

Human Body: Marvels of Physics, Chemistry and Biology Working Together

Know Your Parts and its Functions

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Author Note

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Context

Introduction

Generations of grandparents in the Diné (Navajo) culture have customarily emphasized self-guidance philosophy to ensure continuing successful survival of each generation through an oral teaching to practice daily running early in the morning. The teachings insisted on daily exercise, and as youngsters we were forced to rise early before dawn and run to the east to greet the early morning dawn, and to offer prayer for harmony and well-being. The elders spoke of the deities being out in the early morning and the air is the freshest in the morning to invigorate the mind, body, and spirit. They expressed that the deities say, “Ah, look, there is my child up early, I will bless him.” The gifts granted by the deities include wealth, wisdom, youthfulness, health, and wealth of knowledge. Traditional teachings of our Dine grandparents were to impart moralities, ethics, and practices that led to good health. The grandparents understood that a healthier state of mind, body and spirit had multiple benefits such as having more energy, better mood, positive outlook, more tranquility and better sleep. Studies have shown that running or exercise helps depression, blocks negative thoughts, lifts moods, improves sleep patterns and changes levels of chemicals in the brain such as serotonin and or stress hormones. (Greist, JH. 1979).

American K-12 education includes physical education, ethics, character education, and teaching a common core of different subject areas. Based on the instructional teachings of today in any setting, physical fitness and any disciplinary process taught, learned, and adapted is connected exclusively to European-American values. The traditional cultural teaching seems to be of the past when children learned hands-on showing of how to do from traditional perspective based on the teachings of the Diyin Dine’é (Holy People; Navajo Nation, 1998). Today the western school-based teachings are different based on the physical setting of the learning in a school building, the language used, and the curricula, which comes from school adopted company series. There is still a connection when the two philosophies include the physical development and mental development incorporated to promote long-term health and improvement in the quality of life.

Demographics

Kaibeto is a small community in northern Coconino County; the last census count noted estimated 1,600 people living in the area. The community is near Highway 160 / 98 intersection and easily assessable to many travelers. The elevation is 5, 600 feet with one-seed juniper trees, pinon trees surrounded by high red and white cliffs colorful mesas. The nearest city is Page, Arizona next to Glen Canyon Dam that created Lake Powell recreational area attracting people for water recreation. Antelope Canyon is also nearby attracting visitors from all over the earth. Kaibeto is located 36 miles east of Page, Arizona. Kaibeto amenities consist of a single small gas and grocery shopping center. The area has a community civic center called a Chapter House, one Behavioral Health building, one boarding school, and homes are clustered together and scattered over a nine-mile radius. Most of central Kaibeto residents reside in homes managed by the Navajo Housing Authority. Perhaps 400 housing units is scattered in a 25-mile radius.

(Wikipedia, 2016) The community is considered lowest-economic status with most of the workforce traveling daily to Page or Tuba City (another nearby town) to earn an income.

Kaibeto Boarding School (KBS) is a new BIE (federally controlled bureau school) built 5-years ago to accommodate the local population. The school building is safe and quiet, the current school replaced a 50-year-old structure that was torn down after the new building was completed. The enrolled student population averages 230 students per year and serves Kindergarten through eighth grade. The student population is 100% Navajo on a 100% reduced lunch program. KBS has dorms available to serve students coming from 20 miles away to attend school. On average the dormitory serves 30 students each school year, usually 15 boys and 15 girls reside for the week in the home-living style facility and they go home on the weekends. There are eleven classes, with most of the middle and upper grades being serviced with one teacher per grade class creating high student population higher in some classes. The lower grade classroom receives assistance by paraprofessionals in the classes. The student-teacher ratio is 20 to 1 with 95% Navajo teachers. I teach the only fourth grade class with at least 22 students. The students are usually consisting of half girls and half boys, usually 3 to 4 students in ESS, with 3-4 students needing ESL classes.

Rationale

Majority of the Navajo families living within the community are enrolled members of the Navajo Nation. The residents have economic and environmental conditions common throughout the Native American land reserve. The problem is how to connect and modify existing programs to develop a common action to alleviate some of the common problems. Some examples of these problems are the isolated community where many amenities are not there and most family members have to drive into the city of Page to work. Schools have resources with a mission to provide educational services and it is one existing service that can help erase some of the common health problems through early education and on-going parental involvement. School can identify specific issues, develop curriculum associated to local problems using the common core curriculum standards, and integrate associated educational services to answering long term community problems. This will specifically address difficult health issues affecting many residents locally.

School curriculum could target information on prevention of future health issues and teach ways to change lifestyles to improve poor health. The fourth-grade class is a perfect place to begin. The interest would include the study of specific parts of human anatomy and physiology; this would include studies on lungs, heart, and brain with its related body systems. The teaching tools should include Power point slides, explanation of the basic cellular chemistry (atoms, cells, tissue,) and relevant activities on seeing, touching, hearing and doing provides encouragement, engagement, and excitement. Visual learning such as draw a diagram lays foundation for knowledge as learning topic discovery of the Respiratory, Circulatory, and Nervous System develops. In order to fully understand the content, a foundation of anatomical terminology is required and thorough discussion of the organs and systems. How the brain functions in the network of nerve cells that spread to every part of the body links to their understanding of how an organ is supposed to work.

Knowledge of essential content area includes how the organs work together through explanation of the role and functions of the three vital organs communicated in a format of power point and or activity projects with tangible products. Nonetheless, through knowledge of their understanding of what is going on in the human body, students will be able to communicate the importance of making critical lifestyle eating habits and choices to nurture their human body.

Taking a lead in the inter-family dynamics could be a student goal including making good lifestyle choices like eating healthy and staying healthy. A culminating validation would be communicating healthy well-being ideas of exercises, rising early to run is beneficial to the school by elevating related student performance in class. Increase learning through a positive mindset is an outcome, if children believe and understand that new knowledge empowers them at home, they will buy in to learning at a higher rate. Learning should include understanding systems of the human species including how brain impulses received and sent signals for movement. Learning and understanding scientific terminologies always motivates students to take part in fitness or sport participation. Part of the educational goal is to help students understand holistically how knowledge is always related to life or leading to a possible career in the medical field as well.

Content Objectives

This curriculum unit titled *Know Your Parts and its Functions*, designed for fourth grade students will form a basic understanding of the current knowledge on the human body's three vital organs: brain, heart and lung and their related three systems through lectures, projects, research, and other activities that include analyzing what happens in their own daily environment. In anatomy and physiology, an understanding will become apparent of the different structures of the body and an understanding of the functions and their roles in maintenance.

When studied together, the students will develop a good understanding of the human organs and their systems. They should develop a command of appreciation and understanding. An understanding of the five survival needs of the human body which are water, nutrients, oxygen, normal body temperature, and atmospheric pressure could be studied at a later date. There are also eight functions that humans must perform to maintain life. The eight functions include how to maintain boundaries, respond to environmental changes, take in and digest nutrients, carry out metabolism, reproduce themselves, dispose of wastes, and growth. To be able to define the structure and shape of the body, its parts, and its relationship to one another is the anatomy and how the body works, and functions is the physiology of the human body.

Students at this grade usually enjoy learning about how cells function and how it affects their lives. They have interest in what is inside a cell and how it functions, how it works with organs, how tissues form, and how cells communicate in systems. Creating science experiments is always full of excitement, art in science, and conducting research will lead to building a foundation important in their lives. They will learn about the anatomy of the human body and its fundamental building process that may inspire students to pursue careers in the health profession.

The learning components will integrate cultural aspects of the Navajo culture. Staying healthy must be done with running or exercises as the culture believes it plays an absolute necessity to live a long productive life. The cultural components comes from our elders that insist we rise early before dawn, drink water to wake up the organs, and run to the east so the deities may bless us, also yell aloud to begin circulation of the blood to flow, this will ensure balance in the life and thus physically fit as well.

Contents

Cells

Cells are essential for the health and survival of an organism. All living things are made of one or more cells in our body. Cells share certain basic characteristics and basically made up of nucleus, protoplasm, and plasma membrane. These components are necessary for diversification of cellular function and segregation. Human body has more than 10 trillion cells, so small you need a microscope to see them. Most living creatures are made up of many cells and all these cells work together. The term cell was coined in the 17th century. An English scientist named Robert Hooke examined a slice of cork under a man-made microscope and he said the spaces looked like small rooms. Then in 1674, a Dutch lens-maker named Antoine Van Leeuwenhoek created a better microscope through which he saw what he called “animalcules” swimming around in water sample. (Patton, 2014) Over time, the quality of microscope improved so more observations happened through the eighteenth century. Then in 1830, two German biologists, Mathias Schleiden and Theodor Schwann came up with a cell theory which generalizes that all living things are made up of cells and all cells are the basic unit of life. Cytology is the study of cells. (Calabresi, 2007; Clancy, 2018)

Parts of an Animal Cell

The bodies of all organisms are made up of tiny units. Cells grow, cells are allowed to breathe, take in food, use energy, get rid of waste, and even die. Cell membrane – thin outer covering that keeps everything together and other unwanted substances out. Nucleus – control center that directs all the activities of the cell. Vacuoles – are internal liquid structures that store the cell’s food, water, and waste materials to be used by the cell or discarded. Chromosomes – are made of lengthy strands called DNA. They exist in pairs of patterns that control how a cell grows, develops, and does its job. Mitochondria – is the power plants of the cells, so food turned into energy by organelles. The cells use the energy to do different life functions like getting rid of waste or breathing. Cytoplasm – a jellylike substance that holds stored substances called organelles that have specific functions. The organelles called lysosome contains enzymes that digest particles like bacteria. The organelles called ribosomes are responsible for synthesizing proteins and can move freely in the cytoplasm. Endoplasmic reticulum transports materials inside the cell. Golgi apparatus – stores and secretes compounds made in the endoplasmic reticulum. The difference between animal cells and plant cells is cell wall or chloroplast. (Abrahamson & Langston, 2017; Van De Graaff & Rhees, 2011)

Tissue

Tissues are cells that are the same, performing a similar common function to make the body's tissue. It forms and holds all the organs together as a whole. Each tissue performs a unique function that helps to maintain homeostasis. To ensure survival, the cells in one tissue is arranged to form either a thin sheet of one cell deep or cells may form huge masses that contain millions of cells, thus fixed firmly or embedded in a complex extra cellular material called matrix. All tissues are classified by its structure and function into four principal types. The types being epithelial tissue (cover), connective tissue (holds), muscle tissue (movement), and nervous tissue (communication). How the cells become tissue and organs are when cells together to form a tissue, for example – a collection of many similar cells in one place form a muscle tissue, whereas an organ is a group of tissues working together to perform a task. For example, a heart is an organ with fibrous tissue, muscle tissue and some nerve tissues. (Pearson Education, 2010; Van De Graaff & Rhees, 2011)

Heart

A heart is a hollow organ sitting between the two lungs in the chest. The cardiac muscle can only be found in the heart. It pumps about 7,200 quarts (7,500 liters) and it beats 60 times a minute and if it stops, you will die. Inside the heart are four chambers; two atria and two ventricles. The two pumps working together, where it pumps blood from the body to the lungs to absorb oxygen and then returns to the heart. The other side pumps blood coming back from the lungs so the organ can get oxygen needed. Both chambers have a small atrium with thin walls and a large ventricle with muscular walls. Septum is a muscular wall that divides the left and the right side of the heart. The right side collects blood filled with waste such as carbon dioxide and pumps it to the lungs to be exhaled out. The left side collects blood with fresh oxygen and sends it throughout the body. The blood is collected from the veins in the upper chamber (atrium) valve from atrium to ventricle, the lower chamber, then contracts to pump blood into your arteries (Newquist, 2001; Smithsonian, 2015). When air full of oxygen is taken into the mouth, it travels down the windpipe and into the bronchi and into the lungs. There it's traded with carbon dioxide, a waste gas that needs to leave the body. The heart pumps blood around the body through blood vessels (Viegas, 2002).

Lungs

The lungs are two giant shiny, smooth, pink-gray sponges made of tiny air sacs called alveoli. There are two lungs, one lung is on the left side, and the other lung is on the right side of the chest. The lung on the right side has three compartments or lobes. The the lung on the left side has two lobes because it leaves room for the heart to snuggle in between. Each lung is cone-shaped with a wide base. The upper tip is near the collar bone and rib in the upper chest. The base of the two lungs sits on the large dome-shaped muscle called the diaphragm and serves as a wall between the lungs and the rest of the body. It tightens and relaxes as we breathe in and out. The rib muscles also tighten and moves down leaving more room for air to fill the chest. The lungs are protected neatly by the twelve ribs, the sternum (breastbone) in the front, and the vertebral column (backbone) at the back. The bones are flexible at the joined area to allow shiny sheet of membrane called pleural membrane that lubricates the movement of breathing.

The tiny air sacs inside both lungs have the job to put oxygen into the blood and take carbon dioxide out. When oxygen is breathed in through the nose or the mouth, it goes down the pharynx and trachea into the bronchi, then each branch into bronchioles and as they get smaller and smaller as the ends clump into air sacs called alveoli. Inside the alveoli are tiny nets of blood vessels called alveolus and into a netlike vessel again called capillaries and through these oxygens are able to enter the blood stream. There are six parts that work perfectly; the first is the alveoli where oxygen passes from the air into the blood, and the second is the interstitial tissue of the lungs that fills the gaps. The third is the bronchial tree or air tube /airways called primary bronchus. This divides into narrower airways of the secondary bronchus until the tubes are so small to see. The fourth is the branching system of nerves that control the muscles in the wall of the airways and arteries. The fifth and sixth part is the network of blood vessels. This part takes deoxygenated blood from the heart into the lungs and taking the fresh oxygenated blood from the lungs back to the heart to be circulated all over the body. The two are known as arterial pulmonary tree and venous pulmonary tree.

The lungs contract and expand as we extract oxygen from the air and pass it through to our blood. One tube (bronchi) leads to the left and one to the right lung and inside each bronchi divides into hundreds of smaller passages called alveoli. It has a fine mesh of blood vessel where oxygen passes into the blood vessels as carbon dioxide passes from them. Then when we breathe out, the diaphragm relaxes and arches upward, the rib muscles relax and the space becomes smaller again. The water, carbon dioxide and the unused air are squeezed out of the body. The air we breathe in has at least 21% oxygen, it also has argon, carbon dioxide and other gases. Plants and trees in the atmosphere take in carbon dioxide all day and breathe out oxygen. The planet's atmosphere keeps in a healthy balance in this way.

Brain

The brain is the control center that controls almost everything we do; processing the information from incoming nerve signals that way we know what we see, smell, touch, or taste. It has at least 100 million nerve cells which link together the communication network. The brain works with the spinal cord. The spinal cord is very important in this process because it's the body's main nerve. It is protected by the backbone and extends out from the brain stem all the way to the lower back.

The brain consists of three parts, the cerebrum, the cerebellum, and the medulla. The cerebrum is divided into two halves: a left hemisphere and a right hemisphere. The left side controls the right side of the body. These hemispheres help you to think, learn, teach, remember and make judgments. The cerebrum enables us to speak, feel emotions, use our senses, allow movement, and feel hunger or thirst. The cerebellum is at the base of the brain which helps with balance and coordinate movement. The third part of the brain is the brain stem or medulla that enables breathing, coughing and keep the heart beating. The human brain gets signals or messages from the outside and it processes it and then sends messages to that part of the body for a performance of some type. The messages are sent to nerve cells called neurons, which then relays information as needed. Inside the brain is the ventral root that carries the sensory neurons. "The motor neurons carry messages to the muscle from the brain whereas the sensory neuron carries

messages or transmit signals from the sense organs to the brain.” These neurons have a red center called cell body and long green fibers coming out of the cell body that passes messages onto other cells. The brain is made so different parts of the brain control different parts of the body (Clancy, 2018; Claybourne, 2006; McRae Books, 2008). Motor nerves and sensory nerves branch out on both sides of the spinal cord for sending messages from the body’s sense receptors-small gaps along the nerves all the time; and sending messages to the muscles to act.

Messages are consistently transferred throughout the body as a fast-moving electrical signal. The main cell body of a neuron has a nucleus which reaches out in branches called dendrites. The neuron receives messages (tiny sense receptors) from the dendrites coming from other neurons. Information comes to dendrites from an axon along axon terminal tips which interprets the information and sends messages. The neuron will have many dendrites, but only one axon, and an axon can have more than one tip so the messages can go to more than one cell. The messages that neurons carry is called a nerve impulse.

The Respiratory System

Air, crucial for all living organisms, is a mixture of gases that human beings take into their body. Air is most important because it carries oxygen that is critical for carbon-based life. When we breathe in air, we take oxygen into our body. Carbon dioxide is another important gas in the air around us. When we breathe out, we exhale carbon dioxide as do all animals. Carbon dioxide is an important gas because all plant life takes in carbon dioxide and puts out oxygen. The cycle is necessary for earth creatures to sustain life.

The process is called respiration when the cycle of taking in oxygen and exhaling carbon dioxide happens. The system that is responsible for breathing in and breathing out is called the Respiratory System. In this respiration, the body takes in oxygen from the air and lets carbon dioxide out. The body’s cells use oxygen and food’s nutrients to make energy. Respiratory System allows us to breathe, use our senses, use our nose, mouth, throat, and lungs as oxygen enters the human body and passes into our blood.

Circulatory System

Circulatory System, also known as Cardiovascular System, is where the blood filled with oxygen, carbon dioxide, or nutrients circulates through blood vessels. Blood is the life sustaining liquid that circulates in the human body. Simply put the function of blood is to transport oxygen, carbon dioxide, and nutrients to all the body’s cells. This keeps the heart beating and blood flowing all around the body supplying the cells of the body with nutrients from the food and oxygen we breathe in. There are two components of the Circulatory System; one called the Systemic Circulation that serves the body as a whole, and a Pulmonary System that carries the blood to and from the lungs. (Oleksy, 2001)

When the heart pumps blood all around the body, it is done at a rate of 70 beats a minute. This cycle begins as the red blood full of oxygen passes through the right side of the heart after passing through the lungs and is renewed with oxygen. The blood is pumped into the aorta, which is the largest blood vessel. Then it leaves the aorta onto smaller arteries and travels into

the capillaries and continues its journey through the tissues of the body supplying the cells with oxygen and nutrients. Waste matter is collected from the cells of the body to be excreted. The cleaning process is when oxygen depleted blood reaches the heart through large vessels called vena cava, then sent to the lungs going through the process of oxygenation. Now blood is rich in oxygen again and then flows back to the heart through the pulmonary veins- thus the circulatory system.

Throughout history and thousands of years, doctors and scientists were aware and making discoveries in the field of understanding the human body. Andrea Cesalpino (1519-1603) first called the body's blood transport "circulation." Then in 1628, an English doctor, William Harvey (1578-1657) "discovered that the blood was pumped by the heart and flows around the body in a circular motion through a system of vessels" but also wrote it flowed only in one direction. As time passes, an Italian anatomist, Marcello Malpighi (1628-1694) through microscopic studies learned there are connecting capillaries between veins and arteries. Slowly and surely, there are many branches of sciences discovering more and more about the human body.

The body's systems do not work alone. The systems all need help from other organs in the body, and therefore works in close coordination. The respiratory system works closely with circulatory system as the blood pumped by the heart passes through the lungs.

Nervous System

The nervous system works together with the brain and the spinal cord to make sure it keeps control of the body's activities. The nervous system has two parts, the central nervous system (CNS) and peripheral nervous system (PNS.) The central nervous system works with the spinal cord, the brain and the nerves. The peripheral nervous system takes the information to the central nervous system through the afferent, sensory input, and carries out instructions through the efferent motor nerves. Nerves extend from the spinal cord to all parts of the body from the peripheral nervous system. The nervous system has three jobs to do; the sensory input, integration, and motor output. The sensory input is where neurons called the sensory receptors collect information from the whole body, create an impulse and transmit the impulse to either the spinal cord or the brain stem and to the brain. The sensory impulse travels through afferent neural pathway to the cortex in the parietal lobes of the brain where the impulses are interpreted. The integration is when the Central Nervous System (CNS) makes sense of the input that it has just received. In the motor output, the peripheral nervous system, responds to the sensory input and sends out impulses through the nerves to muscles, glands, and other organs (Norris, Rae Siegfried, & Cumbay, 2019).

Cultural Diné Connection: Running

Within the Navajo cultural connection, running is a tradition practiced for many generations, as the elders started teaching a philosophy, a mindset from an early age to maturation. "Running has its roots in the spiritual tradition," stated by William Channing, the Wings of America's president for they have seen how the program is now a leading renaissance. Many grandmothers interviewed this year have quantified that running is part of the culture because it increases cultural identity, rejuvenates new birth daily, and shows the Gods that the early morning runners

are working to be a stronger person (Brooke, 1998; McCabe, 2019; Tsinnijinnie, 2019). Brooke in an article wrote “for the spiritual belief that a runner creates a living cord between the earth and the sky” when they face the east and run toward the rising sun. In different articles such as “*Indians Proudly Revive a Tradition of Running*” and many other records show that this tradition of running has roots into the 20th century. Olympic gold medalist winner Jim Thorpe (Native American) won decathlon and pentathlon in 1912 has revealed that running is a tradition that has always been encouraged and practiced within the culture. Exercise is seen as a fitness most needed today, but for the elders running to meet the dawn is a continued philosophical focus on spiritual need; whereas running is first a physical thing, then a mental thing, but for the Navajo it is a spiritual need.

In the moral Diné teachings there is a foundational principle, an element, awarded to the Navajo people. This element is that thinking (Nitsahakees) in the East direction and planning (nahata) in the South direction. When running toward the east, in the mind the thinking will be strong and pure, therefore the plans for the day will be clear. To rise early before the sun comes up, drink water to wake up the organs and face the east to say your prayers. Then run to the east, yell to allow fresh air to circulate in the lungs and our body. Thinking and planning given as a philosophy is critical in our understanding of what our body consists of and how we are to take care of it in order to live a healthy productive life. In running, the brain enables us to plan and think rapidly for the daily task of our lives. In running, the heart is strengthened and stimulated so the body will stay healthy and may not be deprived of oxygen and nutrients it needs to function properly. In running, breathing becomes faster and deeper because the lungs can take in more oxygen, thus the oxygen swiftly produces more energy which we need daily. In running, the bones become stronger, joints move and bend easier and muscles develop becoming bigger and stronger so there is less possible injury. In running, your heart pumps faster and stabilizes itself to sustainability. In running, the blood pressure is kept at a healthy level.

Teaching Strategies

Direct Instruction: The human body has many concepts and use of variety of teaching strategies is central for thorough understanding. The introductions and explanations of the human body and its organs and vocabulary related to the system will be covered each day. A scientific journal/notebook will be used as a formative assessment tool as well as notes to be taken daily as they instill interesting facts on the human body. The science journal will entail key vocabulary words, drawings or to glue important images about the topic, and writing of short essays or to complete summaries. The daily direct instructions will include Power point teacher information and facts for learning how to take notes using the Cornell notetaking skill as well. This will also enhance development in the science-process skills and learn how to conduct research skills. The whole group instruction is to reinforce and strengthen student’s understanding of the concepts with further discussion of small groups for focused reading or comprehension skills. The whole class direct instruction will include using multiple modalities such as interactive notes, video presentation, picture books, etc., team tasks cooperative learning as well as individual independent learning.

Graphic Organizer: This strategy illustrates the concept or presentation presented. The use of graphic organizers is an effective tool to provide visual and learning so students are able to read

and understand difficult text. Furthermore, use of graphic organizers have always been an effective tool for the Native American population as it helps students organize their thoughts, in smaller chunks, and improve vocabulary and comprehension skills. Students will work in teams to brainstorm, plan, problem-solve, question, write or make decisions on the topic to presented. The graphic organizers will include Venn Diagram, T-Chart, concept map, etc., as they form pictures and thus allowing for the brain to see patterns and relationships. To access prior knowledge of each concept, KWL will be used as the introduction with each unit.

Technology: Technology standards for fourth grade are incorporated in the group projects to develop the skills of technological use. Teams of students will conduct research on specific concept to enhance the learning experience of internet usage on topic research as a new opportunity. To complete the research report, students will create diagrams of the organs to present as a team project. Since the curriculum unit starts with introduction of cells, some students will work on an animal cell model, label the parts and the functions of each known part, A mode of presentation may be to develop a PowerPoint slide show, 3-dimensional project, and or report to display or present. As they work in teams, emphasis on conceptual understanding along with drawings, use of technology, and the students will familiarize themselves to understand their research study and present the findings onto science board to display and also to present to other students or to parents at a later date.

Inquiry-based instruction: Students are inquisitive in whatever their curiosity and interests leads them, so this is an appropriate time to work on inquiries: students will develop a deeper understanding of what they are learning, ask questions about many things, investigating, generalizing, exploring, and reporting on what they see in their surroundings specifically to science. To become successful in the future, it is best to teach and assist students now in inquiry-based processes as students learn. Inquiries on “how much air can your lungs hold?” or labeling the diagram of the heart, or how blood clots after a cut, and/or how exercise or running in place effect the pulse rate. Students on an inquiry-based questions or write questions relative to human and take part in group discussion. We need to encourage questioning, letting them know they can ask for clarification when they need to understand something and to keep in mind that this could create true reflection to open ended questions that may have multiple explanations. Individual projects may include creating a research project and be used in the form of assessment. Many forms of differentiation could be used based on the individual strengths and instructional performance level of students.

Cooperative learning: To learn in a cooperative group is important to any student population based on opportunities to see many different perspectives. If provided authentic problems where the students are given responsibilities for making commitments to possibly rise early and to meet the dawn, students will apply what they are learning to real-world home problems to increase their interest and understanding. They can discuss their thought on topics daily and then be able to write in their journals base on their discussion. They will write on specific essay topic in references to whether family members practice the early morning run and how they feel about being in harmony and balance mentally, physically, and spiritually with or without the early dawn running. They can conduct interviews with elderlies of whether they have an understanding of rules set by the Holy People based on the early morning run to the east as part of their culture. A fun cooperative activity is the Human Body Scavenger Hunt where students search and find hidden human body fact cards. Cooperative learning strategies grant student growth when

working collaboratively, and to take on other roles such as facilitator or recorder to complete assigned tasks in the lessons and build confidence.

Good description of Teaching Strategies

Classroom Activities

1. **Student Research:** Students, in teams, will conduct research in order to comprehend concepts related to valid health information and health promotion. The end product will include variety of projects such as a research paper, rubrics for the written piece, and if wanting, student may conduct a science experiment related to the title of the research. Student will need research time, folders, and board if doing project as a presentation. All the research will require a written piece of the research. Other presentations can include model, timeline, graph, mural, video, or experiment. The process of the research will be selection of topic, create an outline, and discussion of the approach of what the presentation will look like with the teacher. Lastly, the paper will have at least three resources they used to get the information for their research in a bibliography form. Students should be creative and spend time and energy completing the presentation to amaze their audience.
2. **Building Cell Model:** kinesthetic learners would enjoy building models from kitchen items to form a cell: to better understand the parts and workings of an animal cell- a bowl vessel to serve as cell membrane; light-colored lemon gelatin mixture to serve as cytoplasm; peach half without seed to serve as nucleus with nucleolus; raisins, or licorice or mandarin orange slices to serve as mitochondria; colored jelly worms for endoplasmic reticulum; jelly worms dipped in sprinklings and dried before adding to serve as rough endoplasmic reticulum; folded up fruit ribbon for Golgi body; M&M's candy for Lysosomes; jelly sweets for Vacuoles; and dried spaghetti for Microtubules. Pour the cooled jelly mixture into the bowl and next positions and arrange all the organelles. A detailed collage of the structures will include a clear key, legend, and labeling to identify parts of the model. A Cell Project Rubric will accompany the model as an assessment of each function of cell parts and description. Other items to use can be cereal, gum balls, gummi worms, fruit slices -dried, peanuts, sesame seed -see which works best to make it realistic (Abrahamson & Langston,2017).
3. **Nerve Test** – in partners, have students test their reactions by catching a ruler. Stand facing each other, one holding a ruler to drop and one partner hold his had with finger and thumb apart ready to catch the ruler. The ruler partner holds the ruler at the 0-inch mark and drops the ruler. The reaction partner will catch it as quickly as he can. Note what number the ruler was caught at, if the number is smaller, then the reaction is quicker and high number then slow reaction. Make a chart and test several members of the family and discuss and write out a report. Note the age differences or time of day.
4. **Lung Model:** Student will create a lung model to learn more about how their lung works. Have student take a deep breath and slowly exhale and ask how large they think their lungs would be. Then have them demonstrate how to place one hand on the collar bone and one hand at the bottom of the ribs to give them an idea of the length of their lungs. Go over the fact that the lungs fill the chest cavity and are quite large. Next demonstrate

how to press flattened fingers of each hand placed downward just below the breastbone. Then take deep breathe through the mouth while pressing gently to feel the movement up and down. Tell them this movement is the diaphragm, a long large muscle beneath the lungs. Have a discussion of deeper breathing and feeling the movements. Lung Model: create the model of the lungs; cut bottom of a water bottle, place and secure with rubber band a clear plastic bag, leave some edge hanging so it can be like a handle to pull and push on the bag. Hang a balloon in the mouth of the bottle and turn the edge of the balloon and secure with rubber band. Play with the model by pushing air in and out using the plastic bag. Discussion of plastic bag serving as a diaphragm, as the balloon inflates when the plastic bag is pulled showing how a person breathes in and out. When the diaphragm becomes smaller as air is pushed out of the lungs, or when diaphragm drops the space in the chest get bigger and air is pulled into the lungs. Keep on display so students can play with it for understanding and discussion of the concept.

<https://www.science-sparks.com/breathing-making-a-fake-lung>

5. Make a stethoscope: make a simple stethoscope instrument from funnel, gaffer tape and cardboard tube to listen to a person's heart. First, attach a funnel to the cardboard tube and use a gaffer tape to secure. Or second simple stethoscope from project tech creator on Youtube. Now use it to listen to another person as you count how many times the heart beats in one minute. <http://sciencebuddies.org/.../human-biology-health/make-your-own-stethoscope> or https://www.youtube.com/project_tech_creator
6. Human Body Science Center: Three activities set up at the Science Center to learn more of how the brain functions: Each activity will have worksheet to complete and a written understanding of what they learned when the activity is completed. Student in groups of three will conduct the research activity with several questions: Activity 1: Read the information on brain-should state that the brain relays information from all parts of the body by electrical impulses that travel to the brain and other sensors before we react. Assign a role; one student is going to tap a knee to see what happens to the leg- do the knee tap using items presented. Repeat with other leg. Student then answer first question of -" How did you know to jerk your knee since you didn't say to do that?" Question 2: Why did your leg jerk? Students should give the response of "the nerves in the area below the kneecap felt the tap and send a message to the nerves in the spine and it was relayed immediately to the muscles which jerk the knee.
7. Heart Pump Science Project: Make a simple pump that moved water from the jar through the straws and into the pan serving as a model to show how your body uses blood: your heart pumps blood in one direction, when blood carries oxygen to all parts of your body, the blood is going one way and since all parts of your body needs oxygen to work right. Therefore, your heart has chambers and valves to allow the atrium as an entry chamber and the ventricle as an exit chamber. These entries and exit chambers pump one after the other to push your blood flowing forward. The exit door is the valve, so the blood does not get pumped backwards. The ventricle contracts so the atrium's exit valve closes and when the ventricle relaxes, its own exit valve closes to keep blood from spilling backwards into it. In this way, the pumping of each chamber keeps the blood to flow forward. This simple heart pump model will show how the chambers and valves work. <https://www.homesciencetools.com/article/how-to-make-a-heart-pump-science-project>

8. Brain activity from Mystery Science. Roll up a tube of paper to use as eye piece to look through. Look through the tube and cover the other eye with your hand. Slowly move your hand forward toward the end of the tube, making sure you slowly move your hand back and forth to make sure you see “a hole” in the middle of your hand- it totally looks like there is a hole in the middle of your hand. Keep both eyes open and with one eye looking through the tube and the other looking at your hand. Next in partners present this question for discussion. Why did it look like there was a hole in your hand? Now try again by finding out what each eye sees by closing each eye one at a time: one eye saw a hole looking through the tube and one eye saw the hand. So, the brain took the information from the eye and combined into one picture. The brain had to make a decision and asked itself – Is this real? Do I really have a hole in my hand? But your brain also knows by using all its senses; see, touch, etc., are sending messages to the brain. Studies of brain dissection have shown that all the senses have cords going back to the brain. These cords are called nerves carrying information from the senses back to the brain. So, for the hole in the hand, the brain thought and took all the information and made a decision. Scientist has figured out the brain processes the information from incoming nerve signals. (Mystery Science: mystery 4: Brain & Nerves: How does your brain control your body? 20 minutes video)

Student Assessment Plan

Formative assessments will be used daily or as needed on an on-going process of the curriculum unit to determine whether the learning goals were met. The completion of project-based activities will serve as the daily formative assessment. Opportunities to self-assess in the form of completed assignments, project-based learning activities, essay, Quick Write, and or summative assessments will be used. Completion of the variety of assessment formats for each system and vital organs in test formats will be used to assess student learning. Students will have had an opportune time to reflect on their understanding and application of human body knowledge-based standardized goals. Within the beginning of each organ study, students will first learn terminology specific to human body health education, and to take part in writing assignment where they give a short-written response to an open-ended prompt used as critical thinking practice or to informally assess their thinking. Other assessment could be as lessons progress, short formative quizzes will be used to assess understanding, as well as an end of curriculum unit summative unit assessment.

State and Diné Standard Alignments

The curriculum unit will address the Arizona State Standards, the Common Core State Standards and incorporate Navajo Standards in all components of reading, writing, listening and speaking, and science/health that students will be able to achieve by the end of the unit. Some objectives would include: explain how details and examples support inferences, provide summary of the text, write from opinion, recall specific description and its visual presentation of text, identify key ideas, summarize and comprehend integration of knowledge, write informative text to examine a topic, and engage effectively in collaborative discussions. The Common Core State Standards for Health Smart uses Reading, Writing, Language, and Speaking and Listening aligned with state standards. The standards include research and evidence based on vigorous

content and the application of knowledge through higher-order thinking skills. Health Smart integrates various health topics to draw conclusions, inferences, and evaluate contents in reading. Writing uses effective writing on how students express personal knowledge, journal writing, in speaking and listening, students will engage in collaborative opportunities in small groups and to conduct research and presentations, along with communication skills to use appropriate eye contact, voice volume and clear speech. Lastly, command of grammar and usage conventions will be developed along with writing assignments given. The curriculum unit will cover the standards with whole group direct instruction, strategies to incorporate new vocabulary on human body and health, group assignments to assist in conducting research and presentations, choice project-based learning activities to apply standards in real world applications and essay components to demonstrate proficiency of content area knowledge.

The Arizona State Life Science Standards; many of the standards, strands, and concepts align with making informed decisions to promote healthy well-being and understand that animals (humans) have specialized internal and external structures that serve various functions that aid in growth, survival, and behavior to increase survival. A traditional view is that humans must be balanced socially/emotionally, physically, mentally, and spiritually. Using traditional teachings in connection with Standard: Strand 1: Inquiry Process, Concept 4: communication, communicating verbally, PO2, using bar graphs and Venn diagrams to compare and contrast findings, Strand 4: Life Science, Health Standards Strand 1- Comprehension of Health Promotion and Disease Prevention, Concept 1: Relationship between healthy behaviors and health benefit of describing how physical activity impacts health and learning. Simply stated, content objectives describe goals and “I can” statements align the standards.

The Navajo Nation Standards would encompass the Department of Dine Education that states that they ensured curriculum units be strong in Dine language, history, culture, and values. Therefore, the curriculum unit will include Concept 1, Concept 2, and Concept 3 from character education which includes making healthy choices in daily personal life developing consistent physical activities as part of the healthy productive way of life. Included in the Navajo language standards, students will appropriately express interpersonal communication in relating to cultural experiences and sustain self through Diné teachings of daily statements of how to stay healthy and practice healthy choices of meals to keep organs healthy as a discussion with the family at home. Navajo language terminology could be used to label body parts to practice the Dine way of life through planning with confidence. The teacher will collaborate and advocate inclusion of traditional Native American role models and nutrition presenters to speak with students about ways to model good character, show respect by taking care of oneself and eating healthy to keep a body healthy.

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