Vision Statement for *Science* at NACA

Vision Statements articulate the long-term objectives of the content area, juxtapose that vision to the current state of teaching and learning at the school, and plan for a five years of action to meet the vision.

All “elements” should be in narrative form. The use of research statistics and graphics to support claims is encouraged.

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| Element 1 – A Vision for Science at NACA |
| 1. **Aligns with indigenous education principles and NACA’s mission** 2. **Makes an argument for why it is important for students to excel in your content area** 3. **Describes what a senior graduating from NACA should be able to do after taking classes in grades 6-12 in your content area** 4. **Describes an assessment that a senior could do to prove he or she has succeeded in your content area** 5. **Optional Extension: Includes citations from scholarly texts to support your vision for teaching and learning in your content area**   **VISION STATEMENT:**  Native communities value the human connection to the environment, and are faced with pressing environmental challenges that require specialized scientific understanding, skills and dispositions to address community sustainability and progress. Native scientists will need to recognize, serve and sustain for future generations, a community that includes people, the environment and all living things.  The NACA curriculum prepares students to fulfill these roles in the community by offering a rigorous college and career focus toward STEM pathways. The lens of environmental science provides both a connection for science to Native communities and a framework through which sub-scientific content is learned.  **Five years from now, what will a graduating senior look like as a result of a NACA science curriculum? What skills does the senior possess? What knowledge? What dispositions? What understandings guide the senior’s actions?**   * Native scientists will need to recognize, serve and sustain for future generations, a community that includes people, the environment and all living things. * The NACA curriculum prepares students to fulfill these roles in the community by offering a rigorous college and career focus toward STEM pathways and general scientific literacy. * Students build their research skills (both literature research and experimental research) from grades 6-12 * Students are independent and authoritative advocate for the environment. * Students make objective decisions based on the best available scientific evidence and information * Students will manage resources effectively and efficiently to deliver value to the citizens. * Students can make a difference by working with others to build trust, networks and partnerships to deliver effective outcomes on their lands. * Students can learn and develop to improve strive continuously for improvement and excellence through learning and development * Analyzing and correlating graphs. Making predictions. Identify and evaluate a range of possible solutions to earth and environmental issues at the local, national, and global level. * comprehending current events, choosing and using technology, or making informed decisions about one’s health care. * Apply the science and engineering practices * Confident in ability to determine the validity of scientific claims (spotting and avoiding pseudo-science) * Understanding of the underlying crosscutting concepts that tie all scientific disciplines together * Identifying valid data * Able to integrate beliefs and scientifically verifiable knowledge to form full understanding of natural and human constructed worlds. * Creating concrete and detailed observations of natural phenomena and developing inferences (scientific explanations) based on those phenomena * Develop strong connection to land and the Earth through an understanding of the causes and effects of historically and current environmental trauma * Application of scientific inquiry in numerous daily situations * Explain their own interpretation of the interconnectedness between Native Science and Western science through and understanding of the cross-cutting ideologies and those that differ.   **Why is it important for students to excel in science?**   * *Native communities value the human connection to the environment, and are faced with pressing environmental challenges that require specialized scientific understanding, skills and dispositions to address community sustainability and progress.* * *Students want to pursue careers in STEM fields including medical, veterinary, etc.* * *When students encounter new phenomena, whether in a science lab, field trip, or on their own, they need mental tools to help engage in and come to understand the phenomena at hand. This can create perspective.*   **Summative Senior Assessment**   * As a result of five years in the science program at NACA student should be able to complete extensive research on a topic of his/her choice and produce a research paper with bibliography.     “NACA is a small school that integrates culture, wellness, language, community, family, and preparation for college into each child’s education. Our philosophy is grounded in both the Native American tradition and a rigorous, modern approach to college-preparatory education. We require excellence from our students, dedication from our teachers, and commitment from our parents.”  “Mission  To engage students, educators, families, and community in creating a school that will prepare our students to grow from adolescence to adulthood and begin strengthening communities by developing strong leaders who are academically prepared, secure in their identity and healthy.  Vision  Our vision is of a thriving and dynamic community where students, educators, families and Native community leaders come together, creating a place for students to grow, become leaders, and prepare to excel in both college and life in general. The NACA community and experience will help students incorporate wellness and healthy life practices, community service and an appreciation of cultural diversity into their lives.  NACA Goals  Build youth to be confident in their cultural identities  Encourage youth to persevere academically  Support physical, emotional and spiritual wellness in youth  Prepare youth academically & emotionally for college  Strengthen youth to take their role as leaders  NACA Core Values  Students and staff are encouraged to demonstrate behavior and attitudes that represent each core value as it relates to the overall community.  1. Respect – Having concern for harmonious relationships; honoring yourself, your peers, your family, your elders, your ancestors, your teachers, your school, your community, your tribe/nation. Having courteous regard for others’ feelings and values. Respect helps people get along better with each other.  2. Responsibility – We are responsible to our People; past, present and future, as well as our environment and other living things. Being responsible is a form of trustworthiness; being accountable for your words, actions, and conduct in all that you do.  3. Community/Service – We belong to the NACA community as well as the communities of our neighborhoods, cities, pueblos, reservations and nations. This means that, along with rights, we have the responsibility to provide service to make our community a better place for all.  4. Culture – We honor and value our own cultures and those of others. We recognize we are influenced by many cultures, including Indigenous, youth, and contemporary western cultures and are mindful in how this impacts the development of identity.  5. Perseverance – Indigenous people have endured because of the perseverance and determination of those that came before. We make our ancestors proud by remaining constant to a purpose, idea or task in spite of obstacles. We engage our innate strengths and build relationships with others that support us in developing to our full potential.  6. Reflection – Indigenous thinking and learning is a reflective process involving a deliberate looking inward, self-awareness and contemplation of deeper meanings. We support this reflective practice to encourage thoughtfulness, personal growth, profound learning and meaningful change.” |
| What senior summative assessment will evaluate student ability, and therefore teacher and school ability, against the objectives of science? Describe the assessment here.  *To demonstrate graduation proficiency in science, students will…*  Investigation of a scientific and/or engineering issue relevant to student identity and values. Should include all 8 of the practices (1) Asking questions (for science) and defining problems (for engineering), (2) Developing and using models, (3) Planning and carrying out investigations, (4) Analyzing and interpreting data, (5) Using mathematics and computational thinking, (6) Constructing explanations (for science) and designing solutions (for engineering), (7) Engaging in argument from evidence, (8) Obtaining, evaluating, and communicating information |
| Element 2 – The Current State of Science at NACA |
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| What information/data do we currently possess about our current success and challenges in meeting the science vision?   1. **Includes internal data from our recent data presentations** 2. **(If available) includes external data from the SBA, Discovery Education, etc.** 3. **Describes what data is currently missing in order to assess the current state of affairs in your content area and a plan to collect this data moving forward** 4. **Addresses multiple areas for strength and challenges including curriculum, instruction, assessment, resources, administrative support, etc. with a significant focus on what happens in the classroom on a daily basis** 5. **Gives a balanced overview of both successes and challenges**   **Student Achievement**  **Internal Data**   * *In 9th and 10th grade science, upwards of 50% of students have failed 1 or more semesters of science.* * *Honor roll rates and passing rates are not consistent with our SBA and ACT test data.* * *Our students have a variety of skill levels. We serve a diverse population with a variety of backgrounds and a wide range of skill levels, but tend to really struggle to master the concepts, skills, mindsets, etc.* * *Understanding scientific inquiry (method) in the earth and environmental science* * *Identifying questions and problems in the earth and environmental sciences students can answer through scientific investigations.* * *Can state a range of possible solutions to earth and environmental issues at the local, national, and global level.* * *Students fatigue easily with new concepts. Students have difficulty relating deep ideas through real-world examples. Thinking out of the box can be tedious.* * *Students do not take tests well. Even though mini labs, and materials are provided students, don’t study or review. Or seem to know how to study.* * *Students struggle answering and understanding level II questions. Ex: (differentiate, evaluate, synthesis, correlate)* * *They can not understand why collaboration is needed in extended research or projects.* * *Students lack project management skills and handling their own peers. Presentation and communication skills are absent.* * *9/10 - students not really aware of the overarching concepts of science*   ***Based on internal data using summative assessments for each grade level at the end of semester one, the percentage of students who have demonstrated proficiency in each grade level are as follows:***  Life Science  7th Grade Objective 1: Students will identify a minimum of four characteristics: 28% demonstrated below proficiency; 6% demonstrated nearing proficiency; 60% proficient; 1% nearing advanced; 4% advanced.  7th Grade Objective 2: Students will understand that there are systems in place which are utilized to help us classify and understand the structure of living things: 29% below proficiency; 1% nearing proficiency; 46% proficiency; 4% nearing advancement; 9% advanced  7th Grade Objective 3: Students will understand the basic differences between the structure animal cells and plant cells: 32% below proficiency, 15% nearing proficiency, 43% proficient, 10% advanced.  Physics  9th Grade: The final exam was used to assess student understanding of the 1st semester: 70% were below proficiency; 21% were nearing proficient, 9% were proficient and no advanced.  9th Grade: Apply scientific and engineering ideas to design, evaluate and refine a device that minimizes the force on a macroscopic object during a collision: 58% were below proficient; 30% were nearing proficient; 9% proficient, and 2% advanced.  9th Grade: Design, build and refine a device that works within given constraints to convert one form of energy into another form of energy: 50% below proficiency; 23% nearing proficiency; 14% proficient and 14% advanced.    Chemistry:  10th Grade: The final exam was used to assess student understanding of the 1st semester in Chemistry: 26% below proficiency; 40% nearing proficiency; 26% proficient; and 9% advanced.  10th Grade: Communicate scientific and technical information about why the molecular level structure is important in the functioning of designed materials: 34% below proficiency; 17% nearing proficiency; 17% proficient; and 31% advanced.  10th Grade: Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction: 20% below proficient; 20% nearing proficiency; 40% proficient; and 20% advanced.  Biology  11th Grade: Understand trophic levels and how energy flows to one level to another: 26% below proficiency; 22% nearing proficiency; 37% proficient; and 15% advanced  11th Grade: Choosing an organism and designing a brochure of its ecosystem and how its niche affects other species: 19% below proficiency; 19% nearing proficiency; 43% proficient; 19% advanced.  11th Grade: Students presentation of brochure displays real-world knowledge of their species environment and how it affects our biosphere: 19% below proficiency, 19% nearing proficiency; 43% proficient; and 19% advanced.  Environmental Science  12th Grade: Write a scientific paper in third person: 3% below proficiency; 24% nearing proficiency; 42% proficient; and 31% advanced.  12th grade: Gathering data: 3% below proficiency; 39% nearing proficiency; and 58% advanced.  12th grade: Compare and contrast seeds and the effects of Abiotic and Biotic factors on the environment: 3% below proficiency; 47% proficient and 50% advanced.  The most recent results from NACA students who have taken the ACT averaged a composite score of 15 in Science and a high score of 25.  Summary of Internal data: The internal data does not include a standardized assessment for all grade levels; for example: Discovery Education, NWEA MAPS, etc. In 9th and 10th grade science, upwards of 50% of students have failed one or more semesters of science. Honor roll rates and passing rates are not consistent with our SBA and ACT test data. Currently, there is little cross curricular / interdisciplinary work between science and other core subjects. Students want to pursue careers in STEM fields.  **External Data**   * *The current data that we have on science at NACA is the SBA in grades 7 and 11, we have ACT data (average science composite score for the class of 2015 is 15 with a high score of 25) and , we also have NAEP data from 4th and 8th grade Native American subgroup.* * *SBA Science scores have decreased in the past few years and fall below all other measures*   *External data from the New Mexico State Standardized Based Assessment for 7th and 11th grade scores below the New Mexico American Indian population and the approximately 20-30% below the overall APS population.*  *Data for students who have taken the ACT and are identified as American Indian also test well below the general population of ACT test takers (ACT Report 2013).*  *Additionally, data from the 2011 National Assessment of Education Progress (NAEP), which assesses student Science content knowledge in 4th, 8th and 12th grade also test significantly lower that the general population in the nation and globally.*  **Curriculum**  **Internal Data**   * *The current state of science at NACA is a MS pathway of 0.5 years of integrated science and a HS pathway of Physics, Chemistry, Biology, and Environmental Science.* * *9/10 Students have participated in activities aligned to the different concepts*   **External Data**   * Missy: This list of cross cutting concepts seems like an easy place to start in looking for interdisciplinary units   **Missing Data and Plan**  **Instruction**  **Internal Data**   * *Modifications and extensive scaffolding is necessary to accommodate student learning.* * *Students generally have access to the various components of the vision,* * *Students lessons must provide students a better opportunity to grapple science experiments in meaningful way* * *Students have difficulty fulfilling the roles when working in groups.*   **Assessment**  **Internal Data**   * The internal data does not include a standardized assessment for all grade levels; for example: Discovery Education, NWEA MAPS, etc. In 9th and 10th grade science, upwards of 50% of students have failed one or more semesters of science. Honor roll rates and passing rates are not consistent with our SBA and ACT test data.   **External Data**   * The external data does provide an overview of the performance and students in specific areas, however the data is gathered yearly and does not provide a picture of individual student growth.   **Missing Data and Plan**   * The team should work to identify an external science assessment that will allow students, parents and staff to track individual growth. The end of course exam was utilized with the high school students and data should be available soon.   **Resources**  **Internal Data**   * Students have difficulty grasping concepts, possibly due to the inability to apply understandings in an actual lab. * Computer availability and slow networks inhibit students ability to use time optimally.   **External Data**  **Administrative Support**  **Internal Data**   * *Currently, there is little cross curricular / interdisciplinary work between science and other core subjects.*   *Next steps:*  Within each science class students will work to develop the skills necessary to complete thorough investigations, make predictions, inferences based on evidence gathered by the student/students. The science team will work on a set of expectations and requirements that build on prior years. In addition, the team will collaborate on the general flow of what a day in a NACA Science class should look like. A universal Science assessment will be identified to be used a summative assessment for each grade level with the support of administration. Teachers will design lesson to provide opportunities for students to grapple with real world issues and phenomena in order to engage students in learning. Time to plan with interdisciplines would assist in elevating common expectations for students in each grade level. |
| Element 3 – The Five-year Plan |
| With the goal of achieving the vision, what is possible next year? The year after? Complete the five-year plan, and please use measurable objectives.[[1]](#footnote-0)   * *The lens of environmental science provides both a connection for science to Native communities and a framework through which sub-scientific content is learned.* * *The NACA science curriculum begins with the needs of Native communities and our student’s ability to take a leadership and active role.* * *through meaningful interactions with scientific journals, scientific careers, etc. Real world, community-based issues and student interests drive the investigative cycle, and direct instruction occurs as a tool to promote the investigative cycle.* * *We will acknowledge the existence of standardized science assessments as one component of success in pursuit of STEM careers, and we will provide additional, performance-based assessments that prepare students to demonstrate college and career readiness skills including collaboration, problem solving, research, etc. We will assist students in accessing hands-on summer programs such as (MS)^2 and track their participation rate*   The path forward involves mapping the Earth and Science standards over 7 years and fit the other NextGen standards into integrated science classes that revolve around indigenous communities. We also need a plan to close the gap between students’ current skills and where we want them to be (i.e. scaffolding foundational skills).  Energy planning for rural communities  Pertinent to environmental studies    Preparation for STEM skills and college and career pathways.  Students must have a meaningful experience not just discussion.  What are the protocols (warm up, etc.) that we use across the years?   * Recurring scientific practices work (e.g. a quarter of observation based warm-ups, cycling through the practices) * Self assessing work (how many points would this earn on the SBA?) * Structure is important * Vocabulary work (digital?)   Students are working on activities that are targeted to their interests and current levels   * KWL - is this class based on what students are interested in? are we helping them develop more diverse interests? * activities relevant to community   Writing in scientifically relevant ways   * lab reports * recording observations * investigations * research * note taking * communicating findings * presentations * digital   Students interacting in effective, respectful manner   * sharing ideas * asking for clarification * pushing each other to dig deeper * active questioning * active listening * presenting ideas and asking for feedback * expressing disagreement in a respectful way targeted at developing a deeper understanding   Using math and models to develop and explain reasoning  Reading scientifically relevant  Students are using grade level vocabulary (scientific and general)  Students are investigating relevant concepts  Closing activities at the end (of day/week/unit) should be consistent (CV Reflection)   * What did you think of today’s activities? * What did you learn? * plus/delta, documenting over the course of the year   Students are reflecting on their learning (end of class reflection?)  We collect daily formative data on student learning (exit assessment?)  Keeping a record of learning (science journals?)   * could stamp each day and the collect grades at the end  1. **Describes what classrooms in your content area should look and feel like on a daily basis to students and to an outside observer**  |  |  |  | | --- | --- | --- | | **Say - what’s important to the NACA science program?**  **(Overarching principles of the vision)** | **Feel like - what do students and teachers experience/feel?** | **Look like - how does this manifest itself every day?**  **(Specific Actions)** | | Environmental Science Focused  *Personal choices of humans have major impact globally, small changes which create long lasting consequences in our ecosystems.* | -Everything we do is related to sustainability, preservation,  -Confidence in discussing ES topics with vocabulary  -Through discovery students and teachers can defend research on environmental factors in a populations | * Each unit explicitly tied to sustainability issue * Reflect on how the problems are related to their community and environment * Make connections between Earth systems (graphic organizers, foldables, models) | | Culturally Relevant | -Students can take Science topics and find it relevant and apply understandings to students’ home or place  -Feel empowered to analyze knowledge/scenarios through Indigenous lens .  -Feel like science is not in opposition to culture  -Feel like science is a part of identity | * Using NACA core values and the wellness wheel students will connect Science to sustainability of culture. * Interdisciplinary lessons putting science into historical contexts for student * Topics/issues related to indigenous communities and issues * Science journal reflections to build identity and scientific connections * Students asking questions and developing explanations (Practice 1) | | Contextualized Learning   * The advancements of technology directly affects questions we can discuss. * Inquiry Driven * *New Ideas, hypotheses and observations can be made.* * *We have a need to organize, understand, and classify the natural world and our communities.* * *Scientific knowledge relies on curiosity, investigations, extensive research and advancements in technology.* | -Feel like they understand WHY they are learning something within an immediate context  -Feel ownership/application of knowledge (“independently” developed)  -Feels like that have skills to question and explore the natural world around them  -Feels they can use past and present evidence and ideas to make meaningful connections that produce inquiry, curiosity and about real and the natural world | * Project based learning/Case Studies * Field work * Labs * Engineering challenges * Scientific Dialogue with case studies/ problem based issues * Investigation cycle * Vocabulary taught within the context of experience |  1. **Details an incremental plan that you and your team will carry out in order to reach your vision over 5 years in a measurable and observable way**   Develop culminating projects (science fair, etc.)   * integrating evaluation criteria into ongoing science work * students developing these skills throughout the year * This should be based on the skill development sequence in CCSS & NGSS  |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | Teacher Goals | Students Goals | Outcomes | Evaluation | | Year 1 ‘15-’16 | Teachers will purposefully implement a variety of effective vocabulary teaching strategies  Teachers will implement the investigation cycle (Practices 1, 4, & 6). | SW utilize appropriate and relevant scientific vocabulary throughout the year (EOY culminating project, group talk, writing, etc.)  SW apply scientific investigation skills utilizing appropriate scientific vocabulary  SW ask scientific questions and define engineering problems.  SW gather, analyze and interpret a variety of scientific data to be used to create a scientific explanation  SW create scientific explanations and engineering solutions | Students will independently complete a scientific investigation based on NGSS Science and Engineering Practices 1, 4 & 6.  1. Asking questions (for science) and defining problems (for engineering)  4. Analyzing and interpreting data  6. Constructing explanations (for science) and designing solutions (for engineering) | -evaluate projects primarily on Practice 1 and 6 according to grade level standards.  -evaluate  program for timelines and student and teacher goals | | Year 2 ‘16-’17 | Teachers will  Teachers will implement the investigation cycle (Practices 2, 3, & 4). | SW develop and use models to explain scientific phenomena  SW implement investigation skills to plan and carry out individual  investigations  SW gather, analyze and interpret a variety of scientific data to be used to create a scientific explanation | Students will independently complete a scientific investigation based on NGSS Science and Engineering Practices 2, 3 and 4.  1. Asking questions (for science) and defining problems (for engineering)  6. Constructing explanations (for science) and designing solutions (for engineering)  2. Developing and using models  3. Planning and carrying out  investigations  4. Analyzing and interpreting data | -evaluate projects primarily on Practice 2, 3, 4 according to grade level standards.  -evaluate  program for timelines and student and teacher goals prove | | Year 3 ‘17-’18 | Teachers will implement the investigation cycle (Practices 2 & 7). | SW develop and use models to explain scientific phenomena  SW use a variety of data to create valid arguments that support scientific claims | Students will independently complete a scientific investigation based on NGSS Science and Engineering Practices 2 and 7.  2. Developing and using models  7. Engaging in argument from evidence | -evaluate projects primarily on Practices 2 and 7 according to grade level standards.  -evaluate  program for timelines and student and teacher goals prove | | Year 4 ‘18-’19 | Teachers will implement the investigation cycle (Practice 8). | SW evaluate models, scientific reports, and explanations for relevance and accuracy  SW design models and reports that communicate information for a targeted audience  Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods. | Students will independently complete a scientific investigation based on NGSS Science and Engineering Practice  8. Obtaining, evaluating, and  communicating information | -evaluate projects primarily on Practice 8, according to grade level standards.  -evaluate  program for timelines and student and teacher goals prove | | Year 5 ‘19-’20 | Teachers will implement the investigation cycle (Practice 5). | SW use mathematical and computational thinking to identifying patterns in large data sets.  SW use mathematical concepts to support explanations and arguments. | Students will independently complete a scientific investigation based on NGSS Science and Engineering Practice  5. Using mathematics and computational | -evaluate projects primarily on Practice 5 according to grade level standards.  -evaluate  program for timelines and student and teacher goals prove |   Next Steps:   * Create year-1 year 2, etc. section * Start filling in those sections to demonstrate incremental growth for students and teachers * Identify specific measurable outcomes for each year of the five year plan aligned toward 5 year vision. |
| Element 4 – External PD |
| 1. **Looks outside the school for resources / people who can help or facilitate the team’s movement toward your content vision** 2. **Includes a plan for continuous improvement over the course of the year through 4 meetings** 3. **Describes how you will check in on your team’s progress through the use of artifacts / data** |

1. <http://www.celt.iastate.edu/teaching-resources/effective-practice/revised-blooms-taxonomy/>

   <http://static.pdesas.org/content/documents/M1-Slide_19_DOK_Wheel_Slide.pdf> [↑](#footnote-ref-0)