“This is OUR land”

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TEK
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Context

Sinagua Middle School or SMS, one of the two middle schools, part of the Flagstaff Unified School District. Sinagua was part of three high schools within FUSD from 1989 to 2009, when it closed due to low enrollment. Then it reopened as one of the two middle schools. The school has grades from 6th, 7th, and 8th grade. Currently, the school has enrollment about 1200 + diverse students (Anglo, Hispanics, African Americans, Native Americans, and other nationalities). The school has both certified and classified staff employed, that also includes administration, teachers, paraprofessional, admin, cooks, and janitors.

Students who attend SMS, come from communities within or the outskirts of Flagstaff area like Kachina Village, Mountainaire, Doney Park, Munds Park, Parks, Lake Mary area, Mormon Lake, Belmont, some students even come from small Navajo communities from the Navajo reservation like Leupp, Birdsprings, Dilkon, Cameron, Tolani Lakes, etc. The students that go to school at SMS live within their school boundaries or come to school within a 90-mile radius either by bus or other means of transportation.

According to the information provided by the district, the classes for each of the grades (6th, 7th, and 8th) has a student-teacher ratio of 25-1. That is because there are multiple classes of the same subjects to balance out the high student enrollment and participation. The students take core classes (Math, Science, Social Studies, English, etc.) with some elective classes (Music, Woods, PE, Language, Cooking, etc.). The school have the core and elective programs were created, so during the end of the year or during the summer registration, students can select their elective programs, but their core classes have already been selected for them by their selected counselor. One of the elective classes that is being offered is the Navajo Language. Students sign up with one of the three phases: Phase 1- beginner, Phase 2 - intermediate, and Phase 3 - advance. The other language class that is being offered is Spanish.

Students who are new to the Navajo language classes struggled because students have faced the following: they had little or no exposer to the Navajo language when they were in elementary school, they do not have immediate family members who speak the Navajo language, and they did not learn Navajo in a way the teacher did the lessons or activities. Some students that took this year's Navajo classes knew some of the very basic vocabulary meanings and or two-word simple conversations. Another factor to their struggles was that they came from other elementary schools within the school district, where Navajo language and lessons is being taught by focusing only on basic animals, numbers, and basic questions and answers, and with little or no writing or reading in the language activities. Some Navajo culture or traditions are taught, but in the English language (because those are the only resources that one can find), but to teach Navajo is difficult and challenging simply because the teacher has to be fluent in reading, writing, and speaking.

The students that will be coming into the Navajo class, will be placed in one of the three classes. 6th and 7th graders were in Phase 1 or Phase 2 Navajo (beginner and/or intermediate) while the 8th graders will be in Phase 3 (intermediate to advance). For some students this will a new experience and for some they will be expecting the expectations of the class. All the Navajo classes will have the same lessons and themes, but the level of difficulties will be different and challenging.

There is a Navajo assessment that is given to all the students at the beginning of the school year and another during winter and at the end of the school year. This assessment is called DOPLA (Diné Oral Language Proficiency Assessment). This assessment has four parts of that the student must complete without any help from the teacher, friends, or others. The four parts are reading a short story and answer 10 questions, personal identification questions, recognizing Navajo vocabulary words and use the words into Navajo sentences, describe picture story in the Navajo language, and retelling a selected video into the Navajo language. However, the story could be read to them aloud or they could read the story on their own. But all responses are done in the Navajo language. But if the assessment becomes very difficult then the test ends. This assessment will also indicate how much a student knows about the language and where the teacher will focus in terms of instructions and activities. This test indicates where students were at the beginning of the school year and see if they progress or not throughout the school year and each time this will let the teacher focuses on which of the 4 parts of the assessment the students did not perform well.

I am Chiricahua Apache, born for the Tangle People, my maternal grandfather is Bitter water People, and my paternal grandfather is of the Salt People. My name is James Jones. I have obtained my Associates of Arts degree in Social Science and Psychology from Navajo Community College (now known as Diné College), BS degree in Elementary Ed, and M. Ed in Bi-Culture and Bi- literacy degree from Northern Arizona University. I am from a small community called Rock Point, AZ. I was born and raise there. I went to school there from kindergarten to 12th grade. I was raised in a traditional setting and Navajo language was my primary language at home. I was not exposed to the English language until I went to school. Throughout my education at Rock Point Community School, I was learning all subjects in Navajo and English languages.

At school I was learning something interesting from my students as I watched them play video games or when they would digitally draw things on their Ipads / tablets, or phones, and their laptops. These were simple but complex games / digital activities in coping with life or mental issues and problem solving. Then we had the school handbook. At home, my parents and my grandparents were my teachers and at Thinking back when computers first came into educational existences, technology life back then was complicated and but at the same time made life simple. Sometimes to handle certain technology issues meant stating over from the beginning and reprogram the task. Technology in social and emotional learning was at its basic but with deep rooted (not knowing quantum and science) teachings. And it was easy to maintain a program but not easy to keep the programs because you would have to update everything just to make thing transferrable and compatible. Everyday something new was discovered and technology equipment were getting smaller in size and the pros and cons of the cost.
Now days, things are simple and not that complicated, but as long as you know “which is which” and “what is what”, and “what goes with who or where it goes” then you can earn your place in the next level of the technology world, and you can do this globally without leaving your house. We are living in the technology world and our answers are not within the immediate circle anymore, because we have people in our lives in a global setting (since the introduction social media and social inter connections), and we don’t know these people but only through professional occupations, interest, and expertise. Also today, students are getting more dependent with social and emotional distractions than when I was growing up, but their solutions to their quantum world are much more simple than back in the days. What I mean is that back in my time when you are dealing with issues, you had to seek out information by yourself and sometimes the answers you seek took time and lots of patience. But in today’s world, what you seek for answers are in the palm of your hands because

electronic devices or someone in the digital world will get the information you want. But still, you have to be more specific to get the right answer.

Rationale

"IK / TEK Definition
Indigenous Knowledge is a body of observation, oral and written knowledge, innovation, practices, and beliefs developed by Tribes and Indigenous Peoples through interaction and experience with the environment." Indigenous Knowledge is base in ethical foundations often grounded in social, spiritual, cultural, and natural systems that are frequently intertwined and inseparable, offering a holistic perspective (Prabhaker and Mallory 2022)"

I was about 9 or 10 years old when I was herding sheep with my late paternal grandfather. I was sitting in the back of him as he was telling me about some history about the place we were. He said then that things will change, and it will be up to us (meaning me and my generation) to keep the land as it is. He was telling about rotating the grazing areas where there is regrowth of the grass and not to over graze one area because that will cause things like slow growth of the grass and soil erosion. He said that to keep the land healthy will also keep the flock healthy. After a-while we changed the direction of flock, and I asked him about people in the area that are also herding sheep. He said that if that person understands the land, then that person should not graze where we were before that they should change and move to a different area. He then pointed out to a relative whom had more sheep than us, that he should reduce his flock because it was considered overgrazing and that he comes to the same spot every day and soon there will be nothing left for the sheep to eat and the grass will grow back slowly. *(Eventually, years later that's what happen. He had to leave the area, and he also increased his flock and made it harder for his flock find grass to eat. And to this day the land has slowly recovered but the scars of overgrazing can still be seen.)*

My grandparents use to say that anytime you want to gather certain plants for food or medicine, that we have to give an offer and address the plant what it will be used for, that way the plant will know what their job will be. On another day, we were out herding sheep again and he got a visitor. He was a family friend and clan relative on my father side. They were having a conversation about family gossip and chapter politics and ceremonies, etc. They laugh and get serious and laugh again. I kept my eye out for the sheep and watched where they were. Then my grandfather walks over and tells me that he will be going with his friend for a while to gather some herbal medicine and told me to watch the herd. So, he left me there, sitting on this big horse who only obeys his master, and a hand full of rebel sheep and goats who seem to wonder off. But this day they were all behaving. But I wondered about him mentioning herbal medicine. What are they, how do they use them, but which plants are used? I started to remember about him telling me about yucca, used in many different ceremonies but mainly use for cleansing. It can also be used as soap for washing yourself and or for your hair. But the plant had to be handled with respect and proper procedures were to be done. While I rode towards the herd, I noticed that there were Navajo tea. Navajo tea, tea but then also medicine for hydration and common cold. Grandpa told not to pull the roots out but to pick only the leaves, and to only pick enough and leave some for later or for the tea to regenerate. *(I have noticed that the past*

few years the tea have migrated to different places, but still in abundance.) I also recognized some plants that my grandfather used for cleaning eagle feathers and burn some to burn your cut hair, a plant used to cool off a shade house, natural air condition pads, and also burned so that the ash can be used or added to blue corn mush. Then there is a plant that is part of the mountain tobacco family. I was lost in identifying the plant that the sheep shifted their direction, and I ended up looking for them. I found them just in time because my grandfather came back. I told him what I was doing, and he was not upset with me. Things have been happening around our area just like what he said.

But then it's been a while since I have visited some of those areas.

Lately I have been hearing phrases like "It used to look like this" or "the place has changed because …" These phrases are about places where people use to go for personal escape or because it gave them a sense belonging or responsibility. Then you see pictures of what the before looked like and indeed some places have changed drastically due to weathering or human activities.
What bothers people are two things, 1- how weather has played a major role in the change of the place because plants and or trees may have dried up or invasive plants have taken over making the place look unpleasant or not safe for animals or humans to live. Greta Thunberg book, *No One Is Too Small to Make A Difference,* has made some important statements about how people are helping with the climate and yet how some people are denying that there changes happening to the climate. She has traveled Europe and North America observing and spreading climate change awareness to populated areas and around industrialized areas. She also taught about how she was treated by people on both sides of the awareness, due to her age and knowledge.

Environmentalist, Scientist, environmental organizations and countless others have made efforts to save the Earth. Some protests were and are still organized to help convince the population about the damage corporations or factories or industries have cause to the land, the water, and the air we breathe in. And how people are shifting their role of responsibilities and also blaming others through legal tactics.

The lessons and activities that will be done with my class will be part of the Navajo philosophy of learning paradigm: thinking: *the thought of how and what should be done to help students become aware of the land changes that are happening and for what reasons*, planning: *the thought and to plan on how and what should be done to help students become aware of the land changes that are happening and for what reasons*, life: *the thought of how and what should be done to help students become aware of the land changes that are happening and for what reasons while living in this world*, and happiness: *the thought of how and what should be accomplished to help students become aware of the land changes that are happening and for what reasons*.

Therefore, the lessons will be the following:
Lesson 1: Taking care of the Earth. This lesson is a 5 part lesson. It has an overall lesson with 4 mini sub lessons which I call pillars.
I have mentioned the 4 pillars. These pillars the student will learn through observation, planning, doing hands on activities, and**Error! Not a valid bookmark self-reference.**The student will

view areas of needed attention and plan what can be done to make the area look presentable again. While doing the work outside and doing the worksheet / posters in class, students are collaborating with one another about their opinions and their ideas about dealing environmental issues or awareness. Students also learn about wear and tear about tools / equipment used. They also learn about equipment care so that tools and be used again and that any damage tool(s) can mean set-backs and the means replacement costs.

Lesson 2: Taking tree measurements using the stick method. Students will also become aware of the surroundings where they are. They will be observing for changes happening through the seasons.

Lesson 3: Creating their own Land Acknowledgement. Students will be reading land acknowledgements created by other schools, institutions, organizations, etc. Then they will indicate the key words and phrases used and use those to write their own land acknowledgement.

Lesson 4: Finding the true North (daytime) using the shadow method and finding the North star at night. These lessons are found on the internet and on YouTube.

Content Objectives

The project unit that I teach is call Taking Care of the Earth. A unit that teaches students about simple ways to keep and be aware how people and themselves treat the environment. The lesson consists of four pillars that where students are participating in doing a clean-up and outdoor activities and lessons using the 4 pillars mentioned below.

1. Picking up trash and keeping the place clean.
2. Understanding the 3Rs: Recycle, Reuse, and Reduced.
3. Keeping the environment clean of debris and trash.
4. Spreading awareness about using energy wisely.

The lessons mentioned before will be sharing the same content objectives.

Teaching Strategies

The teaching strategies that will be used, will be used for all three lessons and activities. The students learn in many different ways because some are either, kinesthetic learners, visual learners, and or auditory learners. Some Native American learners learn by hands on lessons and by doing so they will remember the process of how to do things.

This unit will consist of many teaching strategies that will help both the teacher and the students. There will be teacher modeling and modifications will be made as the instruction is being made.

There will be student engagements happening because the lesson will require students to interact with each other. Students will also be doing research for their personal project / presentation.

I do, You do, and We do strategies:

I do, We do, You do (group or class), You do (duel: the teacher will explain the lesson into parts so that students will get enough information on how to do their assignments. Teacher will model each of the four parts which will be: 1) What the students know of TEK and Pillar #3. 2) establishing what TEK and taking care for the environment means and why it matters to people that are within community, 3) understanding the concept of environmental responsibilities, and 4) using the Navajo cultural environmental knowledge and TEK to communicate and how to maintain environmental mindset.

Teacher will also have the materials ready for the three lessons and activities. And with each lesson instructions and the activity the teacher will use all three strategies mentioned so that I make sure that all learners are accommodated.

I do: Teacher will model by introducing the topic of TEK at its simplest term.

We do: Teacher and the students will work on some simple problems together and, than make one up as a class to where the students test their capabilities of solving the problem(s). Also at this stage we will be sharing our work with one another. (I will also be learning with them about this topic.)

You do: At this next step, the students will be doing their assignment in pairs or work in a small group of 6.

We do:

While using the KWHL chart of the TEK and Pillar #3 ,worksheets as visual aids and for media:

Students will be given their own handouts for their lesson and activities. These handouts will help them out when they are doing their assignment(s). They will also watch two videos from YouTube that pertains to the lessons / assignments on TEK and using Pillar #3. There will be handouts for students as mentioned and another where it will also be in a poster size so students can see the in-depth details. The oversize poster will also let students know where to look and also how they are going to use both codes when they are doing the activities of the lesson.

Use of technology:

Students will be using their I-pad or tablet, or phone, for the use of technology to create a profile using various apps and for their presentation.

5. Classroom Activities – Three or more detailed examples of actual teaching methods or lesson plans.

1. W.O.O.P.

Task 1:

Before any hands on activities are to be done there are demonstrations done on how to handle tools, how to properly care for tools, and what nature can teach them if they mishandle things. Safety is the biggest lesson stressed because students will be handling hammers, saws, rakes, and axes (where are students being supervised at all times), etc.

Task 2:

But in the classroom, students will be working on creating posters about the four pillars and also working on a lesson called WOOP (a lesson from the Character Counts website that teaches about social and emotional issues). WOOP is a lesson like the "if.. then.." activities. (Lesson will be attached).

Students will do individual or group input about

W (wish)- What would they wish to happen if: people could pick up trash and keeping the place clean, if people could practice their three Rs-Reduce, Reuse, and Recycle, if people could keep their environment clean, and if people could use alternative energy or use energy wisely.

O (outcome)- What would the outcome look like if: people could pick up trash and keeping the place clean, if people could practice their three Rs-Reduce, Reuse, and Recycle, if people could keep their environment clean, and if people could use alternative energy or use energy wisely.

O (obstacle) people could not pick up trash and not keep the place clean, if people could not practice their three Rs-Reduce, Reuse, and Recycle, if people could not keep their environment clean, and if people could. not use alternative energy or not use energy wisely.

P (plan) what plans do students have to spread awareness about Taking care of the Earth. How will these plans benefit every one.

Task 3:

Students will create a 30 video about any one of the 4 pillars.

Task 4:

Student will create posters about one of the 4 pillars.

2. KWHL Chart on TEK:

Students will approach the topic of TEK from the scientific method research approach.

When I introduced the lesson of TEK, I used a simple approach. I used the science fair project research approach. We were able to learn some simple information about TEK and Pillar 3- Taking care of the environment. The videos that I will share are to be for $6^{th,}$ 7^{th}, and 8^{th} graders. We all did the lessons together and by do that there were a lot of collaboration happening between my students and with me. They will eventually be impressed when they read about stories on land and fire management. There will be worksheets and videos provided for the students.

3. Create a land acknowledgement

Recently there has been a big movement about places or organizations creating land acknowledgements to express or recognize precolonial habitants of the area. Students will read the

4. 30 sec environmental commercial ad

"There is a way to live with the earth and a way not to live with the earth. We choose the way of earth. It's about power…" Thunderheart (1992)

"Some people have a deep, abiding respect for the natural beauty that was once this country and some people don't. People start pollution. People can stop it," (Strand, 2008)

Student will watch a commercial that ran from the early 1970 to 1980's. This commercial was a controversial because it dealt with environment issues.

6. Student Assessment Plan – A specific description of how you will assess student learning of the curriculum unit's content. This should include the method(s) you will use, along with any pertinent documents (i.e., test questions, activity instructions, etc.).

The students will complete the lessons.
Activity 1: W.O.O.P.

Activity 2: K.W.H.L.

Activity 3: Land Acknowledgment

Activity 4: Environmental Commercial Ad

7. Alignment with Standards – A clear statement of the particular state curriculum standards and Diné standards or CRAIS Tool principles your unit addresses. You must align your curriculum unit to both state standards and either Diné standards (DINÉ) or CRAIS Tool principles (TLSI).

AZ Science Standards: Grades 6-8

Sixth Grade: Focus on Patterns; Scale, Proportion, and Quantity; Systems and System Models; Energy and Matter

Life Sciences: Students develop an understanding of how energy from the Sun is transferred through ecosystems.

Seventh Grade: Focus on Patterns; Cause and Effect; Structure and Function
Life Sciences: Students develop an understanding of the structure and function of cells.

Eighth Grade: Focus on Cause and Effect; Energy and Matter; Stability and Change

Life Sciences: Students develop an understanding of patterns and how genetic information is passed from generation to generation. They also develop the understanding of how traits within populations change over time.

Navajo Nation:

7th and 8th Diné Culture Standards
I will develop an understanding of Diné way of life.
Concept 3- I will implement and recognize the Diné lifestyle.
PO-1, -2, -3, and -4

8. Resources – three distinct annotated lists of resources that you have reviewed and recommend for (a) teacher background reading, (b) student reading, and (c) materials for classroom use. You should explain how these resources relate to the content objectives.

Ramos, S. C. 2022. Understanding Yurok traditional ecological knowledge and wildlife management. Journal of Wildlife Management 86:e22140. https://doi.org/10.1002/jwmg.22140TEK THROUGH YUROK LENS | 21 of 21

https://www.grandcanyontrust.org/blog/cultural-uses-pinyon-and-juniper-forests

https://sustainability.colostate.edu/humannature/why-use-locally-sourced-pine-nuts/

Orion Magazine > Articles > Feature > The World As We Know It > The Crying Indian
The Crying Indian
BY GINGER STRAND

Thunberg, Greta. 2018. No one is too small to make a difference. Penguin Books

7A. Alignment with Standards

AZ Science Standards: Grades 6-8

Sixth Grade: Focus on Patterns; Scale, Proportion, and Quantity; Systems and System Models; Energy and Matter

Core Ideas for Knowing Science*		Core Ideas for Using Science*
L4: The unity and diversity of organisms, living and extinct, is the result of evolution.		U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised. U2: The knowledge produced by science is used in engineering and technologies to solve problems and/or create products. U3: Applications of science often have both positive and negative ethical, social, economic, and/or political implications.

Life Sciences: Students develop an understanding of how energy from the Sun is transferred through ecosystems.

Life Science Standards	Crosscutting Concepts and Background Information for Educators
6.L2U3.11 **Use evidence** to **construct an argument** regarding the impact of human activities on the environment and how they positively and negatively affect the competition for energy and resources in ecosystems. **6.L2U3.12** **Engage in argument from evidence** to support a claim about the factors that cause species to	**Crosscutting Concepts:** **Patterns**; Cause and Effect; **Scale, Proportion and Quantity**; **Systems and System Models; Energy and Matter;** Structure and Function; Stability and Change[4] **Background Information:** **Interdependent organisms** living together in particular environmental conditions form an **ecosystem**. In a stable ecosystem there are **producers** of food (plants), **consumers** (animals) and **decomposers**, (bacteria and fungi which feed on waste products and dead organisms). The decomposers produce materials that help plants to grow, so the molecules in the organisms are constantly re-used. At the same time, **energy** resources pass through the ecosystem. When **food** is used by organisms for **life processes** some energy is **dissipated** as **heat** but is replaced in the ecosystem by **radiation** from the **Sun** being used to produce plant food. In any given ecosystem there is **competition**

change and how humans can impact those factors. **6.L2U1.13** **Develop and use models** to demonstrate the interdependence of organisms and their environment including biotic and abiotic factors. **6.L2U1.14** **Construct a model** that shows the cycling of matter and flow of energy in ecosystems.	among species for the energy resources and the materials they need to live. The persistence of an ecosystem depends on the continued availability in the environment of these energy resources and materials.[2(p.27)] **Organisms** and populations of organisms are dependent on their environmental interactions both with other **living** things and with **nonliving** factors. Growth of organisms and population increases are limited by access to resources. In any ecosystem, organisms and **populations** with similar requirements for food, water, oxygen, or other **resources** may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. Similarly, **predatory** interactions may reduce the number of organisms or eliminate whole populations of organisms. **Mutually beneficial** interactions, in contrast, may become so interdependent that each organism requires the other for survival. A healthy ecosystem is one in which multiple **species** of different types are each able to meet their needs in a relatively stable web of life. Newly **introduced species** can damage the balance of an ecosystem. [4 (p. 152)] Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of many other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. Typically, as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. [4 (p. 196)] Human activity which controls the growth of certain plants and animals changes an ecosystem.[2(p.27)] Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all of its populations. [4 (p. 155)] Food webs are models that demonstrate how matter and energy is transferred between producers (generally plants and other organisms that engage in photosynthesis), consumers, and decomposers as the three groups interact—primarily for food—within an ecosystem. Transfers of matter into and out of the physical environment occur at every level—for example, when molecules from food react with oxygen captured from the environment, the carbon dioxide and water thus produced are transferred back to the environment, and ultimately so are waste products, such as fecal material. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. [(p. 153-154)]

Seventh Grade: Focus on Patterns; Cause and Effect; Structure and Function

Core Ideas for Knowing Science*	Core Ideas for Using Science*
Life Science L4: The unity and diversity of organisms, living and extinct, is the result of evolution.	U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised. U2: The knowledge produced by science is used in engineering and technologies to solve problems and/or create products. U3: Applications of science often have both positive and negative ethical, social, economic, and/or political implications.

Life Sciences: Students develop an understanding of the structure and function of cells.

Life Science Standards	Crosscutting Concepts and Background Information for Educators
7.L1U1.8 Obtain, evaluate, and communicate information to provide evidence that all living things are made of cells, cells come from existing cells, and cells are the basic structural and functional unit of all living things. **7.L1U1.9** Construct an explanation to demonstrate the relationship between major cell structures and cell functions (plant and animal). **7.L1U1.10** Develop and use a model to explain how cells, tissues, and organ systems maintain life (animals). **7.L1U1.11** Construct an explanation for how organisms maintain internal stability and evaluate the effect of the external factors on organisms' internal stability.	**Crosscutting Concepts:** **Patterns; Cause and Effect**; Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; **Structure and Function**; Stability and Change[4] **Background Information:** All living organisms are made of one or more **cells**, which can be seen only through a microscope. All the basic processes of life are the results of what happens inside cells. Cells divide to replace aging cells and to make more cells in growth and in reproduction. Food is the energy source they need in order to carry out these and other functions. Some cells in **multicellular organisms**, as well as carrying out the **functions** that all cells do, are **specialized**; for example, muscle, blood and nerve cells carry out specific functions within the organism. Cells are often aggregated into tissues, tissues into organs, and organs into **organ systems**. In the human body, systems carry out such key functions as respiration, digestion, elimination of waste and temperature control. The circulatory system takes material needed by cells to all parts of the body and removes soluble waste to the urinary system. Stem cells, which are not specialized, are capable of repairing tissues by being programmed for different functions. Cells function best in certain conditions. Both single cell and multi-cellular organisms have mechanisms to maintain temperature and acidity within certain limits that enable the organism to survive.[2 (p. 26)] Life is the quality that distinguishes living things - composed of living cells, from nonliving objects or those that have died. While a simple definition of life can be difficult to capture, all living things - that is to say all organisms -can be characterized by common aspects of their structure and functioning.[4 (p.143)] Organisms are complex, organized and built on a hierarchical structure, with each level providing the

	foundation for the next, from the chemical foundation of elements and atoms, to cells and systems of individual organisms to species and populations living and interacting in complex ecosystems. Organisms range in composition from a **single cell** (unicellular microorganisms) to multicellular organisms, in which different groups of large number of cells work together to form **systems of tissues and organs** (e.g. circulatory, respiratory, nervous, musculoskeletal), that are specialized for particular functions. Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (Boundary: At this grade level, only a few major cell structures should be introduced.)[4 (p. 144)] Organisms respond to **stimuli** from their environment and actively maintain their internal environment through **homeostasis**.[4 (p. 143)]
7.L2U1.12	**Crosscutting Concepts and Background Information for Educators**
Construct an explanation for how some plant cells convert light energy into food energy.	**Crosscutting Concepts:** **Patterns; Cause and Effect**; Scale, Proportion and Quantity; Systems and System Models; Energy and Matter; **Structure and Function**; Stability and Change[4] **Background Information:** In most cases, the energy needed for life is ultimately derived from the sun through **photosynthesis** (although in some ecologically important cases, energy is derived from reactions involving inorganic chemicals in the absence of sunlight e.g. chemosynthesis). Plants, algae (including phytoplankton), and other energy-fixing microorganisms use sunlight, water and carbon dioxide to facilitate photosynthesis, which stores energy, forms plant matter, releases oxygen, and maintains plants' activities.[4 (p. 147-148)]

Eighth Grade: Focus on Cause and Effect; Energy and Matter; Stability and Change

Core Ideas for Knowing Science*	Core Ideas for Using Science*
Life Science L1: Organisms are organized on a cellular basis and have a finite life span. L2: Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms. L3: Genetic information is passed down from one generation of organisms to another. L4: The unity and diversity of organisms, living and extinct, is the result of evolution.	U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised. U2: The knowledge produced by science is used in engineering and technologies to solve problems and/or create products. U3: Applications of science often have both positive and negative ethical, social, economic, and/or political implications.

Life Sciences: Students develop an understanding of patterns and how genetic information is passed from generation to generation. They also develop the understanding of how traits within populations change over time.

Life Science Standards	Crosscutting Concepts and Background Information for Educators
8.L3U1.9 Construct an explanation of how genetic variations occur in offspring through the inheritance of traits or through mutations. **8.L3U3.10** Communicate how advancements in technology have furthered the field of genetic research and use evidence to support an argument about the positive and negative effects of genetic research on human lives.	**Crosscutting Concepts:** Patterns; **Cause and Effect**; Scale, Proportion and Quantity; Systems and System Models; **Energy and Matter**; Structure and Function; **Stability and Change**[4] **Background Information:** **Genes** are located in the **chromosomes** of **cells**, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of a specific **protein**, which in turn affects the **traits** of the individual (e.g., human skin color results from the actions of proteins that control the production of the pigment melanin). Changes (**mutations**) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. **Sexual reproduction** provides for transmission of genetic information to offspring through **egg** and **sperm cells**. These cells, which contain only one chromosome of each parent's chromosome pair, unite to form a new individual (offspring). Thus offspring possess one instance of each parent's chromosome pair (forming

	a new chromosome pair). Variations of **inherited traits** between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited or (more rarely) from mutations. (Boundary: The stress here is on the impact of gene transmission in reproduction, not the mechanism.) [4] (pp. 158-159) In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two **alleles** of each gene, one acquired from each parent. These versions may be identical or may differ from each other. In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are **beneficial, others harmful, and some neutral to the organism**. [4] (p. 160) Genetic variations among individuals in a population give some individuals an advantage in surviving and reproducing in their environment. This is known as natural selection. It leads to the predominance of certain traits in a population and the suppression of others. In ***artificial selection***, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. [4] (p. 164) The sorting and recombining of genetic material when egg and sperm cells are formed and then fuse results in an immense variety of possible combinations of genes, and in differences that can be inherited from one generation to another. These provide the potential for natural selection as a result of some variations making organisms better adapted to certain environmental conditions. [2] (p. 28)

7th-8th Diné Culture Standards

STANDARD: K'é dóó nitsáhákees dóó nahat'á náásgóó iiná bee siih hasingo ádoolníił.
I will develop an understanding of Diné way of life.

Concept 3– Iiná
Bits'ą́ądóó bee da'iináanii baa ákonisin dooleeł.
I will implement and recognize the Diné lifestyle.

PO 1. Hooghan t'áá ał'aan ádaat'éhígíí shił bééhózin dooleeł.

I will differentiate the teachings of the hogan.

PO 2. Kéyah dóó naaldlooshii dóó Tó hane' bídadéét'i'ígíí baa hashne' dooleeł.

I will present the stories related to Land and Water Beings.

PO 3. Nanise' ałtaas'éí bee ál'ínígíí naashkaah dóó shił bééhózin dooleeł.

I will investigate different preparation of plants.

PO 4. Azee' ałtaas'éí shił bééhózin dóó choosh'įį dooleeł.

I will integrate different uses of herbology.