

'Ewa 'Āina Education Initiative

Unit Plan: The Role of Lo'i in 'Āina Momona (Link:

https://drive.google.com/file/d/1LsOkcP7d8siMuVTkHP46_peia96Xlcyo/view?usp=sharing)

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'Ewa 'Āina Site: Kuhiawaho

Detailed Lesson-Project Plan #2

Descriptive Lesson Title: Patterns to Kalo Growth

Essential Unit Questions Addressed:

How can I measure length, mass, and capacity using non-standard units?

Educational Standards that the lesson will help students achieve

A.CED.2: Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.*

A.CED.3" Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*

F.BF.2: Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.*

N.Q.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Mathematical Practice:

Use appropriate tools strategically

Look for and make use of structure

HĀ framework and/or Hawaiian Culture integrated into this lesson

Strengthened sense of Hawai'i:

I am enriched by the uniqueness of this prized place. A sense of Hawai'i is demonstrated through an appreciation for its rich history, diversity and indigenous language and culture. I am able to navigate effectively across cultures and communities and be a steward of the homeland.

a. Pronounce and understand Hawaiian everyday conversational words

b. Use Hawaiian words appropriate to their task

c. Learn the names, stories, special characteristics and the importance of places in Hawai'i

d. Learn and apply Hawaiian traditional world view and knowledge in contemporary settings

e. Share the histories, stories, cultures and languages of Hawai'i

f. Compare and contrast different points of views, cultures and their contributions

g. Treat Hawai'i with pride and respect

h. Call Hawai'i home

Materials needed

Videos, Media, Lesson Presentations/Resources

- [Taro \(Kalo\) 101](#) (Link: <https://www.youtube.com/watch?v=QgPcXEZCdBE>)
- [Kalo Ppt](#) (Link:

<https://drive.google.com/file/d/1232pQyHGAKam4s9Vbgy75RybqeVxsx7J/view?usp=sharing>)

- [Desmos Activity](https://teacher.desmos.com/activitybuilder/custom/5e8a4dc47878460c731e57fb?collections=5e7583112425277414fdc1b1) - linear versus exponential (Link: <https://teacher.desmos.com/activitybuilder/custom/5e8a4dc47878460c731e57fb?collections=5e7583112425277414fdc1b1>)
- [Desmos Activity](https://teacher.desmos.com/activitybuilder/custom/569ee4053962ed3f062a0930#preview/16e16922-3ecf-4492-9023-a1662279829f) - linear, quadratic, exponential functions (Link: <https://teacher.desmos.com/activitybuilder/custom/569ee4053962ed3f062a0930#preview/16e16922-3ecf-4492-9023-a1662279829f>)

Student Assessments and Worksheets

- [Nā Ana Hawai'i Hawaiian Units of Measurements](https://papahanakuaola.org/wp-content/uploads/2021/03/naanahawaii-1024x769.jpeg) (Link: <https://papahanakuaola.org/wp-content/uploads/2021/03/naanahawaii-1024x769.jpeg>)

Supplies

- Desmos calculator to teach regression
- Laptops for research

Pedagogy (methods) Used to introduce, teach and close/review lesson

Lesson Introduction

- Attention Getter: Show students 2 objects (Ex pineapples) in an image, then a second image with 4 of those objects and then ask students to share how many objects would be in the third image. *They should say 6 or 8 or 16* then ask them to pick a side of the room for 6, 8, and 16. The students in the same group should share about why they guessed that number of objects and how they can convince the other students to move to their group. Give each group a chance to share just one reason and invite students to move (can be more than 1 round). Finally, invite students to join you in the 4th group, “unsure” (which was NOT an option for them earlier) and share your reason for why - not enough data to predict the next output; not sure what kind of function this is. Transition by asking them to predict how kalo grows.

Instructional Sequence

Teacher Does	Students Do
Show Taro (Kalo) 101 video.	Watch video.
Facilitate Desmos activity on linear/quadratic/exponential.	Participate in Desmos Activity.
Facilitate discussion to review what the best shape of the lo'i was.	Small groups or whole class, write a proposal to Kuhiawaho about what shape their next lo'i should/could be using data/research and reasoning to back up their proposal.
Prompt students to think of tools that native Hawaiians must have used to measure the dimensions of the lo'i field. Handout Nā Ana Hawai'i Hawaiian Units of Measurements worksheet. Ask students to all measure the same size object (like their desk) using a portion of their body. Compare the results of the students and ask how they believe native Hawaiians dealt with the issue	Review Nā Ana Hawai'i Hawaiian Units of Measurements worksheet. Measure an object using a part of their body or something else native Hawaiians would have had access to. Compare their results with their classmates (will likely be different) and have them provide a potential solution for consistency when measuring with non-standard measurements.

of consistency of measurements.	
Once they have the dimensions of their lo'i, the teacher can assign different types of kalo varieties to students to predict the yield in 6 months, 8 months, 10 months, 12 months.	Research the kalo type/varieties and be ready to share the name, how it grows best, pros, concerns. Also, be ready to share predictions for the yield in 6 months, 8 months, 10 months, and 12 months.
Teach students how to create a table (graphing calculator or Desmos) and do the regression to see what kind of function does the kalo grow like.	Insert a table to plot points, run a linear, exponential and quadratic regression graph of those equations and determine which function does their kalo grow most like.
Teach about explicit and recursive form, connecting the function back to the kalo so students have a clear understanding of what a recursive function is.	Create the function in explicit and recursive forms.

Closure

[Desmos Activity - Sequence Patterns- Explicit to Recursive](https://teacher.desmos.com/activitybuilder/custom/57b0645b39f89fef7b94e925) (Link: <https://teacher.desmos.com/activitybuilder/custom/57b0645b39f89fef7b94e925>)

Accommodations for at least 3 types of diverse learners

- ELL students provide or assist with understanding Hawaiian vocabulary words
 - Kalo - taro
 - Lo 'i - Irrigate terrace especially for taro
- SPED accommodations provide resources to help students research about kalo.
- Distance Learning Modifications:
 - Print resources for students to use for their research (students without technology),
 - Students can measure objects at home and do calculations at home.
- Kinesthetic learners will get to use their hands and arms to measure.
- ELL learners have them share how they would say each Nā Ana Hawai'i measurement in their own language.

Suggested Formative Assessment Method/s For This Lesson

Teacher can look at the student's work on Desmos and leave comments (be sure to have students login using their Google account or they will be unable to go back to their work).

THINK ABOUT: Asking students to pitch the idea of creating a lo'i at their school. They can combine what they learned in the first lesson (about the shape) and the second lesson (how they measured it and how the kalo grows) to defend their ideas. Their proposal can be in written format addressed to the principal or a business type of memo.

Explain How This Lesson Relates To the Unit Summative Assessment

The summative assessment will be to create a presentation/video/paper on choosing the best lo'i field (shape, kalo variety) to impact yield and identifying factors that will affect the yield. This particular lesson is pivotal for students to be able to make predictions about how the kalo will grow to support their claim justifying why a lo'i field should be built.