

**ENGINEERING INGENUITY****LEARNING LOG 5**

NAME _____

DATE _____

On the back of this page, sketch a *loko kuapā* (shoreline fishpond with an outer seawall built with rock and coral). Diagram how the flow of water through the *mākāhā* at both rising and falling tides affects water quality and pond life. Use the student reading as a reference.

What observations did you make when you raised and lowered the tide on your model?

What inferences did you make about the fishpond based on your observations?

What is the difference between an observation and an inference?

What is the function of the *'auwai o ka mākāhā* ?



Why was the *mākāhā* important in a *loko kuapā*?

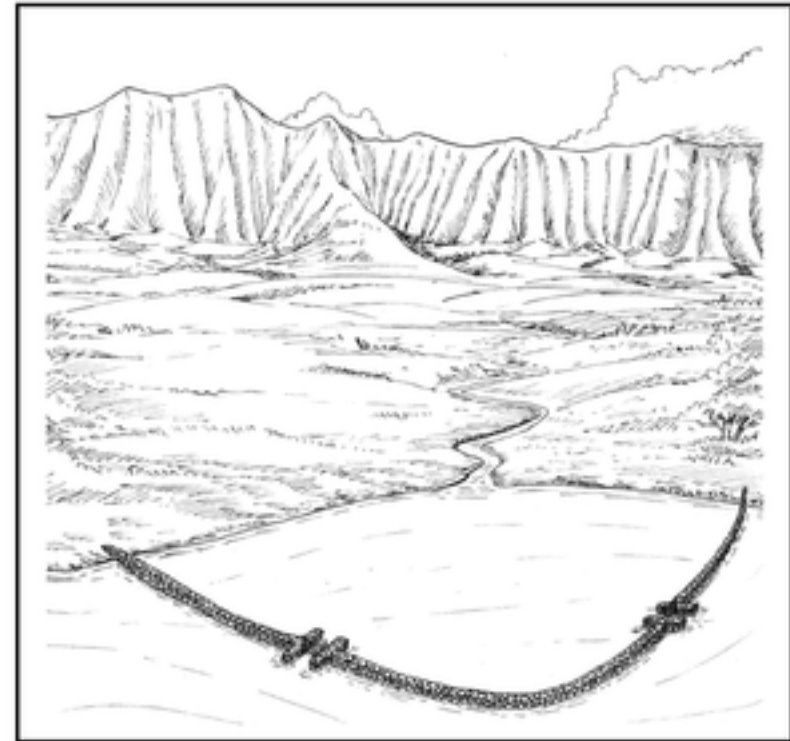
Write one paragraph with a clear topic sentence that describes the technology of Hawaiian fishponds and display it next to your model.



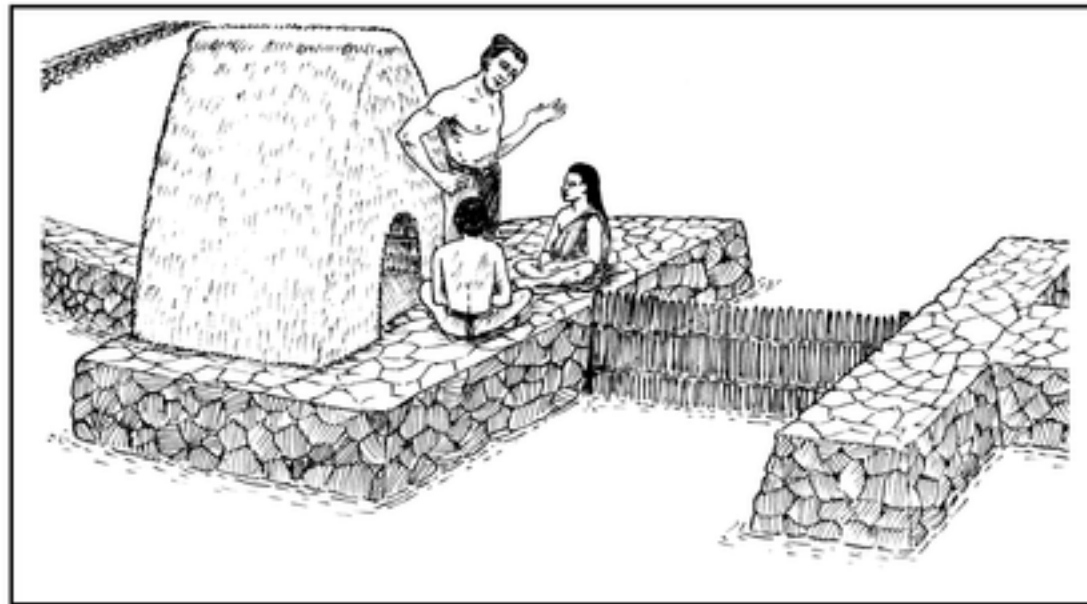
ENGINEERING INGENUITY

STUDENT READING

Fishponds were built in old Hawai'i to raise and harvest edible fish. *Loko kuapā* are fishponds with *kuapā* (seawalls) built of stone and coral and *'auwai o ka mākāhā*. This type of pond with a *mākāhā* is found only in Hawai'i. Hawaiians built these fishponds on a reef flat near a freshwater stream or spring. Many *loko kuapā* had natural freshwater springs inside the pond. The fresh water brings minerals and nutrients into the pond. Nutrients are like fertilizer for phytoplankton (tiny plants) and algae. Fish like the *'ama'ama* (striped mullet) and *awa* (milkfish) feed on the plants.



How did Hawaiians fill their fishpond with fish? Their method was brilliant! They used knowledge of nature's own "technology" to grow fish. The *pua* (baby) of fish like *awa* come to the brackish water inside the fishpond. They are attracted by the large amount of food and the safety of the habitat. While still small, the *pua* can easily



squeeze between the individual bars of the *mākāhā* spaced one-half inch apart (Uyemura, 2007). When the fish grow up, they are too big to fit through the *mākāhā*. They are attracted to the current in the *mākāhā*, as the current brings food directly to them, and they are easy to catch in the *'auwai kai* when the tide changes.

The construction of fishponds using *mākāhā* was a major change in fishing technology. Instead of just catching fish, Hawaiians began growing or farming fish.

When the stone walls of the *kuapā* shore ponds were completed, then the task remained to find the proper wood for the sluice gate or *mākāhā*. This was selected by the *kahuna* of the *'aumakua* who increased fish in the ponds (*kahuna 'aumakua ho'oulu i'a loko kuapā*). The wood was *'ōhi'a 'ai* or *lama* (Kikuchi, 1973) or some other suitable hardwood. When the wood for the *mākāhā* was ready, and the proper day had arrived for its construction, the *kahuna* was fetched to set up the first piece of timber. For this important duty he



offered a pig or a dog suitable to this work of inspiring an increase of fish, and prayers appropriate to this work. Then he reached for a timber and set it up for the *mākāhā* and offered *pule ho'ona* (the prayer that released the *kapu* and allowed the work to proceed). Then the men built the *mākāhā*, binding it together with 'ie cords (aerial root of the 'ie'ie plant). After that they arranged (*ho'onohonoho*) foundation stones with the *mākāhā* and poured in pebbles. It was in this way that all *mākāhā* were built (Kamakau, 1869).

Hawaiians built *loko kuapā* for their *ali'i* (chiefs). The *maka'āinana* (commoners) harvested and ate fish from the *loko i'a kalo* (taro fishponds). These are ponds that they built in the mountains next to streams. The fishponds of old Hawai'i were like the "refrigerator" of today. The fish grown in fishponds were there when people needed them.

