guided interactives for modeling, CER, and data sensemaking; dragging, clicking, simple graph tools [Document Word]	MS-LS (cells/ecosystems), MS-ESS (Earth systems), MS-PS (foundations), aligned by NGSS domain [Document Word]
Explore Learning Gizmos (6–8 / NGSS aligned)	Paid (trial available) [educatorst...nology.com]	Inquiry simulations with variable control + graphing; sliders, measurement tools, graph interaction [educatorst...nology.com] , [gizmos.exp...arning.com]	Middle school NGSS practices + DCIs across PS/LS/ESS (used heavily for MS life science & data analysis) [educatorst...nology.com] , [gizmos.exp...arning.com]
Stile Education (NGSS simulations library)	Free & Paid tiers [stileeducation.com]	Scenario-based sims for cause/effect and systems; interactive controls, structured prompts [stileeducation.com]	Middle school NGSS-aligned sims (biology/chemistry/earth/physics concept sims) [stileeducation.com]

✔ Grade 8 — Summary Table (Quick Reference)

Resource	Cost	Best For (Cognitive + Motor Skills)	NGSS Focus
Explore Learning Gizmos	Paid (trial available) [educatorst...nology.com]	Physical science investigations (forces, energy, reactions) with strong data tools; graphing, variable	MS-PS (matter, forces, energy, waves) + engineering practices through inquiry

(Grades 6–8)		control [educatorst...nology.com], [gizmos.exp...arning.com]	labs [educatorst...nology.com], [gizmos.exp...arning.com]
Virtual Science Teachers (Middle School NGSS hub)	Free [Document Word]	Quick NGSS-aligned interactives and CER supports; dragging, selecting evidence [Document Word]	MS-PS/MS-ESS/MS-LS resources organized by NGSS domain for standards targeting [Document Word]
PhET Interactive Simulations (HS-level sims also used in Gr. 8 with scaffolds)	Free [virtualsci...achers.org]	Concept visualization (energy, waves) via guided inquiry; sliders, measurement, interactive models [virtualsci...achers.org], [teacherspa...achers.com]	Strong support for waves/energy modeling and SEP-aligned inquiry (used widely for NGSS-style investigations) [teacherspa...achers.com], [virtualsci...achers.org]

✓ Grade 9 — Summary Table (Quick Reference)

Resource	Cost	Best For (Cognitive + Motor Skills)	NGSS Focus
ExploreLearning Gizmos (Grades 9–12)	Paid (trial available) [Document Word]	HS inquiry labs across bio/chem/physics with differentiation; multi-variable controls, graphs, datasets [Document Word], [gizmos.exp...arning.com]	HS-PS (matter/energy), HS-LS (cells/genetics), HS-ESS (Earth systems) aligned for 9–12 [Document Word], [gizmos.exp...arning.com]
PhET Interactive Simulations	Free [virtualsci...achers.org]	Physics/chem visual modeling; great for guided inquiry and conceptual change; interactive measurement + parameter changes [virtualsci...achers.org], [teacherspa...achers.com]	HS physical science modeling (energy, matter states, waves) supports NGSS-style SEPs [virtualsci...achers.org], [teacherspa...achers.com]
LabXchange	Free [imaginelearning.com]	Biology & biomed simulations (e.g., gels, diffusion) + curated sequences; step-based virtual	HS life science investigations and data interpretation aligned to NGSS-supporting

		lab workflows [imaginelearning.com]	resources [imaginelearning.com]
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✓ Grade 10 — Summary Table (Quick Reference)

Resource	Cost	Best For (Cognitive + Motor Skills)	NGSS Focus
Stile Education (NGSS simulations)	Free & Paid tiers [stileeducation.com], [Document Word]	Chemistry-heavy sims (reaction rates, energy change) and scenario tasks; variable tuning, interpreting outputs [stileeducation.com], [Document Word]	HS chemistry/physical science concept sims aligned to NGSS practices and phenomena-based learning [stileeducation.com]
Explore Learning Gizmos (Grades 9–12)	Paid (trial available) [Document Word]	Quantitative chem/physics labs with graphing + analysis; precision sliders, graph tools, data tables [Document Word], [gizmos.exp...arning.com]	HS-PS1/PS2/PS3 strands (matter, forces, energy) + engineering-style investigations [Document Word], [gizmos.exp...arning.com]
PhET Interactive Simulations	Free [virtualsci...achers.org]	Periodic trends, energy forms, particle models; interactive experimentation [virtualsci...achers.org], [teacherspa...achers.com]	HS physical science inquiry supporting SEPs (modeling, investigating, analyzing data) [virtualsci...achers.org], [teacherspa...achers.com]

✓ Grade 11 — Summary Table (Quick Reference)

Resource	Cost	Best For (Cognitive + Motor Skills)	NGSS Focus
Explore Learning Gizmos (Grades 9–12)	Paid (trial available) [Document Word]	Biology simulations (genetics, evolution, ecosystems) with data analysis; graphing, model manipulation [Document Word], [gizmos.exp...arning.com]	HS-LS2/LS3/LS4 (ecosystems, heredity, evolution) + SEP-heavy inquiry labs [Document Word], [gizmos.exp...arning.com]
LabXchange	Free [teacherspa...achers.com]	Bio techniques & case-based investigations (e.g., gel electrophoresis); sequenced, interactive lab activities [teacherspa...achers.com]	HS life science lab practices + data reasoning that support NGSS alignment [teacherspa...achers.com]

PhET Interactive Simulations	Free [teacherspayteachers.com]	Waves/EM & model evaluation (wave/particle evidence); parameter control, data visualization [teacherspayteachers.com], [teacherspayteachers.com]	HS-PS4 waves & EM radiation support via modeling and evidence evaluation [teacherspayteachers.com], [teacherspayteachers.com]
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✔ Grade 12 — Summary Table (Quick Reference)

Resource	Cost	Best For (Cognitive + Motor Skills)	NGSS Focus
ExploreLearning Gizmos (Grades 9–12)	Paid (trial available) [Document Word]	Capstone-level investigations and STEM cases; multi-step modeling, graphing, optimization [Document Word], [gizmos.explorelearning.com]	HS engineering/design + advanced PS/LS/ESS applications through inquiry and STEM cases [Document Word], [gizmos.explorelearning.com]
Stile Education (NGSS simulations)	Free & Paid tiers [stileeducation.com]	Systems-level scenarios (human impact, resources) and decision-making; interactive scenario controls [stileeducation.com]	HS Earth & human activity + solution design contexts aligned to NGSS-style reasoning [stileeducation.com]
LabXchange	Free [teacherspayteachers.com]	Advanced bio/environment sequences + simulations; guided inquiry pathways [teacherspayteachers.com]	HS life science investigations and evidence-based reasoning support (great for capstone projects) [teacherspayteachers.com]