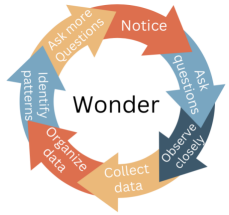
Kilo to Wonder

STEMS^2 Unit Plan

BACKGROUND:

The unit is designed in a way to build the foundational skills and cyclical model of

- noticing
- asking questions
- observing closely
- collecting data
- organizing data
- identifying patterns
- asking more questions



It is suggested that this unit be delivered first in the academic school year. The purpose of this is for learning to build upon throughout the year towards other content area and skills. Kilo is a practice used in historic and current practices to develop a relationship and authentic understanding of place.

Kilo is an essential part of being a scientist and connecting to place. Kilo is defined as to watch closely, spy, examine, look around, observe, forecast, (retrieved May 3, 2023, from *Nā Puke Wehewehe ʻŌlelo Hawaiʻi*, n.d.). It is further explained by Ku'unahenani Keakealani: "Kilo informs us, we watch in detail, observe everything that moves, what changes and what doesn't, looking at your environment from many different forms, views or lenses. Kilo helps you identify what you can help with and what needs to change, what you don't need to change"(*Connecting to Place with the Keakealani ʻOhana on Vimeo*, n.d.). People of Hawai'i practice kilo and notice patterns. They use the information they noticed over time to explain natural events or how things work. These are the steps to the scientific method and/or the Engineering and Design Process outlined by NGSS framers. "Kilo is the sensorial input of the exploration of phenomena"(*Connecting to Place with the Keakealani ʻOhana on Vimeo*, n.d.).

Students will engage in their campus to develop their kilo practice and begin to wonder about their world. They will be outside, looking closely as to what makes them curious about the environment around them. They will develop questions, collect data and work

to solve problems or answer those questions about the place they come to every day to learn and grow. In this way they are engaging in place-based learning, they are cultivating a sense of place, and through authentic, explicit teaching, how to wonder with skills built to kilo, asking and answering questions.

Community Partner:

The community partners for this unit are a local ecologist such as, Sarah Knox, from Akaka Forests Foundation has been working extensively with ecosystems of Hawai'i, place-based science curriculum development, civil science, community outreach, and native species advocacy projects and programs. She is the coordinator for Governor Ige's Geer Grant awarded program Hawai'i PK-12 Research and Development Consortium which collaborated with 20 schools across Hawai'i and partnered with many science and research organizations to create a framework for Hawai'i-based biocultural NGSS-aligned science curriculum resource development. Sarah and Akaka Forests Foundations is a community partner that works extensively with the practice of Kilo and Scientific applications for our 'āina and Aloha 'Aina efforts. Her work over the years has been dedicated to connecting the two worlds of Western science and modern Hawaiian cultural practices of kilo, mālama 'aina, and aloha 'aina. Her scientific background will be essential as a primary source for student research in their phenomenological research and development of kilo and wonder over the course of this unit.
Other options community partners for this project include local conservation researchers, school garden educators, local farmers, librarian, kupuna, gardening enthusiasts, hawai'i cultural practitioners etc.

Unit Overview:

The purpose of this unit is to help young learners build the understanding that using the Native Hawaiian practice of kilo helps you understand your world and ask questions about how it works. The design of this unit is within a biocultural framework that will connect to the building blocks of current academic science pedagogy in a Native Hawaiian practice.

The content learned in this unit is a methodology of science within an 'aina aloha context. They will learn the strategies of asking questions and explore ways to find the answers. They will also learn the types of questions that are answerable. They will learn how to observe closely, draw accurately, and collect data over time. They will begin developing skills in how to organize, read and notice patterns in data. Students

will engage in developing a research plan to support them in finding answers to their questions. They will engage with more kilo, text, digital resources, trusted adults and local scientists to find answers to their questions. They will learn to wonder scientifically.

STAGE 1:

- It is important that students understand that wonder is where ideas begin.
- Young students are naturally curious. They are already good at asking questions.
- Young students are curious about how things work. They are curious about animals and bugs. They are curious about why things are the way they are.

Unit Plan Title: ***Kilo to Wonder***

Essential Question:

- How can engaging in the practice of kilo help Wonder

Enduring Understanding(s):

- Students will understand kilo is observing, examining, and watching closely with all their senses and that kilo goes hand and hand with ‘aina aloha and connecting to their place
- Students will understand that wonder is asking questions and developing ideas about noticings and phenomena in their environment, which will build on their sense of place and engage them in research to answer questions.
- Students will understand that noticing patterns in what they have observed helps humans better understand their world and solve problems in the world

Standard Benchmarks and Values

“‘Aina is the lens through which the instruction occurs” (Ledward, n.d.) throughout this unit,students will develop a deep understanding of a phenomenon through research and conversations with each other and a local scientist/community partner. This approach to learning will support in building a sense of place and in turn a sense of belonging. Children are born curious, but they don’t always understand that their wonders are authentic learning opportunities. This unit aims to develop that understanding along with a drive for stewardship.

Science	Technology	Engineering	Mathematics	Social Science	Beyond
Standards Assessed					

NGSS
K-2-SEP4.1: Record information (observations, thoughts, and ideas).
K-2-SEP4.2: Use and share pictures, drawings, and/or writings of observations.
K-2-SEP4.3: Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems.

Standards Introduced
English Language Arts
Writing **1.W.2**: Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure.
Writing **1.W.8** With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.

Standards Addressed
Math
1MD1: Measure lengths indirectly and by iterating length units.
1MD2: Tell and write time
1MD3: Represent and interpret data.

Social Sciences
SS.K-2.1.2: Construct supporting questions to help answer compelling questions with guidance from adults and/or peers
Inquiry Standard SS.K-2.2.1: Determine whether a source is primarily fact or opinion
Inquiry Standard SS.K-2.2.3: Gather facts from teacher and/or adult-curated sources to answer questions
Inquiry Standard SS.K-2.4.3: Present explanations using a variety of print, oral, and digital technologies
Inquiry Standard SS.K-2.5.1: Identify problems or issues in classrooms, schools, or communities

Technology
CTE1.1: Technological Design: Design, modify and apply technology to effectively and efficiently solve problems

Critical Skills and Concepts:

Critical Skills

- Recognize that wonder is asking questions
- Observe closely
- Notice details
- Collect data
- Draw realistically
- Make many iterations
- Formulating Questions

- Asking testable and researchable questions

Concepts

- Notice natural patterns to explain a phenomenon
- Use evidence to explain the cause of the patterns noticed
- Show patterns using measurement manipulatives
- Explain how their kilo subject has parts and how those parts work

STAGE 2:

Students have learned that kilo will create questions, and questioning sometimes needs more kilo. Students have learned that gathering information about kilo is data collection. Students have learned that collecting data can show patterns and answer questions. And, sometimes data collection can develop more questions. Students have learned that patterns observed can develop ideas to solve problems or explain phenomena in their world. Students have learned how to wonder.

Authentic Performance Tasks:

"I Wonder…."Students will pick a phenomenon or problem they are interested in or have developed questions about.
Students will kilo phenomenon or problem and collect data over time in a kilo journal
Students will use the data to answer questions and develop more questions about their subject.
Students will use their phenomenon or problem to develop questions, research answers, or kilo for ideas. They will use their kilo journals for

- Collecting data
- Engage in wonder by developing questions
- Choose one or more wonder questions to research print, digital, direct source (community partner), and collect more data about
- They generate interesting facts that answer their research questions (Wonders)
- Their Kilo Journal will become a portfolio of which to share the knowledge they build about their chosen phenomenon or problem.

"Did you know…." Students will use their kilo journal as a tool to teach their classmates about their phenomenon or problem.
They will also create a tool (map or step-by-step direction) to direct their classmates to the location where their phenomenon is or problem occurred.
They will create a visual representation, either their kilo journal, a poster, a model of their phenomenon or a problem to share with their classmates.
"What do you Wonder???" students will ask their observer and teach them how to kilo

Authentic Audience:

The authentic audience for this unit is going to be first-grade classmates. The purpose of this unit is for the students to become experts in their phenomenon or problem and become a model for teaching their classmates how they became experts through Kilo, Wonder, Asking, and Answering questions.

Other Evidence:

At the end of each lesson, we will assess the learning intention of that lesson and teaching of the student-level explanations with formative assessment tools such as gallery walks, and reflection discussions. Each kilo and question lesson will focus on one cross-cutting concept

- Patterns
- Cause and Effect
- Measurement
- Systems
- Matter and Energy
- Stability and Change

STAGE 3:

Students learn best when they are engaged in the learning. They learn best when they understand the purpose of the learning and know what is expected of them to be successful or what they need to do to learn. Students learn best when they can practice a skill, recall the skill, and use the skill learned. Students learn best when they can teach each other.

STEMS^2 framework is interwoven throughout this unit. Students will engage in the practice of kilo in their schoolyard to build a connection to place through a deep exploration of a phenomenon of choice from elements within this environment. They will talk with a learning partner throughout every activity in this unit to tell the story (mo'olelo) of their learning, build new understandings, and engage deeper with their phenomenon. They will ask "I wonder" questions and engage in research through makawalu utilizing sources to answer their wonder questions. Students will identify ways in which they will find answers to their questions either by researching in books, the internet, more kilo, traditional mo'olelo, and olelo no'eau and asking a local scientist (our community partner) and our kupuna on campus; thus, they will demonstrate a'o with their new knowledge they will create a tool as to which they will teach a classmate about their phenomenon. Every day we engage in this learning the students will be deepening their sense of place through the kilo, wonder, a'o, makawalu, and mo'olelo. The knowledge that goes beyond the standards built with this unit is Wonder! Wonder is where all learning begins and wonder is what pushes us to learn more and do more to protect our place.

Students will develop skills in the practice of kilo and drawing with accuracy and detail. They will need to make iterations to drawings to make them more realistic and scientific. They will develop wonder questions by utilizing the sentence stem, "I Wonder…?" Students will develop questions and find answers to those questions by exploring multiple resources such as mo'olelo, print, and digital media, discussions with a local scientist, and asking for information from other adults at our school and family members. They will write informationally and communicate their findings to their audience: their classmates. They will engage their classmates in the question stem, "Did you know…" And finish up their presentations by asking their audience, "What do you wonder about?"

The lessons will build on each other over the course of the unit. They will kilo in every lesson, they will build in a new skill along with kilo practice. Students will engage with families in a home to school connections of a phenomenon or a problem they notice and wonder about at

home. They will create a research plan to find answers to a question about their phenomenon. They will create a tool to guide their classmates to the phenomenon/problem such as a map or step-by-step directions. They will communicate their learning of their phenomenon in a “Did you know…” presentation in their kilo journal. They will finally ask their audience, “What do you wonder about?” and show them how they can kilo to wonder too.

The enduring understanding will be addressed throughout each lesson, one building on the other. They will begin with learning how to kilo and they will continue to kilo with each lesson and activity to continue to develop their understanding. They will work towards developing questions, as they kilo and they will continue to create wonder questions each time they kilo. These wonder questions will be developed into answerable and testable questions that are at their level. They will then engage in deeper kilo and data collection to support finding answers to their questions. This will give students a chance to practice all skills needed to accomplish the final assessments several times. Students will kilo their phenomenon many times over the course of this unit which offers students a chance to:

- Think about new knowledge/skills
- Do /create/make using the knowledge/skills
- Reflect and receive *feedback* on knowledge/skills
- Re-do (several times, if needed) constantly pushing for excellence

Learning Plan:

Learning Goals: Student Level Explanations	Lesson Activities and Steps to Learning to meet the Goals	Est. Time
Lesson 1 **Defining and Practicing Kilo** Kilo means to observe closely and come with thoughts, look for messages and information in and from your environment. Collecting data is recording information of kilo including the day, time, location, environment, weather and moon cycle. We look at patterns to sort/group (categorize) phenomena that we have chosen to kilo.	Introducing Kilo: Class created Definition **Teacher Background** **Define kilo** - kilo 1. nvt. Stargazers, reader of omens, seer, astrologer, necromancer; kind of looking glass *(rare)*; to watch closely, spy, examine, look around, observe, forecast (wehewehe.org) **Activity 1** ● Write ***Kilo*** in the center of a circle map ● Turn and Talk ***Talk to your partner and share what you know about the word kilo. What do you think it means, how do you know if you are doing it, where the word comes from?*** ● Share out whole group and **write the responses on the circle map** ● Use circle map to **develop a working class definition**	20 min

	● **Write it** out on the board or under the circle map on chart paper ○ **Revisit** this to start next lesson	10 min
	Modeling kilo with their hands, asking questions about what they notice while examining their hands. **Create a kilo journal** that is labeled with Date Time Environment Weather Moon Cycle or use this Kilo Journal Foldable **Define Phenomenon**: something that is observed to occur or to exist that we can use our science knowledge and science skills to explain or predict **Practice Kilo:** Students will go outside in open space, or garden space and oli to the place. (This sets the intention of the place and that they are here to learn from the ʻāina. Student will choose pānānā, location for kilo and sit, stand, or weed silently for 1 minute Explain: ***sit with voices off, bodies calm, eyes focused and ʻaina will speak to you***	5 min
	Students will find something of interest to kilo and identify as a phenomenon in the garden space outside of classrooms. ** It may be helpful to have a group discussion about wonderings prior to kilo. Such as, “Why are flowers so colorful?” It can help guide students to choosing their phenomenon.*** Possible ideas: ● Flower ● Plant ● Soil	20 min

	• Garden bed • Ground around a downspout or other specific location • The animals in the environment • Spiders/webs • Insects • Clouds • Sun • Wind • Rain Students will have 10 minutes to collect data and draw their phenomenon Student will return to class and in partners discuss their phenomenon **Pull together whole group** • Make a list of kilo subjects on the board • Have students work towards grouping (categorizing) the phenomenon by noticed patterns- What is the same, what is different? Review/Formative: Students will define Kilo, justify how they have collected data, and explain how they used patterns to classify their kilo subjects.	
Lesson 2 Scientific drawing, drafting and feedback practice **Drawing like a scientist** means to draw correctly with all the details of a phenomenon. Giving and accepting feedback is helpful in having an accurate drawing. Making many drafts is good and necessary to get the drawing as accurate as possible	**Modeling**: Austin's Butterfly with students Zoom/F2F or Recording with Scientist Sarah Model using an potted plant or something similar Stop video for- Academic Vocabulary • Accurate • Feedback • Draft Noticing details attributes to guide the drawing process: • Shapes • Lines • Patterns • Texture • Color	20 min

	Practice drafting- Take students out to kilo the class chosen kilo subject **Feedback** Practice - Partner up **Draft 2** If time allows, draft again **Gallery Walk** with discussion partner Discussion questions/Formative: ● Does the drawing have shapes, lines, patterns, texture and color that are accurate and make the drawing look realistic? ● What more can be done to make the image look more realistic? (think like the kids in Austin's butterfly video)	30 min 10 min 10 min
Lesson 3 Asking and Answering questions with a Research Plan **"I Wonder…." :** Asking questions about the phenomenon or problem that I found is a good way to learn more about it. Thinking about best ways to answer my questions helps me identify good resources Creating a good research plan helps me organize how I will find answers to my questions. Finding answers to my questions helps me become an expert about my phenomenon or problem and helps to explain or problem solve it.	**Kilo a phenomenon** In partners: **Ask**-*What does it mean to wonder?* **Develop** a definition for ***wonder*** **KWL Chart:** here is a possible handout or this one Students have had a couple of sessions of kilo of their phenomenon or problem. They will now have an opportunity to use a common graphic organizer tool to begin to develop wonder questions. **Ask**: *Where can we find answers to our "I Wonder.." questions?* ● *Books* ● *Our teacher* ● *A trusted adult* ● *A scientist* ● *More kilo* **Create a research plan**: handout option 1. Ask a "I Wonder" question (*think, can I find the answer to this?)* 2. Identify Resources (*think, where can I find the answer to my question/s*) 3. Find answers to my questions in my resources identified (*think, did this answer my*	5 min 15 min 5 min 10 min

	wonder question) 4. Organize my information (*think, how do I want to tell others about what I learned*) **Begin Research:** ● Students look for books in class ● Make a list of possible topics to ask librarian to help find, if appropriate internet search ● Make a plan to ask our Community Partner, Scientist Sarah ● Kilo **Share** plan with a partner Checklist for partners/Formative ☐ Plan has a clear wonder question ☐ Plan has atleast 1 resource for answering chosen, such as books, ask a knowledgable adult	20 min 5 min
Research Project	Begin with Review of Wonder Questions meaning: Teacher background: Sometimes 1st graders don't have a complete understanding of Wonder, working on building this explanation in is key to this unit. Talk about wonder questions many times throughout the day, remind students that to wonder about something means you don't know the answer, you have to do more work to find the answer. ● **Play 20 questions** to build understanding of what wonder means in this context. ● **Revisit the Working Definition** of "Wonder": ○ *Be sure students are understanding that in this context wonder means to ask questions you don't already know the answer to about a phenomenon you noticed or you have observed. It means to be curious about something.* ● **Revisit research questions** ○ Utilizing this KWL Chart explore what the students already know and what they ○ allow time for students to explore their wonder questions again and rewrite new ones or edit old ones to fit their CURIOSITIES Finding Answers to their questions:	Several days

	Using the research plan foldable and kilo journals have students write their research question Students will research and develop a project to share their learning about their phenomenon and answer their wonder questions. **Ask:** ***How are you going to tell others about what you have learned about your phenomenon?*** **Design a Tool:** Students will choose one project/product they will create to teach their classmates about their phenomenon. Examples are: Posters, kilo journals, maps to find their phenomenon, art piece, poetry, story, etc. Teaching Tool Requirements Checklist: ☐ Title ☐ Image/Drawing of your phenomenon ☐ Labels and explanations ☐ Steps of research outlined ☐ **"Did you know**…."written statement	
Lesson 4: Communicate findings **"Did you know…."**	**Communicate your Findings:** A'o: Students will invite their classmates to share the findings of their phenomenon through their teaching tool. With the sentence stem: "**Did you know**…." Students will share their mana'o of their phenomenon with a classmate. Students will ask: ***"What do you Wonder about?"*** **Presentation Feedback**	