

# **Ho'okele: Native Hawaiian and Pacific Islander Engineering Students Navigating the New Troubled Waters of Identity and Meaning**

**Austin Peters**

Austin Morgan Kainoa Peters is a current B.S./B.A. Integrated Engineering student at the University of San Diego's Shiley-Marcos School of Engineering graduating Spring '22. Peters was born and raised in Wailuku, Maui, Hawai'i, and plans to attend Purdue University's PhD program in Engineering Education beginning Fall '23.

**Susan M Lord (Professor & Chair)**

Susan Lord is Professor and Chair of Integrated Engineering at the University of San Diego. She received a BS from Cornell University in Materials Science and Electrical Engineering (EE) and MS and PhD in EE from Stanford University. Her research focuses on the study and promotion of diversity in engineering including student pathways and inclusive teaching. She has won best paper awards from the Journal of Engineering Education and IEEE Transactions on Education. Dr. Lord is a Fellow of the IEEE and ASEE and received the 2018 IEEE Undergraduate Teaching Award. She is a coauthor of *The Borderlands of Education: Latinas in Engineering*. She is a co-Director of the National Effective Teaching Institute (NETI).

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## Abstract

Native Hawaiians have a deeply rooted history grounded in engineering before the colonization of these islands. Through a keen observation of nature, relational thinking, and technological ingenuity, Native Hawaiian ancestors traversed the oceans without instruments, served large populations through sustainable agriculture, and achieved a myriad of other engineering feats. After Western contact and colonization, this holistic and interrelated engineering identity was lost and a strong disconnect between Native Hawaiian populations and Western engineering was created. To bring this population and ideas back into the engineering space, a cultural change in engineering is necessary to be open to epistemologies of marginalized groups. Due to the insufficient amount of literature on the student experiences of Native Hawaiians in engineering education, we explore literature on Native Hawaiians and other Pacific Islanders (NHPI) in engineering education, STEM education and higher education using a framework developed by *Kanaka ‘Ōiwi* (Native Hawaiian) scholar, Manulani Aluli Meyer. Meyer’s Native Hawaiian Epistemology describes seven core themes that help to demonstrate how the systems of Western engineering culture and NHPI culture put NHPI students in constant conflict. For example, the current culture of engineering education does not acknowledge important values of NHPI populations including place-based knowledge, importance of family and community, and respect and humility towards elders. In worst cases, NHPI funds of knowledge are discredited as folklore not suitable for engineering or NHPI students are assumed to only possess stereotypical cultural knowledge. Simultaneously, the oral tradition of *mo’olelo* or storytelling will be used to recount the wayfinding and navigation history in Native Hawaiian culture. This story helps to exemplify the shift in perception that engineering and Native Hawaiian culture are not two combatting systems but two assets of a Native Hawaiian students intersectional identity that can help these students to rediscover their meaning and engineering prowess. As more specific epistemologies or marginalized groups such as the Native Hawaiians are brought into the engineering space, the structures in place that inhibit diversity and inclusion can be converted to create a place of shared knowledge and acceptance.

Keywords: Underrepresentation, student experience, race/ethnicity, critical theory

## Introduction

Native Hawaiians and Pacific Islanders (NHPI) have a rich history of engineering. For example, the hydraulic engineering prowess of the *ahupua‘a* (land division) system in prehistoric Hawai‘i balances irrigation and conservation to ensure watershed well-being [1]. This *ahupua‘a* system includes a variety of *lo‘i* (agricultural fields) and *loko i‘a* (fishponds) that demonstrate the keen observation and familial relationship with nature where both humans and the world live harmoniously [1]. Many islands in the Pacific had their own examples of this interrelated engineering based on the indigenous principle of the land as an ancestor that continues to speak and live through all things that it touches crossing time and space [2]. However, the islands that NHPI populations call home or have ancestral roots in are disproportionately affected by climate change despite not being major contributors to the processes that have induced and accelerated it

[3]. There is a constant need for engineering solutions through the eyes of the people who have a personal connection and understanding with that place. With the cultural knowledge and the need for solutions to challenging problems such as climate change, NHPI knowledge and populations should be valued and included within the engineering space for the betterment of their homes and engineering education. This requires a cultural change within engineering which has been designed to prioritize efficiency through homogeneity [4]. In other words, the current Western engineering culture was founded on and unconsciously reinforces that diversity decreases efficiency creating a systemic blockade of new or different ways of practicing engineering [4]. Being open to the epistemologies outside of the normal scope of Western engineering, including the more interdisciplinary and land-centered engineering of Native Hawaiian culture, is one way to begin the movement away from efficiency and towards diversity [2], [4].

## **Framework**

Dr. Manulani Aluli Meyer, a Native Hawaiian scholar, conducted interviews with twenty notable Native Hawaiian educators. Through these interviews and her experiences as a *Kanaka 'Ōiwi* (Native Hawaiian), she formulated seven themes to show how Native Hawaiians see knowledge and the world: Spirituality and Knowing, That Which Feeds, The Cultural Nature of Senses, Relationship and Knowledge, Utility and Knowledge, Words and Knowledge, and The Body-Mind Question [2]. These themes are not exhaustive of a Native Hawaiian epistemology but explain some of the uniqueness in the Native Hawaiian worldview. The main difference highlighted is that Native Hawaiians see in the long-term through relationships as “relationship is more valuable than the more modern sense of efficacy, money [2].” For engineering culture to become more welcoming for more people including Native Hawaiians, we argue that understanding and being open to the differences to traditional Western epistemologies and how these differences play out in the experiences of students is needed[4].

## **Methodology**

In this paper, we use Meyer’s seven themes that inform her Native Hawaiian Epistemology as the lens through which we examine literature on student experiences to illuminate cultural differences that occur for Native Hawaiian students in engineering. Although we would prefer to focus only on Native Hawaiians in engineering, there is very little literature focused on student experiences for this specific population. One difficulty is that the term Native Hawaiian falls under a variety of demographic groups such as Native Hawaiian and Pacific Islander (NHPI), Asian American and Pacific Islander (AAPI), or Asian Pacific-Islander Desi American (APIDA). Thus, we used the term NHPI when identifying literature for this study as this grouping consists of the least amount of cultures and these cultures share more similarities relative to the other classifications. Within the new scope of NHPI and engineering, there were only a handful of sources and most were not focused on student experiences making it difficult to identify culturally-relevant tensions. Even as we broadened our literature to include Science, Technology, Engineering, and Math (STEM), there were not many that included student experience. Therefore, we expanded our literature to also include some sources that explored NHPI student experiences in higher education rather than just engineering.

This broadening of scope warrants some cautions. Firstly, a Native Hawaiian Epistemology will be applied to the variety of islands and cultures represented through the term NHPI. Although some traditions and values are similar, these cultures cannot and should not be seen as identical since the lived experiences and histories of these cultures are different. Secondly, students in engineering will have unique issues in comparison to other majors. In an effort to separate these, we only included cultural differences for NHPI students in higher education that also occur in engineering or STEM education. This obvious gap in information on Native Hawaiians (and other specific cultures that get grouped together) leaves out valuable perspectives to the engineering space. Meyer argues that “specificity leads to universality [2].” Universality, in this case, is a more inclusive form of diversity where the distinctness of others are valued and appreciated making knowledge of all more accessible and shared [2]. Hopefully, using a Native Hawaiian Epistemology on the scope of engineering education can help to liberate ways of thinking for students in this space, and then be used further to liberate other knowledges of marginalized groups across disciplines [2],[4].

To integrate a non-traditional way of scholarship, the art of mo‘olelo or storytelling will be intertwined with the experiences of NHPI students in engineering through the lens of Meyer’s Native Hawaiian Epistemology. The engineering marvel that is the *wa‘a kaulua* (double-hulled canoe) was designed to traverse the Pacific Oceans three thousand years before Western societies accidentally fell upon these islands [5]. With its hulls that increased structural integrity and decreased drag, these canoes were incredibly fast relative to all other ships at the time [5]. Similarly, the sails were designed to provide 90% more lift [5]. Combined with the knowledge of the ocean, animals, and celestial bodies, NHPI were able to navigate and make home on the various islands in the Pacific without instruments [5]. Voyaging and the interdisciplinary understanding of wayfinding were nearly lost through colonization [6]. The Hōkūle‘a is the most popular contemporary voyaging canoe in the Polynesian Voyaging Society located in Hawai‘i with ties to the Pacific Islands in Polynesia and Micronesia [6]. On its worldwide voyage Mālama Hōnua, the Hōkūle‘a is a symbol of bridging tradition with technology and nature while proving the truth of sailing in the Pacific Islands [6]. In a similar way, we suggest that the double-hulled canoe can be a metaphor for Native Hawaiians to rediscover their home in the engineering space and to inspire others to see a new way of thinking. Thus, in the next sections of this paper we show how the seven themes of Meyer’s Native Hawaiian Epistemology can be seen in literature related to NHPI students in engineering. Let us set sail in our *wa‘a kaulua* on this intellectual voyage with an open mind and heart!

### **Theme 1. Spirituality and Knowing**

The first cultural theme of the Native Hawaiian Epistemology is Spirituality and Knowing or how spiritual forces are the foundation of knowing [2]. Spirituality, in this sense, is not related to religion but connects knowledge to all living entities past and present [2]. All ancestors, including the land and *‘aumakua* (deified ancestors and guardians) that come in the form of various natural objects, have played a role in creating and preserving the best cultural practices and creation of knowledge [2]. Oral histories and connections to these ancestors become an important aspect of identity formation for NHPI students [7]. Western academia can discredit this spiritual formation of knowledge as folklore compromising the identity of these students [8]. This is exemplified through how NHPI migrated to the various islands via the double-hulled

canoe with intention rather than on accident. Norwegian ethnographer Thor Heyerdahl hypothesized that NHPI populations happened to drift westward from South America and stumbled upon their island homes. This “drift theory” gained a lot of popularity through his expedition on a raft and pop culture [9]. Despite scientists and anthropologists discrediting his theory, the voyaging of the Hōkūle‘a in 1976 from Hawai‘i to Tahiti had to prove this to be incorrect by wayfinding using the Native Hawaiian practice of wayfinding without the use of Western instruments [6],[9]. In a similar way, NHPI students and culture are continually forced to prove their indigenous knowledge when not fitting into the Western standard of STEM education [3].

## **Theme 2. That Which Feeds**

The second theme is That Which Feeds focusing on how land, which is also seen as an ancestor, develops knowing [2]. The Hawaiian understanding of land or ‘āina shapes or feeds the people that live on it [2]. Feeding means to provide physical resources and being a spiritual inspiration of knowledge [2]. The place one is from shapes their experiences and cultural practices that creates and maintains knowledge [2]. When building a wa‘a kaulua, there are many protocols of *oli* (chants) and *pule* (prayers) to ask the land for permission to use its resources and to help keep the voyagers safe on their journey [6]. For many NHPI students, this familial relationship based in profound respect for the land becomes an important reason for their education [7]. Their hope is to address the concerns of their homeland for the place that shaped them [5]. Much of the current research on place-based education shows many benefits but actual implementation is lacking in academics [7],[10]. With land being an integral component of NHPI identity, this lack of place-based knowledge compromises who they are [3].

## **Theme 3. The Cultural Nature of Senses**

The spiritual aspect found in all the themes lead to The Cultural Nature of Senses [2]. This theme describes how senses are informed by culture and pushes knowledge to be more than objective knowledge by adding subjectivity from rational thought [2]. In other words, each person experiences the world differently and this affects the acquisition of their knowledge [2]. The reliance on “objective” science and economic growth in modern Western modes of knowledge does not prioritize subjectivity and spirituality, especially in STEM education [2]. In learning to build a canoe, use nature to navigate, or any other customs, *kupuna* (elders) and *kumu* (teachers or sources of knowledge) are significant mentors that intertwine all three dimensions or objectivity, subjectivity, and spirituality [6]. Through personal anecdotes, oral histories, *mele* (songs), or many of the other types of passing down knowledge, these mentors make sure to teach beyond empiricism. Due to the low number of NHPI in engineering, NHPI students do not have culturally understanding mentors and role models in the field that are able to teach using the objective, subjective, and spiritual ways of knowing simultaneously leaving them to only learn in the objective nature of the current model of engineering [8],[3].

## **Theme 4. Relationship and Knowledge**

The importance of *kupuna* and *kumu* continues to the theme of Relationship and Knowledge. The role of Mau Piailug, Micronesian master navigator, in the renaissance of wayfinding and

voyaging represents the reciprocity within this theme [11]. The prehistoric way of Polynesian voyaging was nearly lost until Piailug was able to teach members of the Polynesian Voyage Society how to navigate the oceans without instruments in the late 1970s to the early 1980s [11]. His generosity in passing down his knowledge to another culture displays how knowledge is a gift to be shared and an exchange between people to help to create balance with one another and the land [2]. *‘Ohana* (Family) and *Lāhui* (community) are influential sources of knowledge exchange and are prioritized in Native Hawaiian culture [2]. The responsibility to these two groups can lead to multiple difficulties for NHPI students in engineering. Family and community needs take precedence over their education and some students leave the field to help with these needs [3], [7]. Similarly, these students represent their *‘ohana* and *lāhui*, so there is an added pressure to be successful and disprove the negative stigmas placed on NHPI within Western education [3]. Forming these support systems within engineering education also becomes important, but the hyper-competitive, individualistic culture of engineering does not translate well to students being able to create their own versions of *‘ohana* and *lāhui* in this space [3].

### **Theme 5. Utility and Knowledge**

For an idea or concept to become knowledge in the Native Hawaiian Epistemology, it needs to have a function and purpose [2]. Function allows the concept to be applied and purpose makes the concept worth passing down leading to continual practice of the concept [2]. In the context of wayfinding, its function is to preserve this traditional custom, and its purpose is to bring a sense of pride to the Polynesian community that inspires cultural growth and ways of knowing [6]. Colonization has played a role in dismantling both the art of wayfinding and NHPI communities in higher education [7]. NHPI students have reported feelings of inferiority, loneliness, and marginalization due to their cultural backgrounds [7]. To make matters worse, as schools aim to promote diversity, these students are often used as poster children [7]. NHPI students tend to be multiracial due to the history of globalization on these islands allowing to check the boxes for multiple minoritized races increasing representation in multiple areas of institutions. NHPI students are exploited as these tokens of diversity leading to a loss of purpose and exacerbating feelings of isolation [7].

### **Theme 6. Words and Knowledge**

Words and thoughts help to create reality as both are expressed through actions [2]. Simply put, the good or bad intentions of words and thought cause a positive or negative effect, respectively [2]. Listening and awareness play a powerful role to recognize what intentions cause specific effects [2]. In navigating, listening to swells of the ocean, observing the movements of animals, and reacting to these natural signals properly help the canoe stay on course [6]. A common practice of learning in Native Hawaiian culture is listening, not talking, and taking in as much information as possible [2]. Combining this with a deep level of respect for kumu discussed earlier, lead to problems for NHPI students in Western classrooms. Students are expected to ask questions or go into office hours for help [12]. For NHPI students, these acts are rude as they represent not listening the first time and disappointing the teacher [12]. This cultural difference leads to NHPI students to not seek help when needed or not answering questions out of the fear of being wrong, making it more difficult to navigate academics [3].

## **Theme 7. The Body/Mind Illusion**

The final theme is The Body/Mind Illusion and how intelligence and feeling are connected and not separated [2]. In Hawaiian culture, the na'au is in the stomach and is where knowledge is located [2]. For a concept to become knowledge, the gut feeling of the na'au matches the sensory information collected by the body [2]. Along with that, the na'au is at the center of spirituality and where ancestors connect, making it the intersection of the three dimensions of knowledge: body, mind, and spirit [2]. In the literature that we examined, the majority of NHPI students talked about how they want to reconnect the gap between their culture and scientific knowledge [7]. This illusion that body and mind are separate is analogous to this gap and maintains the misconception that the gap is there. Seeing through this illusion causes NHPI to assimilate and compromise their cultural values and identity [8]. The Polynesian Voyaging Program at Windward Community College is an example of breaking down both illusions [5]. By teaching the historical, cultural, and technical achievements of the wa'a kaulua coupled with land stewardship and sustainability, the program can demonstrate the engineering prowess of Native Hawaiians through a Native Hawaiian epistemology [5].

## **Conclusion**

The lens of Meyer's Native Hawaiian Epistemology helps us see the disconnects between the cultural mindset of NHPI students and engineering education as described by various studies in the literature. More importantly, the mo'olelo of the wa'a kaulua suggests a way to navigate these disconnects using culturally specific knowledge. Polynesian wayfinding after colonization was a lost art and consistently challenged by Western academia. Through reconnecting to the past and Mau Piailug, the worldwide voyage of the Hōkūle'a and navigating the open ocean without instruments has come back to instill pride and worth for NHPI populations. The key has been specificity and returning to how Native Hawaiians viewed the world and knowledge before colonization. Specificity allows the Native Hawaiian Epistemology to be valued and liberate the assimilative minds of colonization bringing back the perspectives of the past into a modern setting. The na'au can be recentered and a holistic understanding of engineering can be recreated for Native Hawaiian students to see their identity within the field breaking down the illusion that their two identities are separate. We plan to conduct original research with Native Hawaiian students focused on their experience to learn what culturally relevant tensions arise, to break down this illusion between engineering and Native Hawaiian cultures, and to begin the healing process on their identities.

However, the impact cannot stop there but must build outwards with more research. More NHPI cultures, as well as other marginalized groups, can bring their own specific epistemologies into the engineering space creating universality. As the space becomes more open to new perspectives by honoring the differences in knowing, knowledge is exchanged and liberated. From there, this liberated knowledge can be taken back to the place-based and local contexts of each person. The homogeneity built into the structure of engineering can begin to be broken down to create a new definition of diversity. To accomplish this, more research is needed on ethnic groups to open the hearts and minds of the engineering space where specific liberated epistemologies can be more readily accepted. It is time to look deeper than the typical classifications and bring forth a new way to acquire and share knowledge.

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