

	Basic topics (year 1)	Intermediate topics (year 2)	Advanced topics (year 3)
<b>Fall</b>	<b>Soil and water quality</b>	<b>Environmental monitoring</b>	<b>Food supply</b>
<b>Workshop 1</b> – activity 1 – activity 2 – activity 3	<i>Elements in soil and water</i> Core ideas: 5-LS2-1, MS-LS2-5 – Introduction and brainstorming – Nitrogen and phosphorous cycle (CSA, Mendez) – Potassium cycle and NPK testing	<i>Computer programming</i> Core ideas: MS-ETS1-1 – Computers follow directions (CSA) – Computers do math, quickly (CSA) – Using variables (CSA)	<i>Gene assays</i> Core ideas: HS-LS1-1, HS-ETS1-2, HS-ETS1-3 – Designing PCR primers (CSA, Vivic)
<b>Workshop 2</b> – activity 1 – activity 2 – activity 3	<i>Quantifying colors and concentrations</i> Core ideas: MS-PS4-2, HS-PS4-1, HS-ESS1-2 – Spectroscopy + colorimeter – Mixing colors (CSA) – How much is in there?	<i>Programming and microcontrollers</i> Core ideas: HS-ESS3-3 – Conditionals (CSA) – Loops (CSA) – Microcontrollers (CSA)	– Detection of GMO genes, etc. (CSA)
<b>Workshop 3</b> – activity 1 – activity 2 – activity 3	<i>Water quality testing: Kool-Aid and iron</i> Core ideas: CCSS.Math.Content.HSF-LE.A.2 – Plotting lines – Kool-Aid measurement – Iron measurement	<i>Sensors and electronics</i> Core ideas: MS-ESS3-3 – Circuits (CSA) – Sensors (CSA, Vivic) – Environmental monitoring (CSA, Vivic, Mendez)	<i>Metal assays</i> Core ideas: HS-PS1-1, HS-ETS1-2, HS-ETS1-3 – Electrochemical detection (CSA, Mendez, Roukes, IO Rodeo) – Detection of organic mercury, etc. (CSA, Mendez, Roukes, IO Rodeo)
<b>Winter</b>	<b>Pest control</b>	<b>Airborne sensing</b>	<b>Air quality</b>
<b>Workshop 1</b> – activity 1 – activity 2 – activity 3	<i>Optical instrumentation</i> Core ideas: MS-PS4-2, HS-ETS1-2 – Refractive optics – Designing a camera – Making a telescope	<i>Aeronautics</i> Core ideas: MS-PS2-2, HS-ETS1-2, HS-ETS1-3 – Building a flying wing (CSA) – Building an airplane (CSA) – Energy efficiency and limits of flight (CSA)	<i>Chemical sensors</i> Core ideas: HS-PS1-3, HS-ETS1-2, HS-ETS1-3 – Electronic nose sensors (CSA, Vivic, IO Rodeo)
<b>Workshop 2</b> – activity 1 – activity 2 – activity 3	<i>Fruit flies</i> Core ideas: MS-LS3-1, HS-LS3-1 – Exploring the microscopic world – Fruit flies + mutation photos – Trapping fruit flies	<i>Remote sensing</i> Core ideas: MS-ESS3-3, HS-ETS1-2, HS-ETS1-3 – Camera/airframe integration (CSA, IO Rodeo) – Multispectral imaging (CSA, IO Rodeo) – Hyperspectral imaging (CSA, IO Rodeo)	– Detection of natural gas, etc. (CSA, Vivic, IO Rodeo)
<b>Workshop 3</b> – activity 1 – activity 2 – activity 3	<i>Ants</i> Core ideas: MS-LS2-3 – Set up an ant colony (CSA, Hay) – Food retrieval (CSA, Hay) – Ant trail study (CSA, Hay)	<i>Chemical sensing</i> Core ideas: MS-ESS3-3, HS-ETS1-2, HS-ETS1-3 – Global positioning system (CSA) – Data logging and airborne sensors (CSA)	<i>Particulate sensors</i> Core ideas: MS-PS4-2, HS-ETS1-2, HS-ETS1-3 – Particle counting sensors (CSA, Vivic, IO Rodeo) – Detection of pollen, etc. (CSA, Vivic, IO Rodeo)
<b>Spring</b>	<b>Plant processing</b>	<b>Bacterial detection</b>	<b>Coastal health</b>
<b>Workshop 1</b> – activity 1 – activity 2 – activity 3	<i>Separating compounds</i> Core ideas: HS-PS1-3 – Dyes from plants (CSA, Mendez) – Cheese from milk (CSA, Mendez) – Colors inside plants (CSA, Mendez)	<i>Separations and extractions</i> Core ideas: HS-PS1-3 – Capsaicin from peppers (CSA, Mendez) – Fluorescent painting (CSA) – Crashing out a salt (CSA)	<i>Field survey</i> Core ideas: HS-LS2-6, HS-LS2-7, HS-ESS3-1 – Field survey (CSA, Mendez)
<b>Workshop 2</b> – activity 1 – activity 2 – activity 3	<i>Orange oil from orange peels</i> Core ideas: MS-PS1-3, HS-PS1-3 – Distillation of orange oil – Extraction of orange oil	<i>DNA extraction</i> Core ideas: HS-LS1-1, HS-PS1-3 – DNA from plants (CSA, Hay) – Growing bacteria (CSA, Hay, IO Rodeo) – DNA from bacteria (CSA, Hay)	<i>Web-enabled visualization</i> Core ideas: HS-LS2-6, HS-LS2-7, HS-ESS3-1
<b>Workshop 3</b> – activity 1 – activity 2 – activity 3	<i>Aspirin from willow bark</i> Core ideas: HS-PS1-3, HS-PS1-7 – Extraction of salicylic acid (CSA, Mendez) – Acetylation to produce aspirin (CSA, Mendez)	<i>DNA amplification and analysis</i> Core ideas: HS-LS1-1, HS-PS1-3 – Polymerase chain reaction (CSA, Hay, IO Rodeo) – Running a gel (CSA, Hay, IO Rodeo)	– GIS integration and visualization (CSA)