ʻAha: Braiding the Cords of Knowledge for Native Hawaiian Engineering Students

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***Abstract*— This research Work-In Progress begins the discussion of the experience of Native Hawaiian engineering students. Despite having early success in sustainable development and engineering, Kanaka Maoli or Native Hawaiian interdisciplinary engineering practices have not been able to persist alongside Western engineering due to cultural differences in knowledge acquisition. To understand these differences, the Holographic Epistemology of Dr. Manulani Aluli Meyer was used to code semi-structured interviews with three undergraduate Native Hawaiian engineering students focused on their intersectional identities. Common themes and experiences that all three students brought up were matched with native Hawaiian values of Kūpaʻa, Kuleana, and Hōʻihi to represent the Body, Mind, and Spiritual dimensions of knowing within the Holographic Epistemology, respectively. These values and dimensions of knowledge connect the importance of kumu (mentors) and lāhui (community) to the commitment to the ʻāina (land) that both stem from a profound respect for all people and things. Hopefully, all the dimensions can be put into balance and begin the conversation of bringing new mindsets, knowledges, and cultures into the engineering space. However, this is just the beginning of the moʻolelo (story) of Kānaka in engineering, and it is time to continue to build on the knowledge of these people and other understudied populations.**

Keywords—Undergraduate Research, Race/Ethnicity, Student Experience, Critical Theory

I. Introduction

Kānaka Maoli or Native Hawaiians have a deeply rooted history of interdisciplinary and nature-centered engineering. Understanding this knowledge and perspective can help to address the complex challenges of promoting diversity and sustainability in engineering education [1]. This is a promising area of emerging research [1].

Doing research on the experiences of Kānaka Maoli in engineering education is difficult due to the small numbers of these students and how Native Hawaiians are usually grouped into various population classifications [2]. Previously, Native Hawaiians were classified under Asian and Pacific Islanders (API) until 2010 when they were separated into the current classification of Native Hawaiian and Other Pacific Islanders (NHPI) in federally collected higher education datasets [2, 3]. This NHPI classification still includes other Polynesian cultures, as well as Micronesian and Melanesian cultures; therefore, it is hard to identify students as solely being Native Hawaiian. In the 2020 United States Census, 0.5% of the population identified as NHPI alone or in combination [4].

The difficulty of identifying Native Hawaiian engineers is exacerbated with the history of colonization in Hawaiʻi that has led to the majority of Kānaka Maoli being multiracial [3]. Until recently, demographic data would assign each person to one of their races rather than considering mixed heritage. Some of this still occurs today allowing some Native Hawaiians to get lost in data sets. Similarly, colonization has deterred many students from Science, Technology, Engineering, and Mathematics (STEM) education, especially engineering, as it represents betraying their culture and assimilating to Western society creating culturally relevant tensions [5]. This colonial history and issues with identity gives this population valuable insight to a variety of non-Eurocentric cultures and histories that add to the important knowledge that these students bring to the engineering space [1,5].

II. Framework

To understand how Kānaka Maoli obtain knowledge and how this differs from traditional Western engineering, we used the Holographic Epistemology developed by Native Hawaiian scholar Dr. Manulani Aluli Meyer as the basis of analysis in this work. This Holographic Epistemology aims to find a way to balance the three dimensions of knowledge: Body (Objective), Mind (Subjective), and Spirit (Cultural) [6].

The first dimension of knowledge from the body deals with the empirical knowledge that current science and engineering rely on [6]. This knowledge comes directly from physical experience. Secondly, knowledge from the mind comes from thinking and reflection [6]. This is the portion that creates an idea or concept based on the information provided through lessons and/or experiences. The third dimension is the knowledge that comes from the spirit (not necessarily religious)

This work was sponsored by the USA National Science Foundation (NSF) through Grant 1836504.

[6]. This knowledge transcends our bodies, time, and space to discover the relationships and connections between all things. It is a knowledge of unification shaped by the environment, other people, and culture.

Body, Mind, and Spirit all work together to create a holistic and shared picture of knowledge [6]. Meyer suggests considering these dimensions as a hologram composed of three intersecting lasers. The hologram needs all three lasers to create a picture. In a similar way, knowledge cannot be complete unless the body, mind, and spirit are all included and prioritized equally [6]. Contemporary Western society emphasizes the body, recognizes the mind, and discredits the spirit [6]. The prioritization of these knowledges can, in turn, discredit students that have an appreciation for the other two ways of knowing [5, 6]. Most indigenous knowledges, including Native Hawaiian ways of thought, understand that the body or science cannot explain everything. As we go forward with this paper, please have an open heart as we try to weave these forgotten dimensions of knowledge back into a field traditionally based in efficiency and uniformity that opposes the long-term and holistic way of thinking encompassed in the Holographic Epistemology [6, 7].

III. Methodology

To understand the experiences and knowledge acquisition of Kānaka Maoli, semi-structured interviews were conducted by the first author with three current Native Hawaiian undergraduate engineering students. The interview questions were centered around the cultural and engineering identities of the students. These semi-structured interviews also allowed for further discussion depending on responses of the participants [8]. One interview was conducted in person and two were conducted online using Zoom. Participants were given a $25 stipend in appreciation of their time. Interviews were 55 to 65 minutes. Interviews were transcribed by the first author and the transcriptions were coded using the lasers of the Holographic Epistemology using thematic analysis [8]. Emerging themes will be presented in the following sections to begin the investigation of the Native Hawaiian student experience.

Because it is challenging to find participants that identify as Native Hawaiian and are engineering majors, snowball sampling was used through the network of the first author who is a current Native Hawaiian engineering undergraduate that attended Kamehameha Schools, a school that gives preference to students with Hawaiian ancestry, from kindergarten to 12th grade. Using our connections through peers of the Kamehameha Schools system gave them access to most of the participants that fit the demographic we wanted. These students were all raised on different islands in Hawai‘i and are attending different universities in different states. Two of the students attend public Research 1 institutions and the other attends a primarily undergraduate institution. Each student was given a pseudonym in ‘olelo Hawai‘i (Native Hawaiian language) to maintain anonymity and celebrate their Hawaiian identity: Kahiwalani, Kekila, and Hau‘oli.

Throughout the interviews, all participants discussed their identity formation and how being raised in Hawai‘i as a Native Hawaiian has caused challenges in their academic performance in engineering. After being coded in the Body, Mind, and Spirit dimensions of knowledge, each dimension was matched with the Hawaiian values of Kūpa‘a, Kuleana, and Hō‘ihi, respectively. The knowledge or ‘ike for these Native Hawaiian students are out of balance due to the differences in Native Hawaiian and engineering cultures [1]. The concept of the Lōkahi Triangle is used in Hawaiian culture to bring about lōkahi or harmony with others, the land, and spiritual sources [9]. Fig. 1 shows the Lōkahi Triangle as a visual diagram that helps to depict the methodology of coding and Hawaiian values used in our analysis.

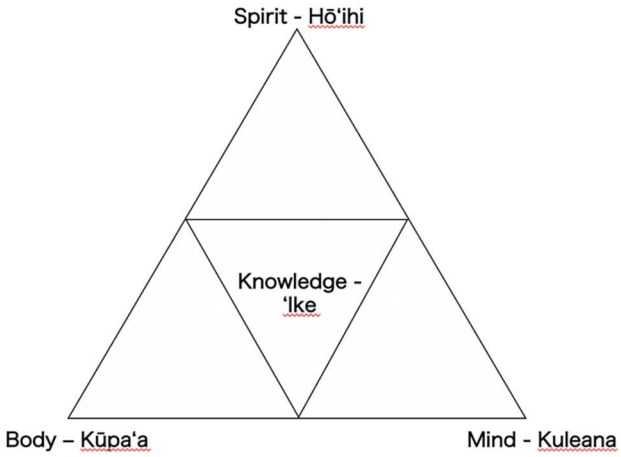

Fig 1. Lōkahi Triangle that Balances Knowledge or ‘Ike of Native Hawaiian undergraduate student participants in engineering as a visual depiction of the coding process.

To challenge the Western dominated engineering space, the Native Hawaiian ritual of ‘aha or cord braiding will be described in tandem with the coded student experiences to bring in culturally specific knowledge and history. Students’ identity, colonial history, and both the Native Hawaiian values and ritual of ‘aha paints the picture of the importance of weaving the three different knowledge types in engineering education to create a new definition of diversity based on the Holographic Epistemology.

IV. Results

A. *Body – Kūpa‘a*

The body laser of knowledge can be described through the actual educational experience of these students with engineering courses and how they have persisted despite setbacks. Kūpa‘a is directly connected to persistence as it is the value for standing firm and being steadfast. Each student mentioned experiences with professors that negatively affected their engineering pathway from professors only caring about their research, feeling patronized when asking for help, and not being able to answer questions because the professor stated that

they had only learned the material that day. All these examples made the students not want to interact with the professors forcing them to learn on their own. Kekila illustrates his experience with isolation with his professors saying that he feels "most professors are there to do their research, so they don't really care. If you go to office hours, they will try to help you, but their passion is research so a lot of the times they're not really interacting with you."

When comparing these professors to past and present mentors, the students emphasized that their greatest mentors made them feel like they mattered. This was the concept that was lacking in other professors in their engineering experiences. Kekila compared his high school teachers with college professors saying that "the thing that made high school special to me was the kumu (teachers) because everyone cared about you and there was a sense that we were all in this together."

Kekila illustrates how a mentor has a specific meaning for Native Hawaiian students. It is more than someone who is going to help with a problem, but someone who will take the time to get to know the student to create a relationship of interdependence essential for respect and camaraderie to be built [5]. A true kumu will help to hold haumāna (students) together. Kumu function like the ʻaha cord, or a strong rope used in the making of houses, canoes, water containers, and many other tools for ancient Hawaiians [10].

B. Mind - Kuleana

The ʻaha cord meaning evolved and became a political symbol for aliʻi (chiefs) [10]. Before any political leader could go through the ʻaha ritual, they had to prove their responsibility and worth to their people [10]. This value of responsibility is kuleana in Hawaiian culture and is the internalization of what to do for others, ancestors, and the environment. Kuleana directly ties to the mind laser as it deals with self-reflection and how it increases personal and community awareness.

As Native Hawaiian engineering students, the need to prove responsibility to the lāhui (Hawaiian community) takes on the same path as the ʻaha ritual [10]. Due to the colonial past of Hawaiʻi that includes the illegal overthrow of the monarchy by the United States, Native Hawaiians have become skeptical towards Western development and engineering [5]. Kahiwalani describes how this skepticism forces Native Hawaiian engineers to show their commitment to the lāhui:

> As an engineer, you get judged for leaving home and not pursuing something related to culture. It's like you are leaving Hawaiʻi behind rather than making something better for our home. There's a stereotype from me being here (contiguous United States) all these years and especially not going home as much that people don't think I care about home anymore or that I am having a better life here. That is not even the case. It's just that engineering is something that I believe could better our people.

Native Hawaiian engineering students are put into this liminal space of science and culture where it can make understanding their identity more difficult [5]. Despite having this issue of balancing history, culture, and engineering, all the students still shared the kuleana to give back to the place and people that raised them using their learned engineering skills.

C. Spirit – Hōʻihi

This commitment to the lāhui and ʻāina (land) has to do with an elevated level of respect or Hōʻihi that Native Hawaiian culture places on ancestors and the environment. When asked what values were instilled in her, Hauʻoli responded immediately with:

> The main one is respect. Everybody in Hawaiʻi calls their elders 'aunty' and 'uncle'...You don't leave anywhere a mess. It's respecting everything; the land, people, objects. We only have one Earth and a lot of Hawaiʻi people grew up with nature surrounding us. We had to learn how to take care of it.

In Hawaiian culture, the land is an ancestor of the people and ancestors were continuities of knowledge that provide information for Native Hawaiian people. There is a sacredness to land and elders grounded in respect that continue to guide Kanaka Maoli engineering students. This is how the spirit laser transcends space and time because it is knowledge that is passed down through nature and culture for generations.

The ʻaha ritual further illustrates this concept as the braiding of the cord by aliʻi is the accumulation of political and spiritual power being passed down from their ancestors [10]. In other words, one's ancestors and their knowledge are the basis of the prowess of the chief. Conversely, the chief is a representative of their ancestors and must carry themselves accordingly or it reflects on their family. Understanding this cultural aspect is integral for what motivates Native Hawaiian engineering students and can help to create a full hologram on how they obtain knowledge differently from the dominant engineering culture.

V. Conclusion - ʻAha

As stated earlier, these three lasers of knowledge must be intersecting rather than separate. Knowledge and identity become holistic when all three are in balance. As seen in the Body and Mind sections, Native Hawaiian engineering students can struggle with the individualistic and isolated culture of engineering while also being discredited from the Native Hawaiian community for assimilating to Western culture. There is an illusion of separation between Hawaiian and engineering culture. This illusion comes from the lack of the spirit laser and the knowledge of our ancestors.

Native Hawaiians before Western contact built society and agricultural fields around watersheds to maintain high population densities. It was the knowledge and respect of nature

passed down from ancestors that allowed them to use interdisciplinary engineering focused on community and the environment. Engineering and Kānaka Maoli have never been separate but the cords of knowledge connecting them unraveled through history. As more Native Hawaiian engineering students continue to be contributing members to both communities, the ʻaha process will continue and the cord will grow stronger.

Native Hawaiian engineering students are the spiritual laser that must continue to challenge the engineering system to be more open to their cultures and cultures of marginalized groups. Kānaka Maoli must bring awareness of the engineering prowess back to the Native Hawaiian community. The struggle with identity is not being stuck in between two cultures but being the binding cord that intertwines both. Similarly, this paper is just the beginning of the ʻaha cord being intertwined. The similarities in experience between Kahiwalani, Kekila, and Hauʻoli are the first braids of Native Hawaiians in engineering education. However, contrasting the experiences of all three participants, discussing multiraciality as Native Hawaiians, and including place-based learning that ties to their ancestral home or the area where they are living for college are all other themes that could have been discussed. As we continue to braid the cord of identity, asset-based research on Kānaka Maoli can also add to the strength of the cord showing that the multicultural heritage of these students and their balance of knowledge is their advantage and will benefit the movement towards sustainability and diversity in engineering.

In future works, we hope to continue this discussion with more students and to modify the Lōkahi Triangle further to include more aspects of knowledge to create a more holistic and cohesive picture of how Native Hawaiian engineering students can interact, succeed in, and challenge the field. Our current depiction can be found in Fig. 2, but is continuously being edited as our experiences and our knowledge is also changing.

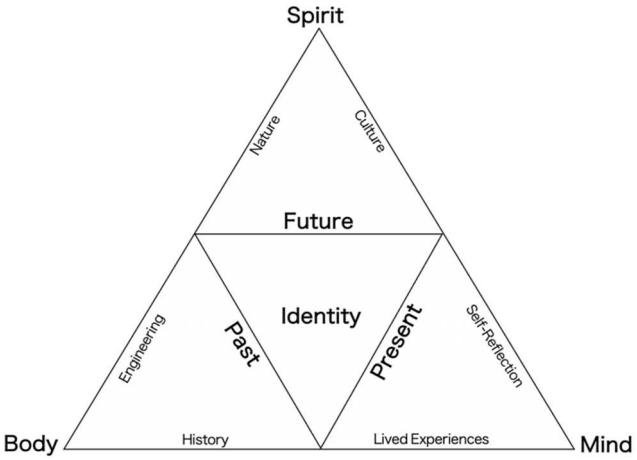

Fig 2. Our current version of the Lōkahi Triangle that focuses on balancing identity for Native Hawaiian students and redefining diversity in engineering education.

Hopefully, both the Native Hawaiian students and the engineering field can move to a place where lōkahi as harmony is not group thinking and lōkahi as unity is not uniformity, but lōkahi becomes a new form of diversity where there is respect and openness in the exchange of all forms of knowledge from all types of people.

ACKNOWLEDGMENT

Thank you to Dr. Manulani Aluli Meyer for giving us permission to use her frameworks and providing the indigenous perspective of knowledge that so many live by. Also, we would like to thank all of our participants for being courageous and telling us their moʻolelo of identity as Native Hawaiians in engineering and being sources of knowledge in their own right..

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