Chariho Regional School District

Science Curriculum Update

School Committee Meeting

June 22, 2021

Science Curriculum Task Force

Jane Daly- Assistant Superintendent - Leader of the Task Force

K-4: Kate Ficarra

Gr. 5-8: Stephen Cormier & Bethany Confessore

Gr. 9-12: Martha Dion & Alexandra Romano

John Labriola - Gr. 5-8 Science Content Leader

Kathryn Sagamang - Gr. 9-12 Science Department Head

Susie Scanapieco - Gr. 5-12 STEM Specialist

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Epistemological Foundations

The Chariho Regional School District believes that students learn best when they are actively engaged in and personally responsible for the learning process. Students need a safe and positive environment in which to talk purposefully about learning, to experience learning, and to observe learning. Learning is enhanced when students have an interest in and choice about what they learn. Students should be engaged in meaningful learning experiences that match their developmental status.

New learning builds on previous knowledge through a process that is challenging and rigorous. That process must encourage students to problem-solve and to think originally, critically, and creatively. Thinking and problem-solving are closely linked to a demanding core of content knowledge. Learning is most quickly assimilated when connected to student goals, when students evaluate their own work and learning habits, and when instruction appeals to a variety of learning modalities and talents.

In an environment of high expectations, sustained and directed student effort and expert teaching practices determine the extent of learning. Our schools and District will organize to encourage and support both.

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Introduction

The Chariho Regional School District recognizes the need to reform the science curriculum so that it serves to communicate a clear and unified vision of teaching and learning for educators, students, and the community. This curriculum aligns with the *Next Generation Science Standards (NGSS)* adopted by the state and derived from the *Framework for K-12 Science Education* and reflect current best practice in science teaching.

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District Mission

The Chariho Regional School District ensures that all students meet high academic standards and are prepared for lifelong learning and productive global citizenship.

District Vision

With a commitment to continuous improvement, the District's highly-qualified staff engages with students in state-of-the-art facilities to master challenging content, to promote creativity, and to foster critical thinking. The District is recognized by the community as its greatest asset.

District Beliefs

We believe that high academic standards and research informed decision making are critical…

Rigorous academic standards and high expectations, along with a robust and responsive system of supports, are the foundation of thise school district.
All professionals operate from a belief that all students can learn at high levels and meet or exceed demanding standards.
All students at every level must be engaged in challenging academic experiences.
Instructional and program decisions must be data-informed and ~~research~~evidence-based.
Learning is a continuous lifelong process.
Schools must prepare students to be creative and critical thinkers, problem solvers, and effective communicators.
The physical, social, and emotional wellness of every child is necessary for optimum learning along with a robust support system.

We believe that the larger community must be fully engaged in the learning process…

Education is a shared responsibility of students, parents, staff, and the community.
Students thrive when supported, nurtured, and engaged by the community.
In an environment that emphasizes school safety, everyone must be treated with kindness, dignity, and respect.
Customer service must be a priority.
Schools must prepare students to be team members and leaders, civic-minded, community contributors, and productive citizens ~~in~~ of a global society.

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Report on Knowledge Base for Science Education

The Next Generation Science Standards (NGSS) provide an important opportunity to improve not only science education but also student achievement. Based on the Framework for K–12 Science Education, the NGSS are intended to reflect a new vision for American science education. By using NGSS, this curriculum strives to use practices, crosscutting concepts and disciplinary core ideas to create a three dimensional science experience for all students. Disciplinary ideas are grouped in four domains: the physical sciences; the life sciences; the earth and space sciences; and engineering, technology and applications of science.

The following conceptual shifts in the NGSS demonstrate what is new and different about the NGSS:

- K-12 science education should reflect the interconnected nature of science as it is practiced and experienced in the real world.
- The Next Generation Science Standards are student performance expectations. Performance expectations clarify the expectations of what students will know and be able to do by the end of the grade or grade band.
- The science concepts in NGSS build coherently from K–12. To develop a thorough understanding of scientific explanations of the world, students need sustained opportunities to work with and develop the underlying ideas and to appreciate those ideas' interconnections over a period of years rather than weeks or months.
- The NGSS focus on deeper understanding of content as well as application of content.
- Science and engineering are integrated in the NGSS, from Grades K–12.
- The NGSS are designed to prepare students for college, career, and citizenship.
- The NGSS and Common Core State Standards (English Language Arts and Mathematics) are aligned.

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Hallmarks of Excellence for Science

Desirable Features of the Curriculum

MORE	LESS
• Emphasis on integration of technology. • Developing explanations and designing solutions supported by evidence-based arguments and reasoning. • Systems thinking and modeling to explain phenomena and to give a context for the ideas to be learned. • Students conducting investigations, solving problems, and engaging in discussions with teachers' guidance. • Students discussing open-ended questions that focus on the strength of the evidence to generate claims. • Students reading multiple sources, including science-related magazine and journal articles and web-based resources; students developing summaries of information. • Multiple investigations driven by students' questions with a range of possible outcomes that collectively lead to a deep understanding of established core scientific ideas. • Students explain by writing journals, reports, posters, and developing media presentations. • Provision of supports so that all students can engage in sophisticated science and engineering practices.	• Reliance on textbook as sole source. • Isolated topics. • Rote memorization of isolated facts and terminology without connection to broader concepts. • Repetition of specific activities for similar topics across grade levels. • Learning of ideas disconnected from questions about phenomena. • Teachers providing information to the whole class. • Teachers posing questions with only one right answer. • Students reading textbooks and answering questions at the end of the chapter. • Pre-planned outcomes for "cookbook" laboratories or hands-on activities. • Worksheets. • Oversimplification of activities for students who are perceived to be less able to do science and engineering.

Source: National Research Council. (2015). Guide to Implementing the Next Generation Science Standards (pp. 8-9). Washington, DC: National Academies Press.
http://www.nap.edu/catalog/18802/guide-to-implementing-the-next-generation-science-standards

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Statement of Educational Goals
for
Science

In alignment with Chariho High School's graduation requirements and in order to transform traditional science instruction into meaningful science inquiry, all students will demonstrate the ability to:

- Acquire, analyze, and evaluate information and ideas to effectively solve problems;
- Effectively utilize literacy skills: writing, listening, speaking, reading analysis, and reading interpretation;
- Display technological literacy;
- Be self-directed learners effectively using ideas and information from various disciplines;
- Analyze problems from a global perspective and contribute to society as responsible and skilled citizens;
- Work actively and cooperatively to achieve group goals;
- Display and understanding of scientific content and process as outlined in the national standards;
- Apply their scientific knowledge to real world situations and problems.
- Engage students in observing scientific phenomena using scientific and engineering practices to gain a deeper understanding.
- Encourage students to develop understanding of phenomena based on evidence gleaned from developing and using models, distinguishing patterns in data and identifying cause and effect relationships.
- Promotes critical thinking, problem solving, collaboration, and decision making.
- Prepares pupils for lifelong learning.

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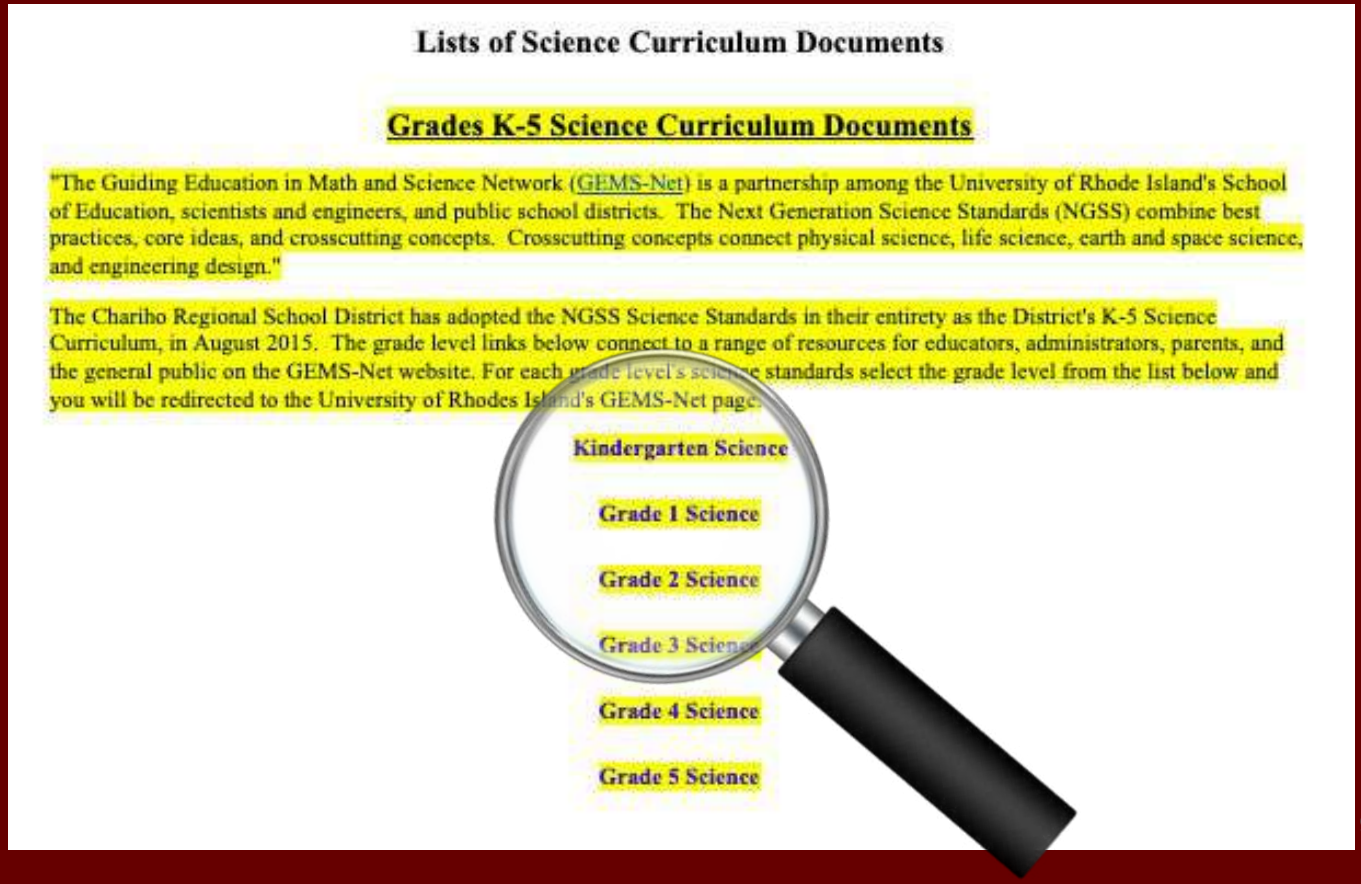
How to View:

To view all curriculum documents, on pages 10-13 of the 2021 Gr. K-12 Chariho Science Curriculum, click on the grade level or course name.



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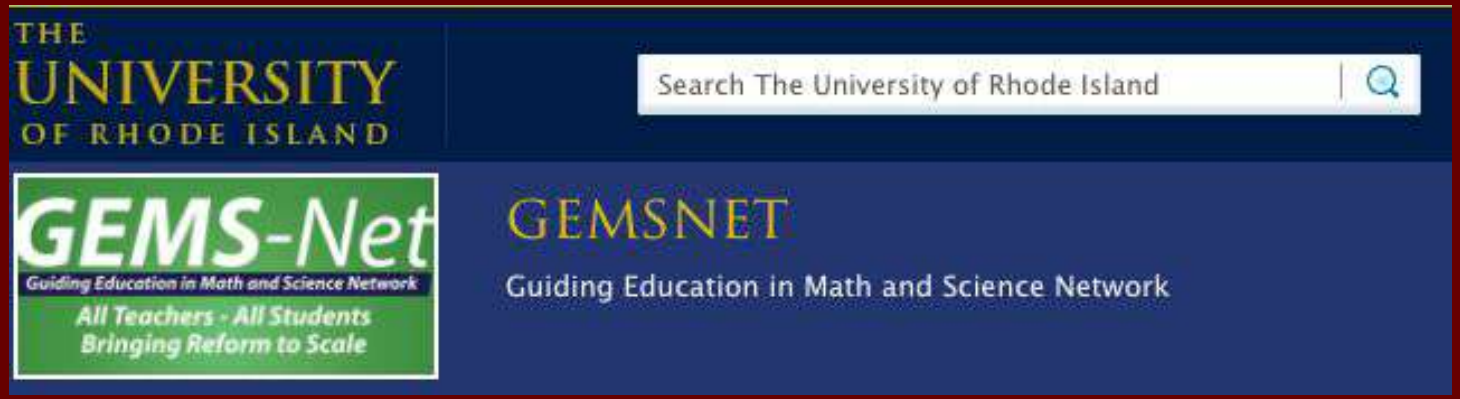

The Guiding Education in Math and Science Network (GEMS-Net) is a partnership among the University of Rhode Island's School of Education, scientists and engineers, and public school districts. We support STEM teaching and learning for Kindergarten through Grade 8. As our partners, school districts receive ongoing professional development for all teachers, curricula recommendations that align with the *Common Core State Standards* and *Next Generation Science Standards*, and leadership development for teachers and principals. Additionally, our staff utilizes highly innovative strategies to prepare pre-service elementary and middle school teachers to be leaders in STEM education.

At GEMS-Net, we balance leading educational research and current school policy in the practical context of the classroom. Our beliefs and practices embody the ideals established by *A Framework for K-12 Science Education*, and have led us to over 20 years of success and sustainability in our field.

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Grades 6-8 Science Curriculum Documents

(Click on the title above for the entire Gr. 6-8 Folder, or each grade level below to view the curriculum documents)

Grade 6 Scope and Sequence & Grade 6 Curriculum

Grade 7 Scope and Sequence & Grade 7 Curriculum

Grade 8 Scope and Sequence & Grade 8 Curriculum

Science - High School - Graduation Requirement

Rhode Island High School Graduation Requirements

The Secondary School Regulations strive to increase and improve equitable learning opportunities for every student through personalization, graduation by proficiency, and multiple pathways.

Graduation requirements are set at a level to provide students the skills and knowledge to successfully enter and complete rigorous post-secondary academic or technical program, join the military, and/or obtain a job that leads to a rewarding and viable career. The minimum state graduation requirements, as set by the The Rhode Island Council on Elementary and Secondary Education through the Secondary School Regulations, for earning a RI high school diploma, are:

- Successful completion of 20 courses
  - 4 English Language Arts courses
  - 4 Mathematics courses
  - 3 Science courses
  - 3 Social Studies courses
  - 6 additional courses, which may include Physical Education and Health, the Arts, Technology, and Foreign Language
- Demonstrated proficiency in 6 core areas (English Language Arts, math, science, social studies, the Arts and technology)
- Completion of one performance-based diploma assessment (Graduation Portfolio, Student Exhibitions, Senior Project and/or a Capstone Product)

Science - High School - Required & Electives - p. 12

Grades 9-12 Science Curriculum Documents

(Click on the title above for the entire Gr. 9-12 Folder, or each course below to view the curriculum documents)

Scope and Sequence		Curriculum	
Astronomy	(0.5 cr)	Astronomy	(0.5 cr)
Biology	(1.0 cr)	Biology	(1.0 cr)
Biotechnology	(1.0 cr)	Biotechnology	(1.0 cr)
Chemistry	(1.0 cr)	~~Advanced~~ Chemistry	(1.0 cr)
Earth and Space Science	(0.5 cr)	Earth and Space Science	(0.5 cr)
Geology	(0.5 cr)	Geology	(0.5 cr)
Human Anatomy and Physiology	(1.0 cr)	Human Anatomy and Physiology	(1.0 cr)
Introduction to Engineering and Design	(1.0 cr)	Introduction to Engineering and Design	(1.0 cr)
Meteorology	(0.5 cr)	Meteorology	(0.5 cr)
Microbiology	(0.5 cr)	Microbiology	(0.5 cr)
Oceanography	(0.5 cr)	Oceanography	(0.5 cr)
Physical Science	(0.5 cr)	Physical Science	(0.5 cr)
Physics	(1.0 cr)	Physics	(1.0 cr)
Principles of Chemistry	(0.5 cr)	Principles of Chemistry	(0.5 cr)

Science - High School - Agricultural Electives - p. 13

Fun Fact:
Floral Design
and
Landscape Design
get ART credit!

The is a great way to see students who enjoy a “fusion” of STEM and Arts & Humanities!

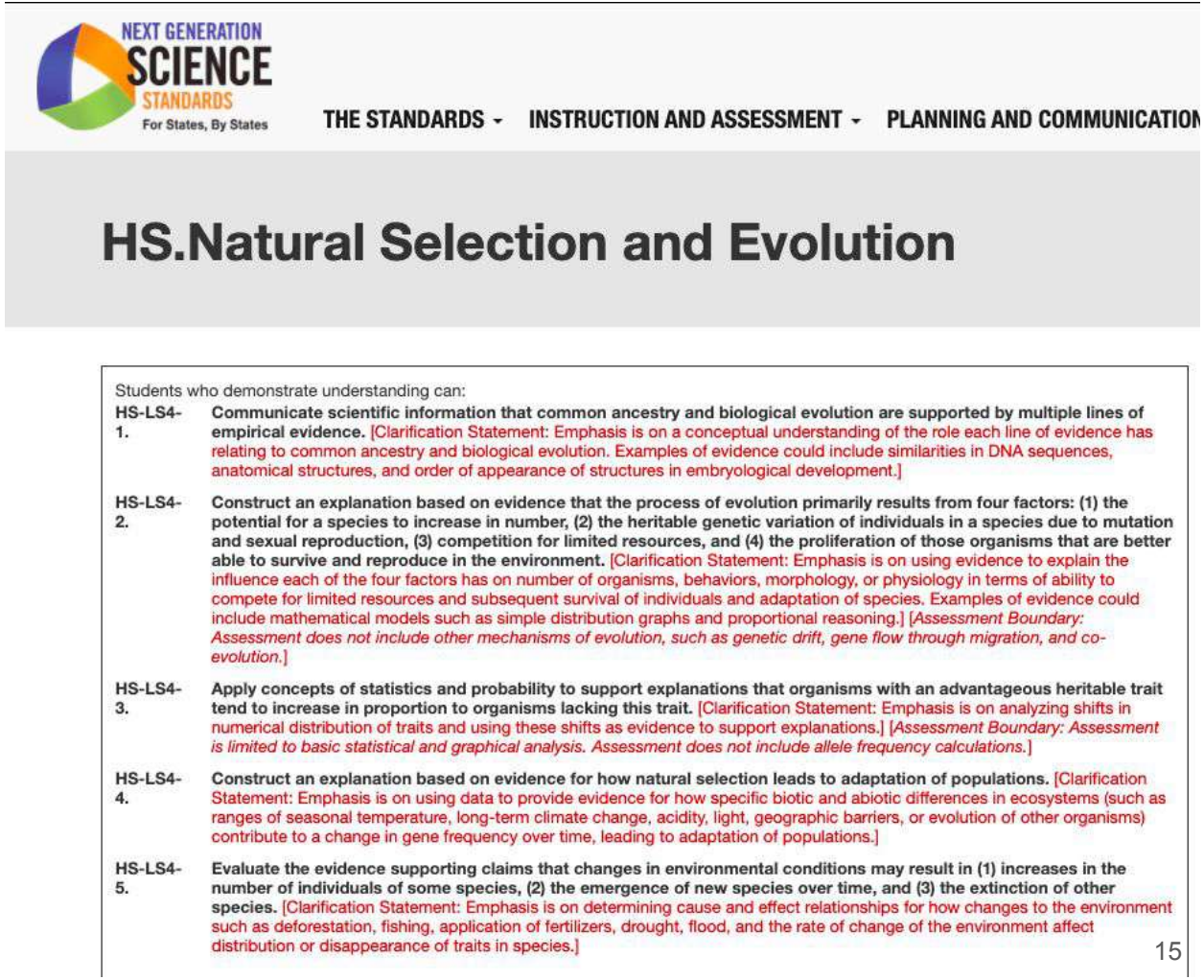
Grades 9-12 Agricultural Science Curriculum Documents

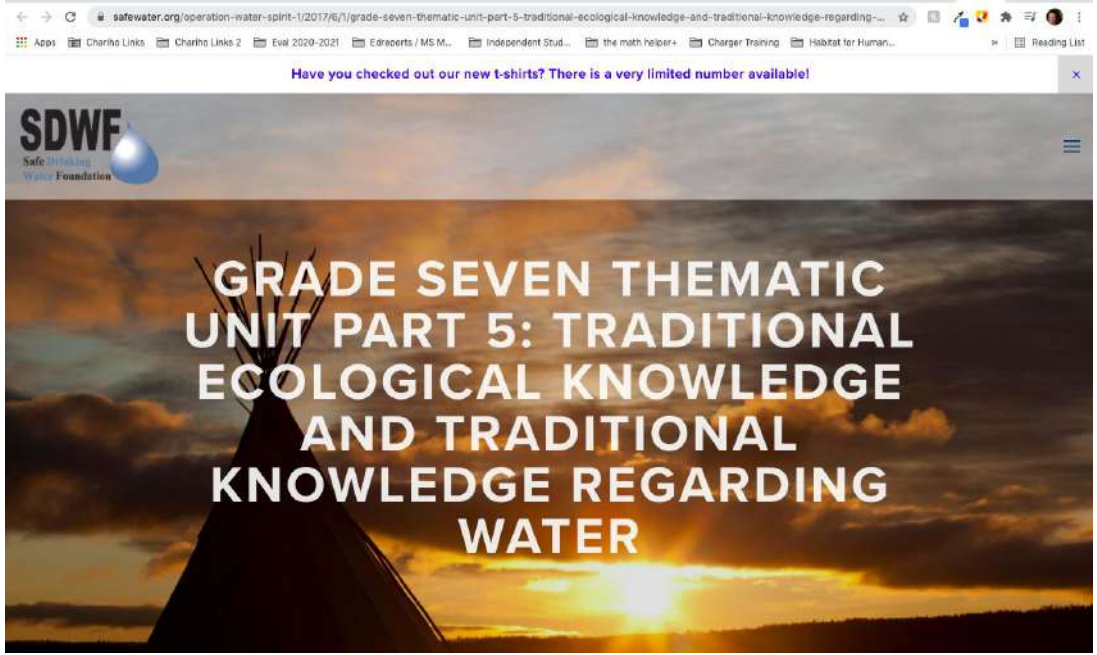
(Click on the title above for the entire Gr. 9-12 Agricultural Science Folder, or each course below to view the curriculum documents)

Scope and Sequence		Curriculum	
Agriculture and Resource Development I	(0.5 cr)	Agriculture and Resource Development I	(0.5 cr)
Agriculture and Resource Development II	(0.5 cr)	Agriculture and Resource Development II	(0.5 cr)
Animal Science	(0.5 cr)	Animal Science	(0.5 cr)
Aquaponics I	(0.5 cr)	Aquaponics I	(0.5 cr)
Aquaponics II	(0.5 cr)	Aquaponics II	(0.5 cr)
Floral Design	(0.5 cr)	Floral Design	(0.5 cr)
Forestry	(0.5 cr)	Forestry	(0.5 cr)
Introduction to Animal and Veterinary Science	(0.5 cr)	Introduction to Animal and Veterinary Science	(0.5 cr)
Landscape Design	(0.5 cr)	Landscape Design	(0.5 cr)
Plant Science	(0.5 cr)	Plant Science	(0.5 cr)
Turf Management	(0.5 cr)	Turf Management	(0.5 cr)
Veterinary Science	(0.5 cr)	Veterinary Science	(0.5 cr)
Wildlife Management	(0.5 cr)	Wildlife Management	(0.5 cr)

Addressed concerns regarding Evolution and Natural Selection from a community member.

1. Noted that we teach directly from the Next Generation Science Standards.
2. In the Elementary & MS specifically we teach inquiry based science, which allows our students to always stay curious to "questioning" science and wanting to learn more.





Other resources being used:
https://www.safewater.org/operation-water-spirit-1/2017/6/1/grade-seven-thematic-unit-part-5-traditional-ecological-knowledge-and-traditional-knowledge-regarding-water

https://jan.ucc.nau.edu/jar/HOH/HOH-3.pdf

https://medium.com/women-of-silicon-valley/just-18-awesome-native-folks-in-stem-134211ff14cd

https://ensia.com/features/researchers/

http://www.nativetech.org/

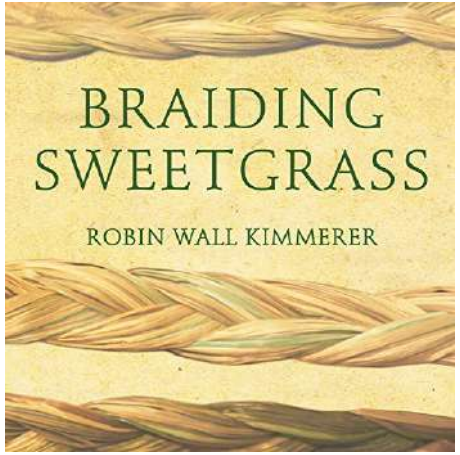
https://files.eric.ed.gov/fulltext/ED407222.pdf

https://americanindian.si.edu/nk360

Addressed cultural perspectives in our curriculum with Silvermoon LaRose, the Assistant Director of the Tomaquag Museum.

1. One example: Traditional Ecological Knowledge. Since we teach the NGSS standards, these ideas would likely be implemented at the lesson plans level, not changing the curriculum.
2. In the Elementary & MS specifically we teach inquiry based science, which allows our students to always stay curious to “questioning” science and wanting to learn more.

(Same justifications as in previous slide.)



Many teachers from the science department and a group of AP biology students are reading an insightful book that focuses on the balance between Traditional Ecological Knowledge (TEK) and what the author, Kimmerer (Potawatomi), was taught in her studies to become an ecologist.
This book was suggested by our community partner, Silvermoon LaRose, the Assistant Director of the Tomaquag Museum and supported by Chariho High Schools' Native American Student Advocate, Katie Kirakosian, who is also a Co-chair on the Board of Directors at the Tomaquag Museum.

"As a botanist, Robin Wall Kimmerer has been trained to ask questions of nature with the tools of science. As a member of the Citizen Potawatomi Nation, she embraces the notion that plants and animals are our oldest teachers. In *Braiding Sweetgrass*, Kimmerer brings these two lenses of knowledge together to take us on "a journey that is every bit as mythic as it is scientific, as sacred as it is historical, as clever as it is wise" (Elizabeth Gilbert).

Drawing on her life as an indigenous scientist, a mother, and a woman, Kimmerer shows how other living beings—asters and goldenrod, strawberries and squash, salamanders, algae, and sweetgrass—offer us gifts and lessons, even if we've forgotten how to hear their voices. In a rich braid of reflections that range from the creation of Turtle Island to the forces that threaten its flourishing today, she circles toward a central argument: that the awakening of a wider ecological consciousness requires the acknowledgment and celebration of our reciprocal relationship with the rest of the living world. For only when we can hear the languages of other beings will we be capable of understanding the generosity of the earth, and learn to give our own gifts in return."

What is Traditional Ecological Knowledge?

Working Definition of Traditional Ecological Knowledge (TEK), also called by other names including Indigenous Knowledge or Native Science, refers to the evolving knowledge acquired by indigenous and local peoples over hundreds or thousands of years through direct contact with the environment. This knowledge is specific to a location and includes the relationships between plants, animals, natural phenomena, landscapes and timing of events that are used for lifeways, including but not limited to hunting, fishing, trapping, agriculture, and forestry. TEK is an accumulating body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (human and non-human) with one another and with the environment.

Reference: https://www.fws.gov/nativeamerican/pdf/tek-fact-sheet.pdf

The Future...

RI Curriculum Legislation

Having access to high-quality curriculum materials is an important component of increasing equitable access to a rigorous education that prepares every student for college and careers. Through this national movement to increase access through high-quality materials, in 2019, **RIGL§ 16.22.30-33** was passed which requires the Commissioner of Elementary and Secondary Education, and RIDE, to accomplish the following:

1. Develop statewide academic standards and curriculum frameworks;
2. Identify at least five (5) examples of high-quality curriculum and materials for each of the core subject areas (English Language Arts, Mathematics, & Science);
3. Support LEAs in the selection and implementation of curriculum materials.

This legislation requires that all RI LEAs adopt high quality curriculum materials in K-12 schools that are (1) aligned with academic standards, (2) aligned with the forthcoming curriculum frameworks, and (3) aligned with the statewide standardized test(s) (i.e. RICAS, PSAT/SAT), where applicable. Furthermore, this selection must be completed by June 2023 for mathematics and English Language Arts (ELA) and June 2025 for science. Respective to each content area, implementation should be in place by September following a June selection.

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References

Committee on Guidance on Implementing the Next Generation Science Standards. "Guide to Implementing the Next Generation Science Standards." *RIDE Rhode Island Department of Education*. National Academy of Sciences, 2015. Web. 18 Oct. 2016. <http://www.ride.ri.gov/LinkClick.aspx?fileticket=ubMckBct3oc%3D&portalid=0>.

"Grades K-5 Gemsnet Science Curriculum." *Gemsnet: Guiding Education in Math and Science Network, University of Rhode Island*. Web. 15 May 2021. <https://web.uri.edu/gemsnet/>.

"Mathematics Standards." *Common Core State Standards Initiative*. National Governors Association Center for Best Practices and Council of Chief State School Officers, 2010. Web. 18 Oct. 2016. <http://www.corestandards.org/Math/>.

"National Core Arts Standards: Dance, Media Arts, Music, Theatre And Visual Arts." National Core Arts Standards, State Education Agency Directors of Arts Education, 2014, www.nationalartsstandards.org/.

"Next Generation Science Standards." *RIDE Rhode Island Department of Education*. Rhode Island Department of Elementary and Secondary Education, 2021. Web. 17 May 2021. <http://www.ride.ri.gov/InstructionAssessment/Science/NextGenerationScienceStandards.aspx>.

NGSS Lead States. "Next Generation Science Standards." *Next Generation Science Standards For States, By States*. N.p., 2013. Web. 18 Oct. 2016. <http://www.nextgenscience.org/>.

"Plant Systems Career Pathways." *National FFA Organization*. The National Council for Agricultural Education, 2015. Web. 18 Oct. 2016. <https://thecouncil.ffa.org/afnr/>.

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Questions???

Thank you!!!