Understanding By Design – Backwards Design Process
(Developed by Grant Wiggins and Jay McTighe, 2002)

Stage 1 – Desired Results

Established Goal(s)/Content Standard(s):
•What relevant goals will this design address?

Career and Technical Education Standards:
Level 1: Standard 5 → Assess the evolving impact of humans on the environment.
- Level 1 CTE Standards Link

Level 2: Standard 7 → Assess water management strategies for increasing water quantity and quality.
- Level 2 CTE Standards Link

Understanding (s)
Students will understand that:

Level 1:
What are the big ideas?
- Ecosystem health
- Humans affect the environment
- History and culture of the place

What specific understandings about them are desired?
- Understand how an ecosystem impacts water health.
- What have humans done to alter the environment and how has it affected the components of an ecosystem?
- What are significant cultural practices and history associated with the place?

What misunderstandings are predictable?
- If the water looks clear, it is healthy and safe.
- Water is only drinkable and clean when coming from pipes

Level 2:
What are the big ideas?
- Water Quality
- Water Parameters
- Purification Methods

What specific understandings about them are desired?
- Understanding the role that water quality plays in an ecosystem.
- What are the appropriate parameters for a clean water system?
- What methods can I use to purify water to meet the parameters?

What misunderstandings are predictable?
- Parameters are different in different situations and ecosystems.

Essential Question(s):
Level 1:
- What have we done to our Waipi'o ahupua'a?

Level 2:
- Do you think we will ever be able to restore the water ways in the Waipi'o Ahupua'a enough in order to drink it?

Student objectives (outcomes):

Level 1:

Students will be able to:

- Perform kilo of a watershed.
- Research the history and culture of the place.
- Perform data collection and analysis of water quality parameters.
  - Temperature, pH, DO, nitrates, phosphates, turbidity, coliform bacteria
- Identify possible human/non-human actions that could affect the environment.

Level 2:

Students will be able to:

- Research the background of Pouhala Marsh (history)
- Accurately analyze water data from multiple sources.
  - Parameters: Ph, Nitrate, Phosphate, Turbidity, Coliform Bacteria
  - Compare and contrast different water samples and sources.
- Based on observations (kilo), draw conclusions based on water data results.
- Posit new and innovative ideas regarding water purification.
- Present their findings and innovations.

Stage 2 – Assessment Evidence

Performance Task(s):

Level 1:

- Students will complete kilo activities to assess ecosystem health.
- Students will perform a skit, song, dance, etc. about the history/culture of the place.
- Students will conduct water quality testing based on provided samples from various sites within the Waipi'o ahupua'a (up, middle, and down stream).
- Students will create a poster, video, or slideshow to demonstrate the human/non-human activities that affect the watershed.

Level 2:

Through what authentic performance task(s) will students demonstrate the desired understandings?

- Students will conduct research using primary and secondary sources

Other Evidence (Level 1):

- Through what other evidence will students demonstrate achievement of the desired results?
  - Students will present their findings of the ahupua'a to the Level 2 students so they can continue and develop (and implement) solutions.

Other Evidence (Level 2):

- Through what other evidence will students demonstrate achievement of the desired results?
  - Students will present their findings of their water purification methods to the

about Pouhala Marsh & explain the impact humans have on the ecosystem (Blooms Level ANALYZE). ● Students will analyze the water data collected in the level 1 course to create an innovative solution to purify the water (Blooms Level: CREATE). ● Students will create a scientific board, presentation, and video to share their innovations (Blooms Level: EVALUATE) By what criteria will "performances of understanding" be judged? ● Rubrics: ○ Research Rubric ○ Innovative Creation CTE Honors Rubric ○ CTE Presentation Rubric	Storm Water Branch (City and Count) & the Division of Land and Natural Resources (DLNR → State)

Stage 3 – Learning Plan

Learning Activities (level 1):

Lesson #1: Then and now

- Students will interview someone who lived in Waipahu 25+ years ago (grandparents, parents, aunty, uncle, teacher, etc.) about the land and water.
- Show maps of old Hawaii and compare to modern day (https://www.oldmapsonline.org/map/rumsey/3707.000)
- Think-Pair-Share about interviews & maps (formative assessment: venn diagram)
- Research mo'olelo about the place. Guest speaker: Ati Jeffers-Fabro
- Based on information gathered, students will create and share a short (5 minute) skit, song, story, video, etc. about the place (past or present).

Lesson #2: Data gathering

- Students will perform kilo activities of the place where water was gathered (either by actually taking a field trip to the area or through photos & video taken by myself). Kilo worksheet.
- Students will conduct water quality testing using SOPs on various sites within the ahupua'a (up, middle, and down stream).
  - Temperature, pH, nitrate, phosphate, DO, turbidity, coliform bacteria
  - Ask Hilary about conducting water quality testing using AQ400
- Students will arrange data into graphs and/or tables to demonstrate any trends that may be occurring within the various sites.

Lesson #3: Urbanization within our watershed

- Students will determine the amount of land use in Waipahu and compare how it changed over 50 years, including a calculation of runoff.
- From this data, students will be able to make predictions and solutions to help the Waipahu area and its waterways.
- Information will be presented to the NRM 2 class students.

Learning Activities (Level 2):

[This is the core of your lesson plan and includes a listing describing briefly (easy to follow)]

Lesson #1: Would You Drink It? (45 minute period):

- **Would You Drink It?**
  - Present 4 different glasses of water in the same container (bottled water, upstream, midstream, Pouhala Marsh).
    - Question: Rank from Most Likely to Least Likely, which water sample you would drink.
- Students will watch a video of past field experiences to Pouhala Marsh and hear information about the site from industry professionals. The industry professionals will also give students a brief description about their occupation and day to day activities.
- Essential Question Introduction + Kahoot on Pouhala Marsh Facts
- NOAA Resource Article: 7 Ocean Literacy Principles
- Exit Pass: Google Jamboard Brain Think Slide → Students will contribute to a KWL chart which we will contribute to for the duration of the unit.

Lesson #2 (4, 86 minute periods):

- **Research → Background Building on Pouhala Marsh:**
  - Class #1: Research Paper Structure + Rubric (Outline)
    - Class Time to work on Outline + Research Collection Chart
    - Exit Pass: Completed Outline
  - Class #2: Credible Sources + Guest Speakers (Primary + Secondary sources)
    - Add information from sources to the outline
    - Exit Pass: Completed Research Chart
  - Class #3: Putting it all together:
    - Synthesize sources to create Draft #1 of paper
    - Exit Pass: Completed Research Paper
  - Class #4: Presentation of Findings + Peer Editing and Feedback
    - Students create a 5-10 slide presentation explaining their findings.
    - Receive feedback from peers via google forms.
    - Make any revisions and corrections

Lesson #3: Water Data Analysis + Innovation Solution Creation (45 minute period + 8, 86 minute periods)

- Class #1: Level 1 students present findings for water quality to level 2 students.
  - Level 2 students take notes and
- Classes #2-#6 (2 week span):
  - Field Experience to Pouhala Marsh.

    - Water purification methods and techniques are introduced to students (Genki Balls, Water Filtration (Grattix Tote), etc. Industry partners will come into class and explain purification methods at their site.
    - Students take notes and work on creating a method that will work at Pouhala Marsh.
    - Upload pictures and videos of the process to a shared drive.
- Classes #7-#8:
    - Create a 10-15 slide presentation or 5-7 minute video explaining their research, method of purification, and process of implementation.

Lesson #4: Presentation Creation (2, 86 minute period):

- Class #1: Introduction to canva video & scientific board outline expectations (CTE Presentation Rubric)
- Class #2: Student work time and presentation completion.

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- W= Where the unit is going?
- H= Hook and hold interest
- E= Equip all students
- R= Rethink and Revise their understanding
- E= Evaluate their work
- T= Tailored learning (personalization to needs)
- O= Organized to maximize engagement