

Third Grade Science
Mushroom Maestros - Suggested Number of Days 45-50

Standards		ELPS Standards or Mathematical Practice	Other Content Standards Connections
Focus Standards	<p>3-LS4-2. Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.</p> <p>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.</p> <p>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.</p> <p>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.</p>	<p>Math Standards</p> <p>MP.1 Make sense of problems and persevere in solving them.</p> <p>MP.2 Reason abstractly and quantitatively.</p> <p>4.OA.1-3 Use the four operations with whole numbers to solve problems.</p>	<p>ELA Standards</p> <p>RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea. RI.3.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a <i>grade 3 topic or subject area</i>.</p> <p>W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly. W.3.4 With guidance and support from adults, produce writing in which the development and organization are appropriate to task and purpose. (Grade-specific expectations for writing types are defined in standards 1-3 above.) W.3.5 With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing. W.3.6 With guidance and support from adults, use technology to produce and publish writing (using keyboarding skills) as well as to interact and collaborate with others. W.3.7 Conduct short research projects that build knowledge about a topic. W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.</p> <p>SL.3.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on <i>grade 3 topics and texts</i>, building on others' ideas and expressing their own clearly. SL.3.3 Ask and answer questions about information from a speaker, offering appropriate elaboration and detail. SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. SL.3.6 Speak in complete sentences when appropriate to task and situation in order to provide requested detail or clarification.</p> <p>L.3.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. L.3.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. L.3.4 Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.</p>
Other Content Standards	<p>Art Standards (in progress)</p> <p>Anchor Standard 1 <i>Generate and conceptualize artistic ideas and work.</i></p> <p>Performance Standard (VA:Cr1.1.2) a. <i>Brainstorm collaboratively multiple approaches to an art or design problem.</i></p> <p>Enduring Understanding: <i>Creativity and innovative thinking are essential life skills that can be developed.</i></p> <p>Essential Question: <i>What conditions, attitudes, and behaviors support creativity and innovative thinking? What factors prevent or encourage people to take creative risks? How does collaboration expand the creative process?</i></p>	<p>ELPS</p> <p>TBD</p>	

**Overarching Enduring Understanding –
How and why do traits develop and how can humans use them to solve problems and develop technology?**

CONCEPTUAL FLOW OF INSTRUCTION

<p>3-LS4-2. Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.</p>	<p>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.</p>	<p>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.</p>
<p>Investigation - “Stolen from Nature” (mini research project, occurs during week 1) Students gather, analyze and interpret data to look critically at the similarities and differences of various organisms in nature and start constructing explanations about why similar organisms may be different (3-LS3-1) and what purpose those differences serve (3-LS4-2). For the activity students find something from nature that we use – either directly or modified – And ask the following questions: <i>Which traits make the organism useful to us? Are there traits that might make it less useful? Are their versions of the organism that are less useful? What traits don’t matter? Why did some attributes develop and others not?</i> (e.g. Pine trees (tall, straight); Bamboo (tall, straight, grows fast); Madrona trees (slow-growing, curvy))</p> <p>Investigation – Hi Fungi! Are you a friend or foe? (research activity, occurs during week 3) Students do research to gather evidence and data on why different traits/characteristics developed in various fungi species. They will compare and similarities and differences that exist between parents and offspring, as well as different versions of between versions.</p> <p>Investigation – Terrific Traits (Summative Challenge, occurs during weeks 4, 5, and 6) After some practice with looking at species variations and identifying different characteristics and traits, students will pick a plant or fungi inspired technology for the summative challenge. In this challenge students must construct an explanation, by providing evidence, of why the plant or fungi has developed the way that it has. This explanation should include both the variations in a given trait and why some versions of those variations are more useful than others.</p>	<p>Investigation - “Stolen from Nature” (mini research project, occurs during week 1) Students gather, analyze and interpret data to look critically at the similarities and differences of various organisms in nature and start constructing explanations about why similar organisms may be different (3-LS3-1) and what purpose those differences serve (3-LS4-2). For the activity students find something from nature that we use – either directly or modified – And ask the following questions: <i>Which traits make the organism useful to us? Are there traits that might make it less useful? Are their versions of the organism that are less useful? What traits don’t matter? Why did some attributes develop and others not?</i> (e.g. Pine trees (tall, straight); Bamboo (tall, straight, grows fast); Madrona trees (slow-growing, curvy))</p> <p>Investigation – Which Kingdom are you from? Who are you more closely related to? (Sorting game, occurs during week 2) As students learn about the kingdoms and biological classification, they will look at traits in various organisms and fungi and patterns associated with those traits. Areas of focus include: connections between parents and off-spring and connections between different types of animals (classes and species).</p> <p>Investigation – Hi Fungi! Are you a friend or foe? (research activity, occurs during week 3) Students do research to gather evidence and data on why different traits/characteristics developed in various fungi species. They will compare and similarities and differences that exist between parents and offspring, as well as different versions of between versions.</p> <p>Investigation – Terrific Traits (Summative Challenge, occurs during weeks 4, 5, and 6) After some practice with looking at species variations and identifying different characteristics and traits, students will pick a plant or fungi inspired technology for the summative challenge. In this challenge students must construct an explanation, by providing evidence, of why the plant or fungi has developed the way that it has. This explanation should include both the variations in a given trait and why some versions of those variations are more useful than others.</p>	<p>Investigation – Mushroom Packaging (hands-on activity, occurs during weeks 2, 3, and 4)</p> <p>In small groups students will mix, grow, mold, and track the creation of mycelium-based products from a dormant material (<i>substrate</i>) over the course of 10 days. In the beginning they will outline design and evaluation criteria as well as the project constraints. Through-out the process they will make observations about any changes in material processing and performance with respect to the initially stated constraints and criteria for their design. At the end students will evaluate their product with respect to their initially stated performance criteria, compare their product with their classmates and suggest possible improvements.</p>

Essential Questions	Unit Assessments
<p><u>3-LS4-2</u>, <u>3-LS3-1</u>. Why do living organisms develop the way they do and what can I learn from them to help me solve challenges or create new inventions?</p> <p><u>3-5-ETS1-1</u>, <u>3-5-ETS1-2</u>. Given Earth's limited resources, what are some ways humans can make better, more environmentally friendly packaging material?</p> <p>Mushroom Materials (<u>3-5-ETS1-1</u>, <u>3-5-ETS1-2</u>) There are many questions throughout the lessons. Students will be focusing on the following:</p> <ul style="list-style-type: none"> • What are some examples of packaging material? • What are the main goals (or function) of packaging material? • Pick one requirement from your list on page 3 that you will observe throughout evaluate at the end of the mushroom packaging activity. Why did you choose that requirement? • Outline here how you are going to observe and evaluate that requirement? • What are some of the other constraints with the mushroom packaging activity? • What packaging material requirement did you identify at the beginning as the one you wanted to evaluate? • Describe your observations and evaluation of the mushroom packaging material with respect to that requirement. • What are some improvements you would suggest for the mushroom packaging material or process? They DO NOT NEED to be related to the requirement you have been tracking. <p>Hi Fungi! Are you a friend or foe? (<u>3-LS4-2</u>, <u>3-LS3-1</u>) There are many questions throughout the lessons. Students will be focusing on the following:</p> <ul style="list-style-type: none"> • Why have fungi developed in different ways? • What are some key physical traits of the fungi (what does it look like)? • What are some key chemical traits of the fungi (can we eat it)? • What types of variations exist within that type of fungi? • How are the off-spring similar to their parents? How are they different. • Why did you choose this fungi to investigate? <p>Terrific Traits? (<u>3-LS4-2</u>, <u>3-LS3-1</u>)</p> <ul style="list-style-type: none"> • What are at least two special traits possessed by the plant or fungus? Why have they developed that way? How does it help the organism? • What is a technology that has taken inspiration from the plant or fungus? • How is that technology currently used? What is a new use for it? 	<p>Formative</p> <p>Exit Tickets</p> <ul style="list-style-type: none"> • Name two plants used by humans and a reason why we use them? • In your own words, describe the difference between a characteristic and a trait. Give an example of each. • What are the three/six kingdoms discussed? • What are fungi? Name an example of or part of a fungus. • Name five characteristics that you share with your classroom neighbor. Describe your traits for these characteristics. Name five characteristics that you share with a relative (parents, siblings, aunts, uncles, grandparents, etc.). Describe your traits for those characteristics. Are you more similar to your relatives for your friend? Why do you think that is? • What is mycelium and why is it important to Ecovative? To the fungus? • Why is Ecovative packing good for the environment? • Describe a plant, animal, or fungus trait you think is cool. Be sure to explain why you think it is cool. <p>Shorter activities</p> <ul style="list-style-type: none"> • Stolen from Nature • Which Kingdom are You From? Who are you more closely related to? <p>Writing prompts and reading comprehension questions</p> <ul style="list-style-type: none"> • Introductory Phenomena: Why can mushrooms grow in the dark? How are they similar to and different from plants? Why do you think they have those differences? • Why is it important that we get the most out of the materials we use? • What are three ways we can reduce the amount of waste we generate? • Why is it important to reduce the amount of energy and resources that go into making new materials? What are some ways we can do this? <p>Summative</p> <p>Mushroom Materials</p> <p><u>3-5-ETS1-1</u>. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.</p> <p><u>3-5-ETS1-2</u> 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.</p> <p>At the end of the mushroom growing activities students should reflect on their design, the materials performance, etc. This reflection should be done individually or in small groups (either written or written and oral) and then shared with the class as a whole for a guided discussion. Discussion guiding questions include:</p> <ul style="list-style-type: none"> • What might you do to improve your product? • What other things could you try for a mold? What requirements do you think there are for a mold? Why do you think that? <p>Hi Fungi! Are you a friend or foe?</p> <p><u>3-LS4-2</u> Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.</p>

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.

Students do research to gather **evidence and data on why different traits/characteristics developed in various fungi species. They will compare** and similarities and differences that exist between parents and offspring, as well as different versions of between versions.

Terrific Traits Summative Challenge

3-LS4-2. Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.

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.

After some practice with looking at species variations and identifying different characteristics and traits, students will pick a plant or fungi inspired technology for the summative challenge. In this challenge students must construct an explanation, by **providing evidence**, of why the plant or fungi has developed the way that it has. This explanation should include both the variations in a given trait and why some versions of those variations are more useful than others. Students must then form connections between how that trait helps the plant, animal, or fungi and how humans could create a bio-inspired innovation to solve a similar problem that humans face.

Common Misconceptions: In progress

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Core Resources	Intervention Resources	Enrichment Resources
<p>CreositySpace Educator Guides Mushroom Maestros Book of Ideas</p> <p>Student Notebooks <i>My STEM Explorer Notes™</i> <i>My STEM Stories™</i> <i>Book of Ideas</i> – Young Inventor Journal</p> <p>CreositySpace Online Resources Mushroom Maestros Digital Forum</p> <p>CreositySpace Videos <i>Ecovative Company</i> <i>Ecovative FireSci™ Chat</i> <i>Mushroom Packaging How-to Video</i></p> <p>Mushroom Maestros Activity Kit Mycelium Materials, Planter molds Classification Chart Books: Fungi: Mushrooms, Toadstools, Molds, Yeasts, and Other Fungi - Judy Wearing It's a Fungus Among Us: The Good, the Bad & the Downright Scary - Carla Billups, Dawn Cusick Read About Fungi - Reading Fun for Kids - Elle Simms</p>	<p>TBD</p>	<p>In progress</p> <p>Mushroom Materials Additional follow-up activities are included on page 25 of the educator guide.</p> <p>Additional Summative Challenges</p> <p>Additional writing prompts and investigations</p>
<p>Supplemental Resources Flour, Water, Large mixing containers and mixing spoons</p>		
<p>Additional Online Resource to Support the Teaching of this Unit</p> <p>Still under development</p> <p>Videos http://www.youtube.com/watch?v=dRXNo7Ieky8 Video (5:56 min) about how to start a compost program at school. http://www.homegrownfun.com/composting-classroom/ Video (3:54min) about a composting fair at an elementary school in California. https://www.youtube.com/watch?v=ffuZ9QYVbJ4 Video on biodegradable plastics (4:44 min, may be better for grade 4 and 5). https://www.youtube.com/watch?v=5M_eDLyfpz8 Make your own bioplastic. https://www.ted.com/talks/eben_bayer_are_mushrooms_the_new_plastic A Ted Talk from Eban on plastics, Ecovative and mushroom materials. https://www.youtube.com/watch?v=HLtGRHX0sLl (3.49 min, no ad) –This is a cool video on how mushrooms grow.</p> <p>Interesting Articles http://kidshealth.org/kid/talk/ga/germs.html Article from Kids Health on germs, designed for kid audience. http://www.timetorecycle.com/compost/bokashi.asp Web article for teachers comparing the bio-digester method to the Bokashi method of composting. http://www.chem4kids.com/files/react_catalyst.html Kid-friendly information on catalysts.</p>		

<http://illumin.usc.edu/134/microbial-fuel-cells-generating-power-from-waste/> A more advanced article on microbial fuel cells that turn waste into energy.

Websites

<http://sheppardsoftware.com/content/animals/kidscorner/foodchain/decomposers.htm> Student-friendly information on decomposers
<http://www.sciencekids.co.nz/topics.htm> An interactive website with many science topics to explore. For this unit, explore recycling and technology. Many teacher resources, interesting facts for students, worksheets, etc.

Company Website

Living Ink makes ink algae that can be printed onto papers, greeting cards, and more. <https://livingink.co/>
 BioMASON uses bacteria to make bricks. <https://biomason.com/>
 Orbella Fragrant Moss is a home air freshener made of living moss. <https://orbellamoss.com/>
 Modern Meadow uses collagen (a protein) to make leather. <http://www.modernmeadow.com/>
 Tidal Vison uses waste salmon skin to make various leather alternatives. <https://store.tidalvisionusa.com/>
 Bolt Thread is developing super strong silk threads. <https://boltthreads.com/>
 Evrnu is developing a new process to recycle fabric. <https://www.evrnu.com/>

Information on biological classification

<https://www.thoughtco.com/six-kingdoms-of-life-373414>

Articles and videos on plant adaptation and survival

<http://science.jrank.org/kids/pages/73/PLANT-SURVIVAL.html>
<https://www.youtube.com/watch?v=Ca4Hc2l6ndE>

<p>Routines and Rituals</p>	<p>Supports for Academic Discourse: Book of Ideas – Young Inventors Journal Brainstorming Justification (evidence) criteria in opinion writing pieces Feedback guidelines</p> <p>Supports for Metacognition: Summary Tables Summative Challenges – exhibition checklists</p> <p>Supports for Questioning: KWHLAQ Charts Pictures (<i>What do you see? What do you know? What do you want to know?</i>) Innovation and brainstorming prompts.</p>
<p>Technology Skills and Tools</p>	<p>Online research Presentation development (optional)</p>