

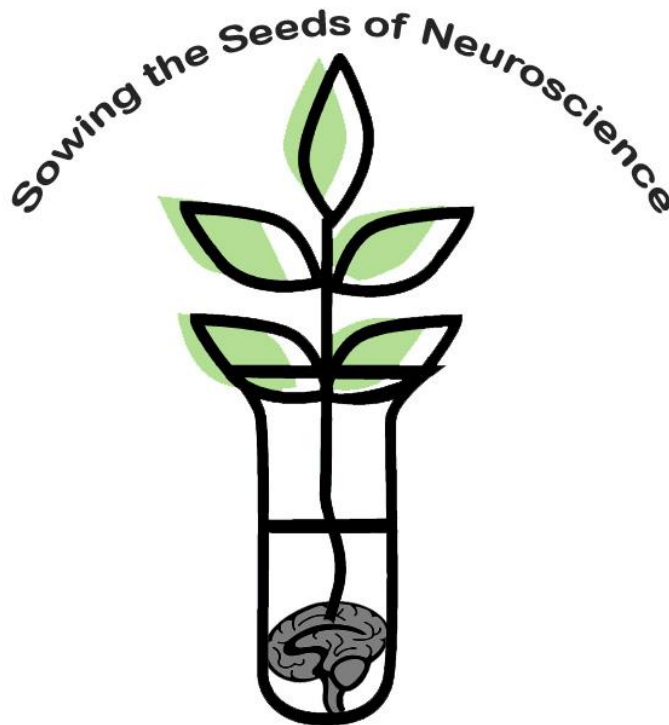
Sowing the Seeds of Neuroscience

A Kit-Based Curriculum for
Students in Grades 6-8



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<http://www.neuroseeds.org/>

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About Sowing the Seeds of Neuroscience

Sowing the Seeds of Neuroscience is a project supported by the National Institutes of Health to develop, evaluate, and disseminate a new neuroscience education resource for middle school students. This new material focuses on the neuroactive properties of plants and herbs and is responsive to national and state guidelines for science education.



The high incidence of neurological and mental illnesses in our society makes it likely that children will encounter someone they know who has been affected by a disease or disorder of the brain. The significant economic and emotional costs of neurological and mental illnesses make it imperative that we all understand the implications of these disorders. We can help people learn how to avoid these disorders and make better health decisions. A knowledgeable public can make healthier lifestyle choices that will reduce the burden of these disorders. Moreover, individuals who are scientifically literate are more likely to support biomedical research than those who are not informed about research and medical issues. The *Sowing the Seeds of Neuroscience* curriculum focuses on the neuroactive properties of plants and herbs to educate students about neuroscience and related careers.

Core Concepts

Our core concepts are derived primarily from the Society for Neuroscience's framework, *Neuroscience Core Concepts* (<http://www.sfn.org/coreconcepts>), and include:

- The nervous system controls and responds to body functions and directs behavior.
- The brain is the body's most complex organ.
- Neurons communicate using electrical and chemical signals.
- Life experiences change the nervous system.
- The brain is the foundation of the mind; intelligence arises as the brain reasons, plans, and solves problems.
- Brain research promotes health and leads to understanding and therapies.
- Neuroscience research must be done in an ethical manner.
- The plant world is filled with species that contain chemicals with medical properties, including neuroactive properties.
- There are many people with mental and neurological disorders in our society.

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Alignment to Learning Standards

Washington State Essential Academic Learning Requirements (EALRs): Science

	Neuroscience 101	Infusions & Decoctions	Chromatography	If Worms Drank Coffee	Heads & Tails	Botanical Superheroes	Botanical Heart Throbs	SpikerBox
EALR 1: Systems								
6-8 SYSA—Subsystems: Any system may be thought of as containing subsystems and as being a subsystem of a larger system.	•			•			•	•
EALR 2: Inquiry								
6-8 INQA—Question: Scientific inquiry involves asking and answering questions and comparing the answer with what scientists already know about the world.		•	•	•	•	•	•	•
6-8 INQB—Investigate: Different kinds of questions suggest different kinds of scientific investigations.		•			•	•	•	•
6-8 INQC—Investigate: Collecting, analyzing, and displaying data are essential aspects of all investigations.				•	•	•	•	
6-8 INQD—Investigate: For an experiment to be valid, all (controlled) variables must be kept the same whenever possible, except for the manipulated (independent) variable being tested and the responding (dependent) variable being measured and recorded. If a variable cannot be controlled, it must be reported and accounted for.				•	•	•	•	
6-8 INQE—Model: Models are used to represent objects, events, systems, and processes. Models can be used to test hypotheses and better understand phenomena, but they have limitations.	•		•		•		•	•
6-8 INQF—Explain: It is important to distinguish between the results of a particular investigation and general conclusions drawn from these results.				•	•		•	•
6-8 INQI—Consider Ethics: Scientists and				•	•		•	•

engineers have ethical codes governing animal experiments, research in natural ecosystems, and studies that involve human subjects.								
EALR 3: Application								
6-8 APPC: Science and technology are interdependent. Science drives technology by demanding better instruments and suggesting ideas for new designs. Technology drives science by providing instruments and research methods.								•
6-8 APPG: The benefits of science and technology are not available to all the people in the world.			•					
6-8 APPH: People in all cultures have made and continue to make contributions to society through science and technology.		•				•		
EALR 4: Physical Science								
6-8 PS2A: Substances have characteristic intrinsic properties such as density, solubility, boiling point, and melting point, all of which are independent of the amount of the sample.			•					
6-8 PS2B: Mixtures are combinations of substances whose chemical properties are preserved. Compounds are substances that are chemically formed and have different physical and chemical properties from the reacting substances.			•					
EALR 4: Life Science								
6-8 LS1A: All organisms are composed of cells, which carry on the many functions needed to sustain life.					•			
6-8 LS1C: Multicellular organisms have specialized cells that perform different functions. These cells join together to form tissues that give organs their structure and enable organs to perform specialized functions within organ systems.					•		•	•

Source: State of Washington Office of Superintendent of Public Instruction. (December 2008). *Washington State K-12 Health and Fitness Learning Standards*. <http://www.k12.wa.us/HealthFitness/Standards.aspx>.

Next Generation Science Standards (NGSS)

	Neuroscience 101	Infusions & Decoctions	Chromatography	If Worms Drank Coffee	Heads & Tails	Botanical Superheroes	Botanical Heart Throbs	SpikerBox
From Molecules to Organisms: Structures and Processes								
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.	●				●			
MS-LS1-3: Use arguments supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.	●			●	●		●	●
MS-LS1D-8: Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.	●	●		●			●	●
Growth, Development, and Reproduction of Organisms								
MS-LS1-5: Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.						●		

Source: NGSS Lead States. (2013). *Next Generation Science Standards: For States, By States*. Achieve, Inc. on behalf of the twenty-six states and partners that collaborated on the NGSS.

Common Core Standards: Mathematical Practice

	Neuroscience 101	Infusions & Decoctions	Chromatography	If Worms Drank Coffee	Heads & Tails	Botanical Superheroes	Botanical Heart Throbs	SpikerBox
CCSS.Math.Content.6.SP.B.5c: Summarize numerical data sets in relation to their context, such as by giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.				•				
CCSS.Math.Content.8.SP.A.1: Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.				•				

Source: Common Core State Standards Initiative. (2010). *Common Core Standards for Mathematics*. National Governors Association Center for Best Practices and the Council of Chief State School Officers.

Common Core Standards: English Language Arts (ELA)

	Neuroscience 101	Infusions & Decoctions	Chromatography	If Worms Drank Coffee	Heads & Tails	Botanical Superheroes	Botanical Heart Throbs	SpikerBox
Reading Standards for Literacy in Science and Technical Subjects 1 & 3: Key Ideas & Details								
CCSS.ELA-Literacy.RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts.		•		•	•	•	•	•
CCSS.ELA-Literacy.RST.6-8.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.		•	•	•	•	•	•	•
Writing Standards for Literacy in Science and Technical Subjects 2d: Text Types & Purposes								
CCSS.ELA-Literacy.WHST.6-8.2d: Use precise language and domain-specific vocabulary to inform about or explain the topic.		•	•	•	•	•	•	•
CCSS.ELA-Literacy.WHST.6-8.2f: Provide a concluding statement or section that follows from and supports the information or explanation presented.				•	•	•	•	•
Language Standard 4c & 6: Vocabulary Acquisition & Use								
CCSS.ELA-Literacy.L.6.4c: Consult reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech.	•	•	•	•	•	•	•	•
CCSS.ELA-Literacy.L.6.6: Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.	•	•	•	•	•	•	•	•

Source: Common Core State Standards Initiative. (2010). *Common Core Standards for English Language Arts*. National Governors Association Center for Best Practices and the Council of Chief State School Officers.