

**SCIENCE EDUCATION AND NATIVE HAWAIIAN PEOPLES:
A STUDY OF THE DIS/CONNECTION BETWEEN SCIENCE TEACHING
AND BEING NATIVE HAWAIIAN**

**A THESIS SUBMITTED TO THE GRADUATE DIVISION OF THE
UNIVERSITY OF HAWAII IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF**

MASTER OF EDUCATION

IN

EDUCATIONAL FOUNDATIONS

DECEMBER 2007

**By
Franklin S. Allaire**

Thesis Committee

**Hunter McEwan, Chairperson
David Ericson
Walter Kahumoku, III
Steven Marble**

We certify that we have read this thesis and that, in our opinion, it is satisfactory in scope and quality as a thesis for the degree of Master of Education in Educational Foundations.

THESIS COMMITTEE

Hunter Mc Ewan Chairperson

[Signature]

Walter Kellum

Stephen Markle

DEDICATION

To my wife Sachie, my parents, Madeline Sturm and Thomas Allaire, and my brother Ross Allaire all of whose love and support inspire me.

ACKNOWLEDGEMENTS

There are many people that owe thanks to for loving, inspiring and supporting me in throughout my entire life. These are just a few.

My parents and brother have always been a source of love and encouragement to try new things, to set my sights high and to never give up on my dreams. Throughout this process, mom, dad and Ross have been there to “high-five” me when things went right and have been shoulders to cry on when things were frustrating. Their love of learning (both formal and informal), reading and exploring new ideas has been a model that I have tried to live up to.

I owe an immense debt to my wife Sachie who encouraged me to go back to school and to continue this process even when faced with extremely frustrating obstacles and seemingly insurmountable odds. She is the light that guides me through the darkness, and any greatness and intelligence I may seem to have is a pale reflection of that which she emanates. I must also mention my two dogs, Mele and Kayla, who provide hours of entertainment, unconditional love and the perfect excuse to procrastinate.

I also want to acknowledge my friend and classmate Nikki Stevens who epitomizes the plurality of identity. We laughed and cried. We sat up late nights typing our respective theses, drinking too much coffee and smoking too many cigarettes. We voiced our frustrations and were sounding boards of ideas and concepts. But throughout everything, we supported and encouraged each other to finish what we had started.

I wish to also thank the participants, without whom this thesis would not have been possible. They were kind enough to open their hearts and souls and share their experiences with me, and for that I will always be eternally grateful.

Finally, I want to thank my thesis committee, Doctors Ericson, Kahumoku III, Marble and McEwan. I am especially thankful to Hunter McEwan and Walter Kahumoku III. Hunter McEwan provided me with the guidance, encouragement and focus I needed when trying to find balance between being a teacher and a student. Walter Kahumoku III, along with helping provide a Native Hawaiian voice to this project, provided me with a friendly and empathetic ear at just the right time to overcome my fears and frustrations and not give up and quit.

ABSTRACT

The mainstream science education paradigm which permeates many public and private school systems does not recognize the indigenous knowledge of the Native Hawaiian culture as a viable partner in the classroom/laboratory to “traditional” scientific methods. Researchers and scholars argue that many science teachers align themselves to values associated with scientism resulting in an atmosphere where a Hawaiian science teacher’s beliefs and cultural identity are viewed as unscientific and unimportant. This creates a situation where teachers are forced to categorize themselves based on a single identity, in this case the choice between being Hawaiian or a science teacher. This singular identity system creates an atmosphere in which Indigenous science teachers, and in turn their students, must choose to either abandon their culture in favor of the “civilized” methods of science or to become disengaged from science as a whole. This thesis approaches the identity from a different perspective, one in which individuals have plural identities at different times. This theory will be supported by literary works such as Amartya Sen’s *Identity and Violence* and Kwame Appiah’s *Cosmopolitanism* as well as three cases studies involving science teachers of Native Hawaiian ancestry.

TABLE OF CONTENTS

Abstract.....	vi
List of Figures.....	ix
Chapter 1: Overview of Research Questions.....	9
Introduction.....	9
Research Questions.....	11
Chapter 2: Literature Review.....	13
Review.....	13
Critique.....	17
Chapter 3: Methods.....	22
Theoretical Framework.....	22
Collecting Oral Histories.....	22
Interviews.....	24
Chapter 4: Findings.....	26
Participant A: Kalaimaola.....	26
Participant B: Ku'ulei.....	38
Participant C: Lopaka.....	46
Themes Between Participants Kalaimaola, Ku'ulei, & Lopaka.....	56
Pluralistic Viewpoint of Self.....	56
Facilitation/Impediment.....	61
Connecting Hawaiian Identity to Science Teacher Identity.....	63
Concerns About the Hawaiian Identity.....	64
Chapter 5: Discussion, Recommendations and Conclusions.....	67
Discussion.....	67
Recommendations.....	74
Conclusions.....	76
Appendices.....	77
A. Quantitative Interview Protocol.....	77
B. Qualitative Interview Protocol.....	78
References.....	80
Notes.....	84

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. An individual must choose to be Hawaiian or a Science Teacher.....	11
2. A single reflection (identity) of being a science teacher.....	57
3. A single reflection (identity) of be a Hawaiian.....	57
4. Lopaka looks into a mirror and see many multi-colored and multicultural reflections (identities) that make up his total identity.....	58
5. Kalaimeola and Ku'ulei look into a Hawaiian mirror and see many multi-colored and multicultural reflections (identities) that make up their whole identities...	58

Chapter 1. Overview of Research Questions

Introduction

The mainstream science education paradigm, which permeates many public and private school curricula, does not recognize the indigenousⁱ knowledge of the Native Hawaiianⁱⁱ culture as a viable partner in the classroom or laboratory. Researchers such as Aikenhead, Brickhouse, Cajete and Kawagley argue traditional “science teachers tend to harbour a strong allegiance to values associated with scientism. Science is: non-humanistic, objective, purely rational and empirical, universal, impersonal, socially sterile, and unencumbered by the vulgarity of human bias, dogma, judgments, or cultural values” (Aikenhead 2001). A result of this belief is that a Hawaiian science teacher’s heritage and cultural beliefs are viewed as non-scientific and unimportant. This creates a situation in which teachers are forced to categorize themselves based on a single identity, in this case being Hawaiian or a science teacher. This singularist identity system creates an atmosphere in which science teachers, and in turn their students, must choose either to abandon their culture in favor of the “civilized” methods of science or to become disengaged from science as a whole.

While there is a prevailing scientific outlook among science teachers, I would like to consider that science teacher’s identities are not this narrowly constrained. Instead, as Sen argues, people can be many things at different times. We all have plural identities and “the sense of belonging to a community, while strong enough in many cases, need not obliterate – or overwhelm – other associations and affiliations” (Sen 2006, 37). Some of these identities are chosen during the course of our lifetimes (i.e. career, social and political affiliations) while others are assigned to us (i.e. gender, culture, and geographic

affiliation). Sen notes that these identities, both chosen and unchosen, are plastic and that “we have different ways of identifying ourselves in different locations” (ibid, 37) and situations.

I will make a critique some of the current scholarly literature that is based on the dichotomous framework in which Native Hawaiian values and knowledge and a scientific paradigm oppose each other. I will also argue that instead of separating identities we instead look upon them as parts of an individual’s plural identity. This identity theory, based on the writings of author’s such as Amartya Sen and Kwame Appiah and supported by the oral histories of participants, is one in which being Native Hawaiian and a science teacher may cause and carry some incongruities that individuals have to reconcile, but does not necessarily conflict with one another in the way aforementioned researchers believe.

Therefore, this thesis will focus on how being Native Hawaiian affects the engagement in science education within the current paradigm, and whether being Native Hawaiian facilitates or impedes this engagement. In order to discover this, Native Hawaiian science teachers actively participated. In this thesis, three individuals were interviewed to share their inspirations and influences in becoming science teachers as well as the biases, prejudices and judgments they encountered from both the Native Hawaiian and scientific communities. In these interviews Native Hawaiian science teachers will share their unique experiences that they had and continue to have during the pursuit of their interest in science education.

Research Questions

It is the belief of some scholars, past and present, that the relationship between science and Native Hawaiian culture, knowledge and language are disconnected. This flawed belief raises the following question: Is the disconnection between these two identities so wide and irreconcilable that Hawaiians interested in becoming science teachers must identify themselves singularly as represented in Figure 1?

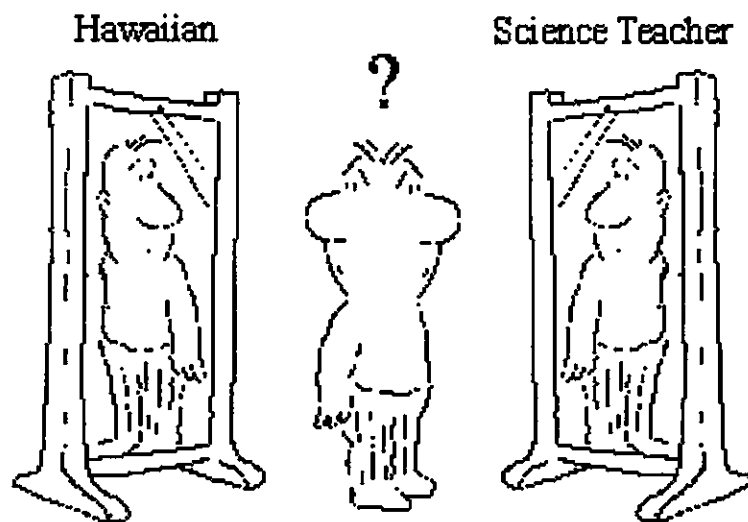


Figure 1: An individual must choose to be Hawaiian or a Science Teacher.

Given that Hawaiian science teachers have plural identities, how do they navigate this apparent science teacher / Hawaiian divide? To find out, three individuals were interviewed using the following questions as a guide.

1. In what way(s) has being Native Hawaiian enabled or diminished your capacity to be a science teacher?
2. In what way(s) has being a science teacher enabled or diminished your capacity to be a Native Hawaiian?

By interviewing individuals who are both Native Hawaiian and science teachers, we get a better understanding of what inspired them personally, culturally, and professionally. Additionally, we can learn how they are able to navigate and reconcile their cultural and professional identities.

Chapter 2. Literature Review

There is a wealth of information published regarding indigenous populations and science education. However I encountered two issues, both of which have to do with identity, that made preparation for this project challenging. First, there is very little research in regards to Native Hawaiians in science-related fields. Articles by and on the subject of Hawaiians and education were mostly concerned with Native Hawaiian epistemology and curriculum reorganization such as Kaholokula (2003), Kana'iaupuni (2005), Meyer (1998), and Sing et. al. (1999). These scholars challenge misconceptions “based on foreign perceptions of reality” (Kana'iaupuni 2005) that non-Hawaiians have of Hawaiians, specifically students. This challenge and the research that stems from it is an effort to improve student performance through cultural experiences (Kaholokula 2003; Meyer 1998; Sing et. al. 1999) during and after school, the creation of a native teaching force (Manuelito 2003), the use of strengths-based approaches to education, and the creation of Hawaiian culture-centered schools (Kaholokula 2003; Meyer 1998).

Most research and published materials have focused on other indigenous peoples such as Native Americans (Cajete 2000), Maori (Aikenhead 2001; Marshall 2000; McKinley 2005) and Inuit (Aikenhead 1997; Kawagley et. al. 1998). The social, political and educational histories of the Native Hawaiian people parallel the histories of many other indigenous populations, therefore general statements could be made regarding Hawaiians and science education based on research done with other indigenous groups. However, these generalities do not give a full and accurate picture of Hawaiian culture, its history, and its people. Nonetheless, articles with reference to other indigenous cultures, science

education and issues of identity provided an abundance of information, aspects of which are supported and challenged by the case studies presented in chapter 4.

The second issue I encountered relates to the construction and basis of arguments presented by researchers who have aligned themselves with the singular identity framework. Various authors have approached the issue of identity from an array of vantage points. For this reason I would like to take some time to briefly review these points of view.

One of the largest groups of researchers is the multiculturalists. Authors including Brickhouse & Kittleson (2006), Cobern & Loving (2001), Costa (1995), Gauch, Jr. (2006), Jordan (1981), Kawagley & Barnhardt (1998), Ninnes (2000), O'Loughlin (1992), Padilla (2005), Schmidt et. al. (2005), Siegel (2002), Simonelli (1994), and Stanley & Brickhouse (1994) have examined science curriculum and the disconnect between so-called "Western" science with other ways of knowing by calling for more of a "world view" within science textbooks and the curriculum they espouse. Major arguments for this paradigm change stem from previous education models "designed for indigenous peoples (that) used science as the tool of choice to modernize and supplant indigenous culture" (Cobern and Loving 2001). Additionally, the need for a "scientifically literate global society" has prompted individuals and groups such as Michael Padilla (past president of the National Science Teachers Association (NSTA)) to create strategic plans to improve teacher and student science education. At the fundamental level, Stanley and Brickhouse (1994) pose three important questions that multiculturalists have been seeking to answer: "Whose culture are we teaching? Whose knowledge is of most worth? Who benefits and who is harmed by current approaches to

curricula?” By raising these important and difficult questions researchers prescribing to this mode of thought are attempting to create a dialogue that will affect science curriculum, teacher training and challenge the prevailing universalist (scientific) paradigm that dominates today’s science classrooms. With any challenge to the status quo come questions of appropriateness, feasibility and, in this case, whether it is good science. Tabak (2005) puts the whole idea of multiculturalism into perspective by simply asking, “Is multicultural education an important dimension in science education?”

A second group of authors that include Aikenhead (1996 & 2001), Boyne (2003), Corsiglia & Snively (2000), Kawagley et. al. (1995), Kawagley et. al. (1998), McKinley (2005), Michie (2002) and Simonelli (1994) I will refer to as the infusionists. These researchers have sought to reconcile the apparent disconnect between science education and indigenous knowledge by advocating for the infusion and incorporation of indigenous knowledge and ways of knowing into the current science curriculum. The basis of this argument is to challenge methods in the “teaching of science in the United States (that are) dominated with examples of the contributions of European and American scientists” (Kawagley, Norris-Tull and Norris-Tull 1995) while ignoring the contributions of indigenous peoples. These researchers believe that today’s science focuses more on teaching students to “think like a scientist” (Aikenhead 2001) while acculturating students into a “mechanistic, reductionist, empirical, mathematically idealized, exploitive, impersonal and elitist” (Aikenhead 1997) ways of science. The result of which is either assimilation of indigenous peoples or the alienation of indigenous students in the science classroom. To compensate, the science curriculum should be adjusted to move away from the aforementioned negative qualities and embrace traditional,

indigenous ways of knowing “in a non-tokenistic way – informed and not dismissive in its status” (Michie 2002). By incorporating knowledge of this type, science becomes accessible to indigenous students, respectful of their cultural heritage. As Boyne (2003) explains:

Teachers should use practices consistent with how Native students learn mathematics and science and should include simultaneous processing (seeing the whole picture) instead of successive processing (analyzing information sequentially), instructions that build on Native strengths as learners, using hands-on material or manipulatives and structuring classrooms to support cooperative learning.

This locale-specific science curriculum will “utilize our abilities to observe and remember years of sensory information and also our ability to make useful inferences” (Corsiglia and Snively 2000). The paradigm shift in science curriculum is associated with holism of knowledge and sustainability as opposed to “specialization and the excessive division into disciplines that many feel has separated science from the good of society” (Simonelli 1994).

In this same vein, researchers have argued that a way to incorporate indigenous knowledge into the science curriculum is through the additionⁱⁱⁱ of the word “science” (i.e. native science and Indigenous science^{iv}). Both types of science “consist of a set of explanations which seek to make sense of the natural world” (Baker 1996) and involve prediction, theory formation, experimentation and explanation (Aikenhead 2002; Baker 1996; and Naone 1995). However, researchers stress that so-called Western science emphasize qualities such as logic, rational empiricism, compartmentalization, science done just for the sake of new knowledge and is teacher (expert) centered. On the other hand, Indigenous science focuses attention on cohesiveness, participation, relationships, sensation, imagination, emotion, and symbols and is dialogical. “Indigenous science is

the process by which indigenous peoples study and live with their surroundings to achieve complete balance and well being” (Naone 1995). Due to these inherent differences in structure and purpose, the teaching of so-called Western science to indigenous students often leads them to become disengaged from science. “In some cases, the disparity between home and school environments is so great that some Native American (and native Hawaiian) students experience a kind of culture shock which significantly affects their attitudes toward school” (Cajete 1986, 201). Accordingly, through acknowledgement of the importance of indigenous science and infusing it into the current science curriculum should encourage more active indigenous student participation as well as creating value for indigenous knowledge for non-indigenous students.

Critique

Although some research attempted to pluralize identities, most of the current literature utilizes and reinforces the singular identity theory. Multiculturalists, for instance, seek to diversify science curriculum in an effort to be more sensitive and inclusive. In their efforts at sensitivity, multiculturalists have made two assumptions. First, they have assumed that the science student identifies herself with a particular culture that is separate and different from the so-called dominant culture. Secondly, if this student does identify with a particular culture, is this single unchosen identity is their most important identity? By assuming that a person identifies with one culture or another, and that identification is more important than all others, multiculturalists are setting up a situation in which the only people qualified to teach members of a particular cultural group are members of that cultural group. Sen (2006) points out that throughout

our lives, we have to “decide whether a particular group to which we belong is – or is not – important to us” (24). The multiculturalist assumes that the unchosen cultural identity of a science student is their only relevant identity. In reality, we all go through life “deciding on what our relevant identities are, and weigh the importance of these different identities” (ibid, 24).

To answer Tabak’s question regarding the inclusion of a multicultural dimension in science education, I would need to pose my own clarifying questions. What does multiculturalism mean? Or more precise, what determines if a student is multicultural?

Herein lies a fundamental problem. There is no precise definition of multiculturalism. Without a clear definition with which researchers can base theories on, multiculturalism has become a pedagogical buzzword synonymous with terms like “diversity” and “world view.” Is a student multicultural because their ancestral heritage can be traced to more than one path? If that is the case, I am a multicultural student because I can trace my lineage to both Poland (mother’s side) and France (father’s side). Is a student multicultural because his or her ancestral culture differs from the dominant culture? Is the dominant culture community specific? What if this student does not identify with their ancestral culture? From whose culture are we judging a student’s *multiculturalness*? Does Hawai’i’s “local” culture count as a vantage point to judge another’s multiculturalness? These are some important questions that multiculturalists have not answered in part because of their assumption that individuals can be singled out and/or will choose to be identified by their ancestral culture.

While the weakly defined multiculturalists seek to establish “science for all,” infusionists are endeavoring to include specific groups, namely indigenous peoples, that

they feel have been marginalized and alienated through a so-called Western science curriculum, language and practices. As I stated previously it is my belief that indigenous knowledge has a place within the science curriculum, particularly in discussions of knowledge and theory formation, observations and the methodology of science. I have used Hawaiian history and culture as a way to enhance discussions in my science classes with both native and non-native students. Nonetheless, infusionist literature makes the same errors of assumption that multiculturalists and their literature make.

First, infusionists assume that indigenous peoples identify with this particular cultural identity. Much has been written and spoken about the negative attitude European and American settlers had towards the indigenous peoples of the Americas, the Pacific and Australia. One result of this negative attitude by explorers, missionaries and various governments has been the assimilation of indigenous peoples into the dominant culture and therefore people who do not identify with their indigenous ancestry. Secondly, if people identify with their indigenous ancestry the literature assumes that this identity is the most important in their lives regardless of their personal situation.

Some infusionists make a third error in their basic attitude. While multiculturalists advocate for an expansion of sorts to make science more inclusive, some infusionist advocate a completely separate science curriculum. This culture-specific science curriculum, in my opinion, insults the very intelligence of the culture they are trying to support. By creating a separate science curriculum that is culture specific is almost like saying, "we can not handle this science, so we need to change it so that our students can succeed." Hopefully this is not the prevailing attitude behind the campaign for culture-specific science, but it feels like it is.

Basing a person's entire identity upon a single unchosen factor, as the multiculturalists and infusionists do, is detrimental to the learning process and to human interaction as a whole. Instead of establishing and supporting a cross-cultural dialogue between people of different backgrounds, identities and experiences it creates an "us versus them" power struggle, which alienates members of all parties. While the creation of a division between indigenous peoples and so-called Western peoples creates an antagonistic atmosphere from without, Indigenous scholars have created this type of atmosphere from within. By viewing themselves through a single identity, such as being Hawaiian, they risk alienating individuals with similar cultural heritages who do not pass a cricket test^v or "measure up" to arbitrary standards. David Kekaulike Sing notes in his article with Alapa Hunter and Manu Aluli Meyer (1999) that part of being Hawaiian is "knowing what our beliefs are about – the skills, abilities, morality, talents and information." Are Hawaiians without or varying levels of this knowledge still Hawaiian and who decides?

Creating artificial divisions between identities, individuals and the knowledge they possess generates an interesting dilemma for individuals of indigenous ancestry. On the one hand, the idea that people have a single identity such as being Hawaiian defines their identity in terms of allegiance to one group and prohibits or inhibits the capacity to belong to different camps. It also sets them apart from others, makes them unique and can be a way to preserve and protect an already fractured history. On the other hand, this single identity model "damages irreparably, the nature of what it seeks to protect. For protection, here, involves partition, making countless mine-and-thine distinctions." (Appiah 2006, 129) "The points of entry to cross-cultural conversations are things that

are shared by those who are in the conversation” (ibid, 97). Meyer (1998) suggests that “two different systems exist” and that there is a “misconception that a Hawaiian identity can best thrive in a non-Hawaiian educational milieu.” It is my belief that the participants in this research would disagree with this summation. As we will see, they all value their Hawaiian identity, but it is not their only identity. Instead it is one of many that they rely upon to navigate through their lives and be, as Meyers exclaims in Sing et. al. (1999), “Hawaiians doing things” regardless of what those things are.

Chapter 3. Methods

The subject and core idea of this research project is to learn how Hawaiian science teachers^{vi} have navigated and reconciled the seemingly (according to the literature) incompatible identities of being both a Hawaiian and a science teacher. To facilitate this, personal histories were collected through three separate interviews or “talk story^{vii}” sessions with three individuals, all of whom are Native Hawaiian, currently live in Hawai‘i and are science teachers or otherwise associated with science education.

Theoretical Framework

The theoretical framework for this research is case study of three individuals informed by Sen’s ideas about plural identities through a cultural/ethnographic lens. In addition, this framework will be co-mingled with indigenous methodologies as a way to stay true to the nature of the participants and the culture they represent. As clarified by Smith (2004) “the mix reflects the training of indigenous researchers which continues to be within the academy, and the parameters and common sense understandings of research which govern how indigenous communities and researchers define their activities” (134). Using case studies as a way to gather data provides us with a glimpse into Hawaiian science teacher’s life and reality as they continuously seek to find a balance between the pluralities of their personal identity.

Collecting Oral Histories

The data in this study was collected via interviews with three (3) individuals of Native Hawaiian ancestry who are science teachers. I chose participants who represented a broad spectrum of scientific disciplines including biology, environmental science and physics. The methodology used in this research takes the form of three case studies using

the semi-structured interview protocol outlined in the appendix. To this end, this study utilized facets of several projects outlined by Smith (2004) including, but not limited to, indigenizing^{viii}, story telling^{ix}, reframing^x, protecting^{xi}, and discovering^{xii}.

The purpose of talking story with these three Hawaiian science teachers was “not to get answers to questions, nor to test hypotheses, and not to ‘evaluate’ as the term is normally used. At the root of in-depth interviewing is an interest in understanding the lived experience of other people and the meaning they make of that experience.” (Seidman 2006, 9) This is especially true of those people representative of indigenous cultures due to the fact that many indigenous cultures, including ancient Hawaiian culture, passed their knowledge along from generation to generation through an oral tradition. Today the Hawaiian language is both written and spoken. Awareness and the use of Hawaiian language has increased over the years. Many Hawaiians utilize written language as a method of sharing ideas and knowledge but “oracy, debate, formal speech making, structured silences and other conventions which shape oral traditions remain a most important way of developing trust, sharing information, strategies, advice, contacts and ideas” (Smith 2004, 14 - 15).

Although a wealth of information could have been gained through literature, surveys and quantitative data analysis none of these methods would have given the rich insights that can be realized through encounters with people who have experienced being a Native Hawaiian science teacher. Merriam (1998) explains that this (qualitative) methodology emphasizes “the way humans experience the world” and “the stories that they tell” (157). In addition, more quantitative methods completely ignore and alienate the rich oral tradition that Hawaiians developed over centuries. They all assume that the person, the

individual, the voice is not an important (or not as important) source of data in the quest for knowledge. Wolcott (2001) puts these differences between these quantitative approaches and the more qualitative approach I chose into perspective when he states:

In quantitatively oriented approaches, and among the more self-consciously 'scientific' qualitative types, researchers typically desert their subject at the last minute, leaving folks and finds to fend for themselves, seemingly untainted by human hands and most certainly untouched by human hearts. At the heart of qualitative approaches is to treat fellow humans as people rather than objects of study, to regard ourselves as human who conduct research *among* rather than *on* them (83).

This statement not only supports the qualitative approach's use of interview and oral history collection but also parallels one of the Hawaiian values discussed by some participants; that people are not independent of the world around them and that we have an effect upon everything we come in contact with physically, emotionally and spiritually.

Interviews

I conducted each of the interviews based on the semi-structured protocol outlined in the Appendixes section of this thesis and within the regulatory boundaries established by the Institutional Review Board (IRB) of the University of Hawai'i at Mānoa (UHM)^{xiii}. Each interview was recorded digitally with the permission of the participant and transcribed with the assistance of *Express Scribe* software. Following transcription, copies of transcripts were e-mailed to each of the participants to allow them to make changes, clarify or remove information from the written record. In the following chapter, each participant story is told individually before a collective thematic approach is used to report the overall themes. Additionally, outside readers and my advisor, Dr. Hunter

McEwan, were asked to verify the accuracy of the themes garnered from the participants stories and experiences.

In an effort to maintain anonymity, several steps were taken to ensure that the exact details of each of the participants' personal and professional lives are kept confidential. There were, however, instances where a participant's information is integral to their experiences. In these cases, the specific contextual information has been "blurred" and/or generalized to avoid exposing the participants. As a final level of anonymity, I requested that each of the participants choose a pseudonym that will be used to refer to them throughout the thesis. Participant A^{xiv} will from now on be referred to as *Kalaimeola*, participant B will be known as *Ku'u lei* and participant C will be known as *Lopaka*.

Chapter 4. Findings

In this chapter, Kalaimaola, Ku‘ulei and Lopaka tell their respective stories including inspirations, influences, challenges and experiences being Native Hawaiian science teachers. Following the three individual narratives is a breakdown and analysis of several themes that connect them.

Participant A – *Kalaimaola*

Kalaimaola^{xv} (K.) is a 10-year veteran private high school biological science teacher on Hawai‘i Island. After graduating from a private high school on O‘ahu^{xvi}, he attended a university in the continental United States where he earned his bachelor’s degree. He is currently working on his master’s degree and participating in a fellowship in New Zealand in association with Stanford University. As a teacher, K. helps with annual school and district science fairs and is involved with several Native Hawaiian organizations such as his alma mater’s alumni association, the Office of Hawaiian Affairs (OHA), Department of Hawaiian Homelands (DHHL), UH Hawaiian studies department and various charters schools on Hawai‘i Island.

As a science teacher, K. very much considers himself to be Hawaiian both ethnically and culturally. As he explains, “I come from a very Hawaiian family. I’m mixed, I have eight different ethnicities, but it is predominantly Hawaiian. I’m more than half-Hawaiian, and both my parents are Hawaiian. All four of my grandparents are Hawaiian and it goes all the way back.” Coming from such a culturally rich background such as his, K. said, “it’s hard to pinpoint exactly how I call myself Hawaiian. I don’t know, you know like all of our culture that we grow up in...I don’t know anything different. So it’s almost kind of tough to say, ‘hey...how are you who you are?’ It’s culture. It’s ingrained

in you. It's not even necessarily taught.” Reflecting upon this statement, K. shared how he considers himself to be “lucky enough to say, I am Native Hawaiian without being conscious of it until older age, high school, then I realized ‘hey, this Hawaiian thing is different’ and its not necessarily how everybody else is raised in Hawai‘i.”

K.’s statement reflects not only the history of Hawai‘i but also a concern that has and is being raised within the larger Hawaiian communities. K. went on to point out that he considers it interesting that “being Native Hawaiian, in a lot of ways, has to be taught now, because of the influence of other cultures. So you actually have to consciously teach, or be taught, how to act and how to think in cultural ways because of this huge influence of other cultures on us.” Recognizing this current situation, we talked about his family, their influence and how he was raised. “Words were always used; Hawaiian words...and Hawaiian terms. The way that we see situations always fall on our values and our cultural values. Really they're family values because the culture's so based at the family level. People would define the things me and my family would do as ‘Hawaiian.’” Such as, “if there's a luau to go to or a rally at the palace to go to or anything that would be considered ‘Hawaiian’ chances are my family was involved one way or another.”

Considering the way he was raised, and how culture was so much a part of his family and childhood experience, K. reflected on what he had said about becoming ‘conscious’ of being Native Hawaiian in high school. He went on to describe his high school experiences. “I went to Kamehameha, and I think the whole experience...just going to a school that you had to be Hawaiian to go to was already an interesting thing. My parents had both been educated in public school, so Kamehameha was a new thing for my

family.” When you attend Kamehameha Schools, they make you very aware, whether you want to or not, of being Native Hawaiian because you actually have to prove blood, with birth certificates, that you're Native Hawaiian.”

When attending Kamehameha Schools “you're surrounded by Hawaiians, with your fellow students.” But the “interesting thing is that most of the teachers, faculty and staff historically at Kamehameha have been non-Hawaiian.” In his opinion, this goes back to the mission and goals for the school. “You ask alumni, and they'll always tell you...what Kamehameha gave me, what it taught me, was to be a good missionary...because that's what it was founded on. To be a good missionary children and be raised the same way that ali'i were raised.” We were also taught “to be good readers, writers, mathematicians but to do it in a very Western context.” He also considered some of the changes that are happening at Kamehameha Schools. “It's kind of a new thing (more Hawaiian teachers and staff), so the new catch phrase is ‘are we a school for Hawaiians or are we a Hawaiian school?’ And that raises some interesting questions that we're looking at.”

K. then described how and when he became interested in science. “That was also high school. Interestingly enough, it was from the ability of the teachers to engage me in science through cultural stuff.” He shared that he'll “never forget how he started to get hooked was a trip, a big island trip, that one of the teachers that was associated with a research program set up. Their hook was you can go to Big Island for a week and do cool stuff. Go to the volcano, jump in the ocean and do all this neat stuff. Basically it was a free big island trip, and that's what got me hooked, and it was the beginnings of some of the really neat research I got to do.” It was this experience of learning and doing “natural products research and looking at Native Hawaiian herbs, herbal medicine...and exploring

microbiology and some other stuff through cultural eyes.” “It excited me because it validated who I was as a Hawaiian and it also validated me as a student because there was some creative science. So with this little hook of going to the big island, I got pulled into science. And it’s been a big part of my life since.”

Referencing Native Hawaiian herbs and herbal medicine led us to a brief discussion about biopharmaceuticals. “More and more now, you’ll see ‘awa, kawa kawa pills are coming out and a few Polynesian things such as noni are starting to be used, but there’s a whole lot of native medicine that we haven’t tapped. And some potentially very valuable compounds, natural products research that are very untapped.” The discussion led to a brief foray into the problems of bioprospecting, which has become a major issue to many indigenous groups. Bioprospecting^{xvii} is a term used to describe how scientific-based companies, specifically pharmaceutical companies, research and patent Native herbs and healing practices without acknowledging the source of that knowledge, the peoples who gained that knowledge or the methods used. K. related this back to a conflict between Native knowledge and science. When asked if he felt there is a conflict, he responded by saying that it seems, in his opinion, that any knowledge is “not truth or its not really there unless Western science justifies that it’s there and that’s true on so many levels, from astronomy to plants to medicine...you name it in science and I will tell you how Native peoples, all peoples, in whatever culture they come from are invalidated in a lot of ways.” As Native knowledge bearers “we have to go through this whole scientific process before we validate the information that people know and remember in different ways for forever, and I just laugh sometimes at the newest research that comes out because its so old...the

knowledge that its based on is so old that you just have to laugh. They just found out something new but we knew it and we've been doing it forever!"

Sensing this conflict, how does K. view himself? "Most people would say 'I'm a science teacher' who teaches Hawaiians and science is first and the culture and the way that you go about designing curriculum and stuff is secondary. I would absolutely say the opposite. I'm Hawaiian first...I come from a Native Hawaiian perspective and then I'm a science teacher, second." And how does this factor into his teaching? "I teach students science through a cultural perspective and that's really the way that I look at it. I teach students about themselves, help them to realize a little bit more about who they are, the culture, the very, very important culture that they come from...and help them to realize that science is Hawaiian culture. It really is, in so many aspects. It is the culture; it's been the culture. We haven't put the same terms, and jargon and labels on it...that is used in Western Science, but it is very much a part of our culture and it's always been, so I kind of come from that perspective."

K. works hard to bring culture and science together, but he admitted that it can be difficult. When asked to share if he had ever experienced difficulties personally and from either the western science community (because he is Native Hawaiian) or from the Native Hawaiian community (because he is a science teacher), he responded that he had not. K. shared that he has, "felt pretty encouraged, and if there was any criticism it came from the science side...you know, science should be taught 'this' way and to mix culture in there is very questionable and stuff like that. But I honestly haven't gotten a lot of that."

"Luckily I haven't encountered a whole lot of resistance about the methods that I go about developing curriculum or empowering Native Hawaiian students at all really." The few

comments he has received often refer to concerns over the addition of culture into the science curriculum and how it could dilute the “hard science” needed by and expected of graduates from his school. In response, K. enjoys reminding other science teachers that while “it's great to have the science stuff,” because of the goal and mission of his school “we have some imperatives to do on the cultural side” as well.

While the criticism has been minimal, K. admits that he tries not to put himself into circles (of educators) where the methods he uses would be criticized, and on the rare occasions when his methods are criticized he actively removes himself from those situations. Instead, he tries to surround himself and participate in circles where methods that include the synthesis of Hawaiian culture and science are encouraged. Through his amalgamation of Hawaiian culture and science, K. has seen his students become interested in both their own cultural heritage and the various career opportunities that science can give them. But he also admits and acknowledges that his situation is unique compared to other educators in both Hawai‘i and around the world. “Being placed in Hawai‘i and working with students here (in Hawai‘i) is quite different than if I had to move and do something different elsewhere. I think what I do works in Hawai‘i because I work in Hawai‘i, I'm Hawaiian, and I work with Hawaiian kids. If any of those factors were different,” how K. teaches may not work as well and may meet with additional criticism. Building upon this admission, I wanted to know if he believes being Native Hawaiian and teaching Native Hawaiian students makes a real difference in the classroom. “It makes a difference to Native Hawaiian students that I'm Native Hawaiian. And a lot of people are scared to talk about things like that because they don't want to offend, and I say that in a total non-offensive manner. In order to teach culture, any

culture, and to convey that to students...you need to be of that culture.” “It’s not impossible to do it if you’re not (Native Hawaiian), in fact I think it’s fantastic that non-natives teach native students and open their eyes to so many different things. But I think if you want to teach culture and convey cultural things you need people in that culture to do it, and it’s very hard otherwise.”

We continued by discussing what he sees as the major issues involved with non-natives teaching Native Hawaiians, especially in the sciences. “It’s absolutely essential and so important that there’s people who see the value in it (Native Hawaiian culture) and try to go as far as they can, within reason, and say, ‘you know what, this is not my culture and I feel uncomfortable doing that.’ A lot of times...people would just dive into it and say this is Hawaiian culture and do it however they thought. So it resulted in a lot of students thinking stuff was Hawaiian, and it was non-Hawaiians at Kamehameha and other non-Hawaiians teaching Hawaiian students, making stuff up and just doing whatever so they (the students) have this unstable idea of what is culturally appropriate and what is not.” “If there’s a central issue to teaching native Hawaiian students science, or anything for that matter, it’s...the ability for people to realize it’s very difficult...to teach about one culture if you are part of another culture. This is what it was to be Hawaiian, or worse yet in our grandparents and parents time, it doesn’t matter what being Hawaiian, we don’t care, this is what you need...and that’s not what you are.”

As our discussion began to wind down, we began to reflect upon some of the things we each shared with each other regarding science and culture and K. shared with me what it means to him to be Hawaiian and a member of the Native Hawaiian community. After a long and thoughtful pause, he confessed that he thinks being Hawaiian “means that

there are specific values, ideas, practices, rituals, ways of doing things...including language and values. Values are the crux of it that are followed whenever decisions are made, whenever something has to be done, whenever you learn something, whenever you come into a new environment, whenever you live life...you always come down to these core values that you follow. And make decisions based on those values, right or wrong, to go or not go. We always return back to those values.” “I would say, being Hawaiian that you have a set core of values that other Hawaiians...that see themselves as a part of that community also buy into and try to follow.” Regarding the Hawaiian language, “it’s always been an important part of the culture. Unfortunately we almost lost it, but it’s coming back and it’s increasingly becoming an important part of the culture. It always has been, it just was kind of forgotten for a little while and it’s returning hopefully to much greater use.”

He went on to explain that although there may be a core set of values, the Hawaiian culture and community is in no way a static entity. “Now that community (the Hawaiian community) is defined differently sometimes. Hawaiians have always been very dynamic. The same Hawaiian language that was spoken on the big island was not exactly the same Hawaiian language that was spoken on O’ahu or Moloka’i. So to lump everyone as Hawaiian is a big thing. Just as you can’t really lump (or create) a very defined clear picture of what it is to be an American, but I would say there are some very definable values that can apply seeing the world and that is really what I see as the defining trait.” These definable values include “aloha” and “malama (care), to the point of preservation and conservation.” “But I think one (Hawaiian value) that is definitely scientifically related is to see yourself as a part of a situation instead of unbiased observer

of a situation. And I think that is a very core concept culturally. Never, ever as a Hawaiian can you really sit outside and be an observer who doesn't affect your surroundings. And that's one that I emphasize in my teaching of science. A lot of views of science is that you can be an unbiased observer watching a chicken laying an egg and theorizing about that, and saying that to you have no influence on the chicken deciding to lay to the egg or not, but as a Hawaiian you absolutely know, without a question, that you are influencing the chicken. Whether it be spiritually or emotionally, you can't necessarily see it, physically you're doing something that...you may not be doing anything but who knows...there's all kinds of other factors on a non-physical level.”

“That's another value, Hawaiians see and measure things on so many different levels that, if it doesn't fall into one of the five senses it doesn't matter because Hawaiians understand there is always a spiritual side to everything. There's always a spiritual connection, and just because you cannot see it, doesn't mean it's not true. Just because you can't use one of the senses, doesn't mean it's not true. It just may not be definable at this point in time by something, by one of the (scientific) methods we define things with. So I think, that's one of those cultural things. There's always a spiritual aspect. Whenever you start, end or go through it. And the realization that you affect everything around you, whether you intend it or not, there's some kind of effect on...everything around you. And to be an unbiased observer is to be very naive to what goes on in the world.”

K. and I concluded our discussion with the sharing some of the changes he would like to see happen in science curriculum and in curriculum in general based on his ten years of teaching experience. “I'm still playing around the idea in my mind that, you need to be

more hands-on with Hawaiians because I will definitely have told you a couple of months ago that with Hawaiian kids you have to be hands-on as much as you can. You have to tap into all of the senses. You have to tap into inter-disciplinary education, multi-sensory and all that good stuff that they tell us. You have to tap the different learning, because students are diverse learners. I'll tell you, that's something you have to do with Hawaiians, but you really have to do that for all kinds (of students), regardless of if they're native Hawaiian or not. Really the benefit is for all students.”

Another change K. would like to see is an increase in both “experiential and authentic learning.” As he points out, “a lot of the connection between science and culture is very ecologically, environmentally based, and ocean based. And that's always a hook for Hawaiians, but there's always the value. *Malama 'aina, malama kai, malama wai*...protection, care for the land the freshwater and the ocean resources and that is one of those important cultural values. Students grow up knowing that culturally, that ultimately if you care for the land, the *'aina*, the land will care for you. And I found that to be extremely true for my kids. If they take care of land, it will take care of you. If they don't, it won't...it'll come back to them.”

He also said he would like to see students “travel to other places, islands, and countries.” Not only can this “hook” Hawaiian students into science just as he was in high school, but it also gives students the opportunity to experience different cultures and learn about themselves at the same time. “You really don't learn who you are, to see yourself from an outside perspective until you get out of being in Hawai'i and Hawaiian, and you really understand what it means to be Hawaiian. “Although,” K. points out, “these (strategies) could be said for all students.” Summing up his thoughts, K. believes

that success for Native Hawaiian students in science requires, “less lecture and more projects where they can apply and make what they learn relevant, which ties into authentic learning. They learn it much better and it's a higher quality and sticks with them a lot longer. If they can apply the information they see to themselves, it is profound.”

Lastly, K. reflected and had some thoughts on increasing the number of Hawaiians teaching Hawaiians. “I think there's more that needs to be done (in terms of) Native Hawaiians teaching Native Hawaiian kids. That's something the university is constantly looking at, how to increase the numbers of Hawaiians in education. A big part of it, not having enough Hawaiians teaching Hawaiians is that there aren't enough Hawaiians getting degrees and being in those positions to teach. So increasing those numbers are always a big concern at the higher education level. Wanting and having Hawaiians seeing that it's valuable and desirable to teach other Hawaiians has been a challenge and increasing those numbers will help to increase overall Hawaiians teaching Hawaiians. I absolutely see value in non-Hawaiians teaching Hawaiians, its just that non-Hawaiians don't see limits of teaching culture and they will go right ahead and teach Hawaiians to be ‘Hawaiian’ which is just the most...far out and offensive, really, really offensive thing that you can do to any people is not be whatever (culture) that is you want to teach, going up to somebody and telling them how to be that...it is just so offensive. But for people to realize ‘hey, I'm not that...I don't presume to be that, but I will teach you whatever I know from my perspective and try to empower you to be whoever you want to be’ I'm all about that! And I think for my generation...I was lucky to experience that...my parents weren't.”

K., at the time of writing and publication of this thesis, is on sabbatical from his teaching duties to attend a fellowship on indigenous education in New Zealand. This fellowship brings together educators representing a variety of indigenous peoples from around the world including Maori, Native American, Native Hawaiian and Inuit tribes to talk and share ideas and research in indigenous epistemologies.

Participant B – *Ku‘ulei*

Ku‘ulei^{xviii} considers herself to be more of a native practitioner than a science teacher, even though she has taught biology concepts through a project-based format for the past seven years. Following her attendance at both the UHM and UH Hilo, where she earned her bachelor’s degree and teacher’s certification, she co-founded and became the executive director of an environmental education organization that manages and protects a Hawaiian fishpond on O‘ahu. This organization also specializes in connecting Native Hawaiian epistemology^{xix}, values and practices with the local environment. In this capacity, Ku‘ulei gets the opportunity to partner elementary, intermediate and secondary students from local schools with researchers from schools such as Chaminade University.

Although she works in what could be considered a scientific field, Ku‘ulei will be the first to tell you that she is not a “classically trained” scientist. However, as I found out through our conversation, she is a thoughtful and passionate advocate for Hawaiian ways of knowing. Ku‘ulei is also an impassioned campaigner for the land and community that she serves. Much of this advocacy stems from how and where she grew up. As she puts it, she is “of this land. My family comes from Maui and Hawai‘i (the Big) Island,” particularly the “the valleys of Waipio and the high country of Maui.” She comes from “a rich tradition of farmers, of farming, fishing and hula.” “My parents had me at a very young age, so...I was mostly raised by my grandparents, one of whom was a native speaker.” “So, the language is the repository for culture...the traditions passed down to me...ideology...the tradition, the culture, the practice and the religion.” Some of the other familial traditions her family participated in included “gathering of seaweed, bivalves, crabs and fish, collection of flora for lei making, hula and music making,

preparation of Hawaiian food, fish net making and mending, surfing and preparation of basic herbal medicines.” As a result of her upbringing, Ku’ulei’s personal philosophy is very much in line with the “traditional construct” that everything in the world, including people, culture and the knowledge they possess, are interrelated and inseparable.

Having been raised within the traditions of Hawaiian culture, it was hard for Ku’ulei to pinpoint when exactly she became aware of being Hawaiian. This is because her “conception of awareness and consciousness is different from when I was five or ten.” “I’m not just Hawaiian. I’m other things as well. But I have a very strong affinity for Hawaiian culture. It was just the way our family was...it was socialized into us.”

As Ku’ulei and I talked, it was clear that because of her upbringing, she had always had an interest in the land, especially in caring for the land. However, “I think I became conscious of my interest, and really acutely aware soon after I graduated from high school.” That following year “I attended UH Hilo, and I got involved in all kinds of activities.” “My schooling, my education at this time really was born from all of the extracurricular stuff I was involved in. And I think the reason why (science interested me), even though I went to a school supposedly based and founded in Hawaiian ideals, it wasn’t UH Hilo...it was all the experiences outside of UH Hilo.” She became more “involved in the community” and “was really inspired and sensitive to the environment, for the resources and my impact as a human being, how that all related to one another really became very alive for me.” Overall, “it was the culmination of a number of experiences, but if I had to point to just one experience that really motivated me to learn about science or to look at things differently, it would be learning to sail a double-hulled canoe as well as learning the art of celestial non-instrument navigation. And the reason

why that would be a pivotal point in my experience, it just taught me to be a true member, a sailor, learning the navigation. It taught me to observe and to look at natural system and how it's related. How it's connected. How they may be disconnected. How to harness the energy in different systems.”

Having discovered an interest in science, Ku'ulei was disheartened at the lack of support she got from her advisors and counselors at the time. “I was discouraged by my counselors. My double major was going to be Hawaiian studies and natural science. I took a lot of courses, but when I wanted to declare they discouraged me.” “I shouldn't have listened to them. It (UH Hilo) was supposedly a Hawaiian school...I don't know why they advised me that way. Probably one reason, just the timing.” It would have “prolonged my career as an undergraduate student. Secondly, I think it was a stereotype. I got the impression that it was a stereotype. That I didn't have...because I didn't come from that kind of (scientific) background I would struggle and because I didn't place into higher math, etc....I placed at status quo math. That was my hang-up. And that's why I didn't pursue science.” “When I talked to people at my college they said they agreed. They said just get out of it,” meaning graduate. Then you can go on to your graduate degrees, your master's and your doctorate. It didn't make sense (to them) to double major. But they've changed tunes since.”

“It was a different time. It was just ten years...but it's changed drastically now. There are so many opportunities now.” Even though there are more opportunities, such as scholarships and research grants, “today I think it's a lot more in vogue for scientists to collaborate with people that retain traditional knowledge and have skills in the cultural setting.” Ku'ulei's friend and colleague, a trained scientist, interjected to give her

thoughts on this attitude. She believes that “the reason why there is always such a big problem between traditional knowledge and modern science is because really the two are so similar. One of the fundamentals of science, because science is just the tool, is observation...that's the first thing on the list. Observation, hypothesis...so the observation part is exactly what traditional ways of knowing, traditional science, whatever you want to label it, that's what it is. We get that part! I think we all get that part! But then when you take it to the next level, that's when it starts to get a little bit fuzzy. The hypothesis, and testing the hypothesis and the data and all that kind of stuff that...I think that's when we get into a lot of heated arguments with scientists.”

Even so, Ku‘ulei feels that her cultural background and experiences have helped her in her scientific pursuits. “It's helped ground me...in applying contemporary scientific methodology. The ethics behind it all is grounded in my cultural system and cultural beliefs. So that supports and reinforces my process and application of science. It's helped me because in pure sciences and the way, at least now that it's taught today, everything is very compartmentalized. You look at the micro level first and then expand out in some cases. The viewpoint from a cultural/Hawaiian perspective you would look at the whole first so that it goes from large scale to small scale.” However, this road has not been easy. “I've had to reconcile. I don't have it all figured out, of course, but I've negotiated certain feelings and emotions and I think I'm much more secure in my cultural grounding, so again, because of my confidence in my cultural identity, that will inform the application of the scientific process.” Some of these issues include “colonization issues, and sometimes feeling if I were to adapt certain contemporary scientific models that I would affirm my colonized condition. I think about approach. I was thinking

about, okay...is it a matter of changing hats? Wearing your cultural hat and your scientific hat? Or is it one and the same? Or is there just knowledge systems and knowing which domain and sphere you're in?" Another issue she has wrestled with is integration of knowledge. "If I integrate knowledge systems is that going to dilute my cultural identity? Is it going to dilute the rigor of the science? Then looking at if I made certain assumptions about how my ancestors managed their resources, and if I assume that they were engaging in a scientific process...recognizing the culture is dynamic and not static, that I too can add to the cultural expression of science and add to that body of knowledge. Maybe an example would be fishponds. Fishponds were widely regarded as an engineering feat. It's a fine example of intuitiveness and application of scientific attitudes and skills. So in managing that type of area, maybe I should adapt certain things...look at the framework and take it to another level. So I guess I'm thinking about the progression and progressiveness, and do I want to look at the traditional model and the current model and envision a future model that transcends traditional and current models? And me, as a Hawaiian, a kanaka maoli (a Hawaiian), creating meaning from it." To reaffirm her position, she questioned a couple of friends and colleagues who joined us later in our discussion "are we walking in two worlds? Are we building a bridge between two knowledge systems? Are we inventing our own system? Are we reinventing a system?"

Ku'ulei felt that she has been fortunate in her life that she has not had to navigate these questions and discussions on her own. When asked whose support she has had, Ku'ulei answered "my colleagues mostly. The core leadership and staff, we are all co-founders of this organization that serves the pond. And of course the place itself" helps

her. “The places that I serve, the communities that I serve, and my family” especially her husband, who is an environmental engineer, all help her to navigate and find answers to the questions she asks.

As Ku‘ulei continued along this theme (of support from her family, friends and colleagues) she described what “being Hawaiian” means to her. In her typically thoughtful way and with a consciousness of the past, present, and future she answered, “today (laughs) being Hawaiian means that I take care of my *akua* (spirituality).” “I take care of it because I continually relate with *akua* with my *‘ohana* (family). My spirit and body. My extended *‘ohana* and the place that we come from, the *‘aina* (land). I guess that would be my universal meaning. But today, I guess my narrow, well-defined meaning today would be taking care of my new son and my immediate nuclear family. So that we can take care of our extended family. And with a strong, vibrant, resilient extended family we can support everyone else. And by everyone else (I’m referring to) people of all color and all races that live here in Hawai‘i. Also when I say *‘ohana*, it’s *‘ohana* meaning family and *‘aina*. That’s what it (being Hawaiian) means to me today.”

As someone who is actively involved in educating Hawaii’s youth using place and project-based education, I was also curious to know what changes Ku‘ulei would like to see. “I don’t know...I think I’m looking for some type of overarching vision that would be inclusive. It includes me (a Hawaiian) as a political entity looking at things from a certain viewpoint. Are we looking to improve the quality of life in Hawai‘i? Are we looking to reach economic self-sufficiency? Whatever we’re looking for, wherever it is, the overarching mission/vision whatever you want to call it will be clearly defined that science will be used...in that kind of application.” “For example, the governor^{xx} lays out

her plan, her outlook for the future and she has key initiatives set forth calling for different things, then we find ways to link the curriculum to these current issues and initiatives.” In the organization she helps run, she works to “link action science, action research science that’s being conducted by professional scientists or graduate students and link it to curriculum.” “I think the curriculum has great application when it’s delivered in a field setting.” Ku’ulei gave an example, citing interest in alternative energies and “green” technology. “If we know we want to lead the nation in green technology, then looking at the private sector to identify certain projects and emerging technology, such as wave energy and tidal energy” it would be great to “have our students have little field schools.”

She continued, sharing that “the curriculum would have to be adaptive and dynamic. I think the benchmarks” would also have to “link to that home community and local issues.” Constructing curriculum and teaching in this manner “would have greater meaning for the students and there would be better buy in from a large variety of sectors. She also sees a need to change the attitude as to what education can do and mean for students. Today, Ku’ulei sees an emphasis on going to school just so that you can get a high paying job later on, rather than developing knowledge in a field that student’s are passionate about.

Building on these thoughts, we concluded our discussion with some helpful advice that Ku’ulei could offer other Native Hawaiian students interested in science. Her advice centered on that which she did not have during her high school and college years. “Find good mentors that will teach you how to think correctly, and teach you how to think for yourself and to be objective. Find a mentor that is conscious of the cultural dilemma” for

lack of a better term. She also suggested students' "to identify their weakest areas...whatever it is...and build that area." Also, "go and experience as much as you can, explore different opportunities, and find something, a real problem or something that you're really passionate about, an issue that you're passionate about and apply as much effort as you can. Exercise your skills as much as you can in something that you're really excited about."

At the time of this thesis, Ku'ulei is continuing working for the land and the community that gives her strength and that she cares so much about. She works within her organization, forming partnerships with educational institutions and researchers to raise awareness of Native Hawaiian cultural and environmental issues.

Participant C – Lopaka

Lopaka is a 10-year veteran biology and physics teacher at a private school on the island of O'ahu. Following his attendance and graduation from a prestigious private high school in Hawai'i, he attended the University of Texas at Austin then returned to Hawai'i to earn his graduate degree at UHM. Though he is very busy spending time with his wife and two young children, he finds time to be a member of a local science teacher's organization. He also helped found and continues to supervise a Native Hawaiian horticulture club at his school, he also helps run a summer program for high school students to learn about the ahupua'a system of land management and conservation.

Though born and raised in Hawai'i and of Hawaiian ancestry, Lopaka does not consider the way he was raised as "being very Hawaiian." Growing up in Kailua, he guessed "that for lack of a better word" his family was "very local" with lots of family gatherings. "My mom's side of the family is from Texas," and "my dad grew up here and graduated from St. Louis (High School), but he was in the Air Force too." Lopaka sees aspects of his family being both Hawaiian and "haole^{xxi}" but found it difficult to verbalize and separate the two from each other. "My cousins certainly did a lot more than I did" such as "hula and stuff like that...they were more involved." Reflecting upon this, Lopaka pointed out "that it was a different age too. Some people now ask me how come I don't speak Hawaiian or do hula," and he tells them "growing up in the 80's it was different." "I remember at Kamehameha Schools, as a class, no one wanted to take Hawaiian. It just wasn't emphasized" the way it is today. "There were some classmates of mine, who I didn't know spoke fluent Hawaiian, until after graduation. The only people" he knew of "who could speak in Hawaiian at that time were academics."

He went on to point out that “we certainly had a lot of Hawaiiana^{xxii} courses...and Hawaiian history course but then, in terms of applying what did that really mean, that wasn’t emphasized.” When asked about the difference between Kamehameha School when he was a student as opposed to today, he explained, “The difference now is the (Hawaiian) language and learning to pick up the language. Language is more than just a tool of communication. It’s a way of looking at the world, and speaking...a different language you view the world slightly differently. I can only appreciate what it meant to be able to do that in Hawaiian.” However, “my understanding of Kamehameha Schools, based on talks with former teachers, is that they’re trying to permeate everything with Hawaiiana. Maybe it’s almost...the pendulum has swung too far the other way.”

As the Hawaiian language becomes more intertwined in the curricula of Kamehameha Schools, and certainly in the Native Hawaiian immersion school movement of the past few years, Lopaka see some concerns for Hawaiian students in the 21st century. “Yes, it’s wonderful to get a cultural identity, and it’s important to have a cultural identity because from it comes things like self-esteem and self-awareness and the ability to make choices in their own lives...but if you don’t equip people to deal in the Western world, if you don’t teach people basic skills like English, reading, writing and functioning in a western society you’re doing them a disservice.” “Because ultimately you’ve got to go where you’ll be able to function in a world of money and power, and the world of money and power runs through English...especially in science.” “I hate to think that they’re teaching science in Hawaiian because I don’t see any practical value in that. I don’t know if that’s the case, but even I can acknowledge that. English should be the main language, and then use certain Hawaiian concepts to express maybe a few scientific

concepts. It's like math and physics. Mathematics is the language of physics and I tell my students that you have to know math and work with math, you just won't understand the language of physics. And in science, English is really the language of it."

His years at Kamehameha Schools did not stress some aspects of "being Hawaiian" that would be considered standard today, but Lopaka did see it as instrumental in the development of his Hawaiian identity. He began recognizing this identity during "middle school...probably even before that, the beginning of it would have been elementary school." "Certainly going and being at Kamehameha School, because I didn't realize what being at Kamehameha Schools was until I was at Kamehameha Schools. There "they teach you what the Hawaiian people were about, the culture, the history, the heritage." "I remember it was the first time I really understood kind of what it (being Hawaiian) was. Just to have such a rich heritage and to identify with the Hawaiian community." "The fact that we had so much wrapped up the history of the school...founder's day and song contest...and these things not only connected us to the school but also connected us with an identity of being part of a Hawaiian community."

But as Lopaka explained, his years at Kamehameha schools were not without issues because his light-colored skin. "I remember I used to tell people that I went to Kamehameha Schools and they would say 'bullshit, you can't go to Kamehameha schools.'" "When I got hired for Explorations (a summer immersion program where they put fifth graders up at Kamehameha school for a week and immerse them in Hawaiian culture) after I graduated high school, during my interview they asked why they should hire me. I remembered when I came to explorations in fifth grade, and I remember looking the way I did and feeling like it was going to be hard for me because other kids

wouldn't like me because of the way I looked. I was one of the few Caucasians that hated looking Caucasian growing up. I mean I hated it! I wanted to be more Asian looking or more Hawaiian looking or whatever. I'm okay with it now, but at the time it was a different story. So I told him, you know there are going to be other kids in this program who are going to be Hawaiian but do not look Hawaiian, and it's important for them to identify with their Hawaiian pride and heritage but realize that they can do that and not necessarily have to look a certain way. And, I said, that's what I bring to the program.” He was hired for the explorations program.

Building upon this idea of Hawaiian identity, and some of the comments he made about his experiences in school, I asked Lopaka to clarify some of the issues as viewed them. As he explained earlier, although he was born and raised in Hawai‘i, he considers his family to be very Western in relation to other members of his family. This gap was widened upon his return from college. “I went to school in Texas for five years, and came back to visit and ran into friends and all of a sudden ‘Kurt’ was ‘Palani’ and then so-and-so was suddenly ‘Kehau’, and I’m still Robert. All of the sudden they've adopted...very Hawaiian identities. And that never really happened to me, because I was on the mainland. Now that's not to say that I didn't empathize with a lot of what was going on (referring to the renaissance of Hawaiian culture and practices in Hawai‘i). Because I did understand it and I really believed in things like the need for programs targeted towards the Hawaiian community. It was always a dream of mine to come back and be a member of the Hawaiian community and give back to the Hawaiian community. That was also very clear. Identifying with the Hawaiian community was very clear at that time. My wife is like this too. She went to Kamehameha schools (K - 12) and

graduated the same year I did. But, she left and lived in Tokyo, Japan for eight years and so our experience is very different because we actually stayed away from the island for a long time after high school. Because of that we really kind of took a different path. For us coming back sometimes, and this is where I get (upset)...because I've experienced this in my own way...there are certain members within the Hawaiian community who want to define what it is to be Hawaiian. And I think they hijack it for their own purposes, and then sometimes people who look like me and sound like me get pushed to the side. And even my wife, she's Hawaiian but looks mostly Chinese, but to say that I'm a little resentful of that because of that in thinking that is prejudiced...I do feel discriminated against.”

“So I think, for my wife and I, when we came back I think we ran into some of that (discrimination). And it's been hard, particularly because we weren't here when some of this stuff was going on. So for us, in some ways, we feel like we're on the outside looking in.” Though many would find this discouraging, Lopaka and his wife have used these feelings and experiences as they undertake various projects within the Hawaiian community. “I find this to be true sometimes, people want to fit other people into our little peg holes of society. Square pegs go in square holes. Round pegs go in round holes. When they can't fit you into that category, for their own lack of intellectual interest or laziness or inability to go beyond what they already know or a world that does nothing but reinforce what they already know then you kind of out. This is what you have to deal with as an individual, you have work with that or work through that and not let it be an obstacle to you that keeps you back from doing what you want.”

Through our conversation so far, it was clear that science, having a good knowledge of science, and a quality science education were extremely important to Lopaka. Sensing this, I wanted to know if Lopaka could identify when he first became interested in science. Though it was hard for him to pinpoint exactly when he became aware of being Hawaiian, it was much easier in the case of science. "Ninth grade...my biology class. I thought 'wow, this was super cool!' 'How far can you go and make a career out of science?' I just realized that I was good at it, and I enjoyed it." Becoming interested in science can sometimes be the easy step, deciding how to be involved with it can be a more difficult challenge. "Some people thought I was going to do research, and I actually did do research...but I don't like research. Research is just too boring for me. Some people like it, but I don't like sitting in a lab. I knew I wanted to be a teacher back then too. But I wanted to do other things before then. I thought I was going to go to medical school, and work in medicine and then go back and be a teacher. But I always knew I wanted to teach." Following this, we talked briefly about joint experiences working in research and how those experiences brought us both to teaching. He remarked, "That's the whole point of these experiences and how they shape us, they kind of tell you not what you want to do but what you don't want to do. Which is what I think is just as an important decision to make in your life."

While he works hard to bring science and culture together, I asked Lopaka if he felt that being Native Hawaiian helped or hindered his ability to be a scientist or science teacher. "It's certainly helped because of the financial opportunities. I've gotten grant money and certainly I enjoy the fact that I'm one of the few Hawaiians that are actually in the science programs. I enjoy that they used to push that about me sometimes with some

of the folks up at UHM. 'Oh yeah, we have a Hawaiian student.' Maybe not directly, but indirectly...I think its particularly fun now with this program that I work with over the summer because I feel like I do take a lot of that (scientific) background and then bring it to this other summer program. So I see the synthesis between the two (science and Hawaiian culture).” “There's a gross misunderstanding of just how amazing Hawaiians were, particularly in science. It's so misunderstood just how amazing Hawaiians were as scientists especially in the field of ecosystems and conservation management. You look at what they did, and the whole concept of the ahupua'a and the ahupua'a now...with the concept of ridge to reef and seeing that an entire ecosystem is connected is now the worldwide approach to understanding ecosystems and restoring ecosystems. But this is something the ancient Hawaiians were practicing long ago. They're excellent scientists, excellent observers, able to work things out and come up with hypotheses about what they observed. Look at the creation of the fishpond systems. It was just amazing what they were able to do. But thinking of Hawaiians as scientists today is not done.” In this summer program, “we take college students for five weeks and teach them about watershed, and they do some Native Hawaiian plant restoration and some fishpond restoration work. I don't feel like it's held me back at all.”

Flipping the question around, and thinking back to some of the discrimination he went through, does he feel that being a scientist has helped or hindered his ability to be a member of the Hawaiian community? “I think, like I said with the summer program, I think it's helped.” It's given him the opportunity “to go to Washington D.C. to represent Hawai'i on coastal issues for high school students.” “Being in science and doing some of the things I do it creates opportunities to talk go up and talk to people in Washington

D.C. and tell them that this is what our knowledge was. This is what Hawaiians were doing and look how great and amazing these people were. To take that message to the nation's capital and teach all of them, students from around the country about that...I think it enhances it (the community)." However, "I don't believe a person's identity is ever just one thing. It always troubles me when someone makes one aspect of their personality the focus of their personality." Being Hawaiian is "just one hat of many hats that I wear."

Lopaka felt this to be especially true about being a teacher at his school or any school. He explained to me that the opportunity to make connections between science and Hawaiian culture could be hit-or-miss depending on the student population. At his school, in Kailua, "there's not a whole lot of opportunity." Stressing that "some kids take an interest and some don't." He then added "it might be different if I was teaching at Nanakuli, Waianae or Kahuku...(schools) that serve the Hawaiian community." At those schools, in those areas "I could actually make a lot more connections with the students in the classrooms with their own Hawaiian backgrounds. You want to make connections with their own Hawaiian identities with what we're doing in the classroom."

Because he sees such an importance in connecting what happens in the classroom with being Native Hawaiian, I asked Lopaka to explain to me what being Native Hawaiian means to him. "I would say that being Hawaiian means, and this what I think I would like to try to do, having a sense of community and going beyond yourself. I think there's sense of humility about the things that you do and a general kindness and giving-ness of the personality. You go to someone's house and they say make yourself comfortable or when someone needs something and you say that you'll take care of it and

there's...a real sense of community. That's what it means to me sometimes. Personally, it means a tremendous spiritual connection to Hawai'i and with the rest of the Hawaiian people. It certainly means a sense of pride in what it means (to be Hawaiian) and a need or want to continue to be a part of the Hawaiian community and do what I can. Maybe not make all the difference but certainly doing what I can."

"If you have students who aren't working hard or cheating or doing things, that's certainly not Hawaiian and you can certainly point to the fact that Hawaiians were a hard-working, industrious people. And when you sit in my classroom and do nothing, that's disrespectful to what it means to be Hawaiian. It's just awful...I think it's terrible. And it creates this whole false stereotype about who the Hawaiian people are and just buys into this plantation mentality^{xxiii}, which just drives me nuts!" "We've got to get away from the plantation mentality but it still persists today. The Native Hawaiian community has to take a hard look at itself, and see there are certain things that we do to perpetuate this negative stereotype, and take action within the community to make things happen and make these things change. There are so many of us that work so hard to just make it, and there are so many others that help to bring us down." "You've heard the analogy of crabs in a bucket, and I think that's too true in some cases." "This is a thing to joke about Kamehameha School. We're Kamehameha School graduates and what do we do? We all join the fire dept and become police officers. Why can't we be more and do more?"

Those around him cultivated Lopaka's interest in science and he was encouraged to see it as a viable career option. Although there are more opportunities available for Native Hawaiians, Lopaka still sees a gap between what is available and what Native Hawaiian students are encouraged to pursue. More importantly, Lopaka would like to see

a change in attitude in both the scientific and Native Hawaiian communities to one where students believe in themselves, their abilities and feel that they can contribute to areas such as scientific research and medicine. This type of change is already happening through grant and scholarship programs, summer immersion activities and through concerned individuals like Lopaka who see themselves not only as “a scientist” or “a Hawaiian.”

Lopaka continues to work hard with his wife in the raising his two daughters, both of whom have Hawaiian names even though he does not. He is also currently helping to plan a summer college program that will help students synthesize the relationship between Native Hawaiian culture and science. In addition, he is also helping his school become the only school in the state of Hawai'i to offer the international baccalaureate degree. This requires the school to conduct both horizontal (planning across a particular grade level in a variety of subjects) and vertical (planning across a range of grade levels from K – 12) planning of their curriculum. As a result, graduates of this school will have a comprehensive and rigorous curriculum that will prepare them for higher education.

Themes between *Kalaimaola, Ku'ulei, & Lopaka:*

Pluralistic Viewpoint of Self

The major theme that arose from my conversations with the participants was the pluralistic view they have of themselves. As I discussed in chapter 2, most researchers utilize a singular identity model for the construction of their arguments for infusion, integration and multiculturalism. Proponents of these models assume that individuals identify themselves by a single characteristic, their culture. Scientism, on the other hand, makes the same assumption albeit from a different angle. Scientism and its supporters see science as being acultural and that to be a scientist (or a science teacher in our case) a person must ignore their cultural identity in favor of their science teacher identity. All three participants contradict both the culturalistic and the scientific models and identify themselves as existing within a plural identity model such as the one discussed by Sen.

All readily identified themselves as being Hawaiian, and see “being Hawaiian” as an important part of who they are and as a system of guidance. However, they do not see “being Hawaiian” as the sole facet of their being and as the singular defining characteristic of their lives. In the same vein, but from the so-called opposing viewpoint, two of the three participants identify themselves as science teachers (Ku'ulei identifies herself as a native practitioner) but they do not view this as the sole defining characteristic of their being. Instead, the participants see their science teacher and Hawaiian identities being plastic, as Sen suggests – malleable and adjustable depending upon their situation. I imagine all of our identities, chosen, unchosen and changing, as being segments of a broken mirror. Looking into a standard mirror gives a single reflection (identity), in this case that of being Hawaiian (*Figure 2*) or a science teacher

(Figure 3). Looking in to a multicolored and multi-cultural mosaic represented in figures 4 and 5 generates many different colors, angles and reflections (identities). The separated-yet-interconnected nature of this mosaic is representative of how our whole identity is made up of and supported by a variety of personal, professional, and cultural identities.

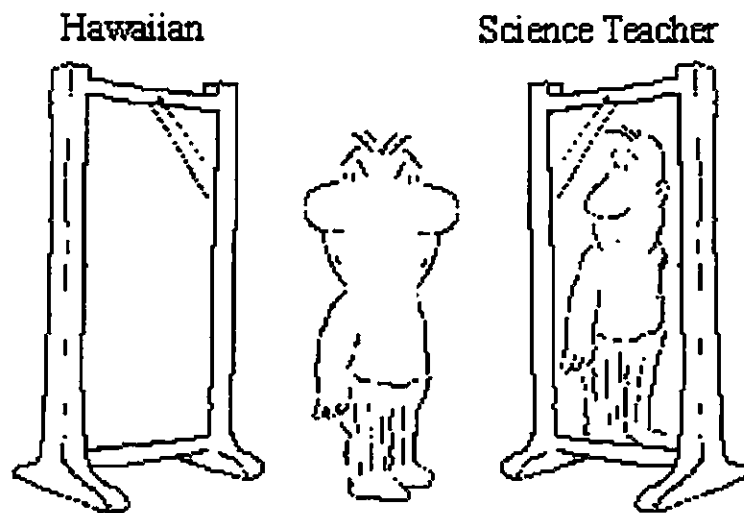


Figure 2: A single reflection (identity) of being a science teacher.

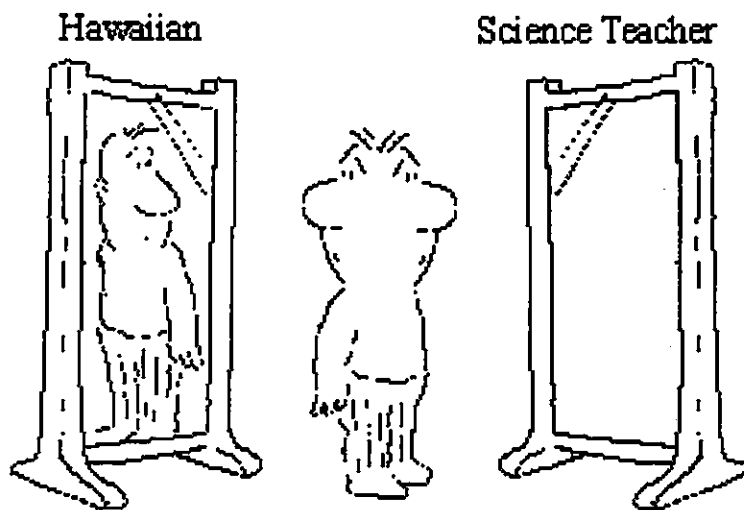


Figure 3: A single reflection (identity) of being a Hawaiian.

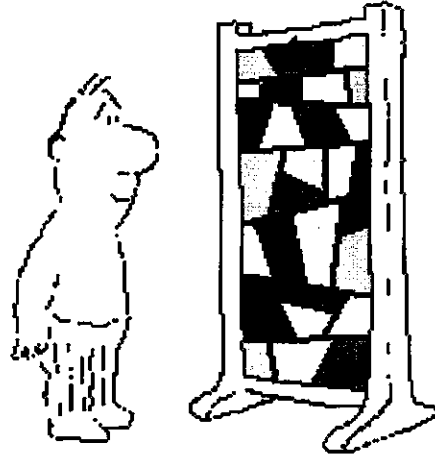


Figure 4: Lopaka looks into a mirror and sees many multi-colored and multicultural reflections (identities) that make up his total identity.

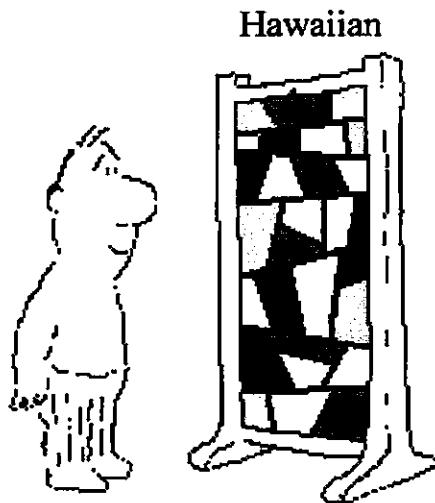


Figure 5: Kalaimeao and Ku'ulei look into a Hawaiian mirror and see many multi-colored and multicultural reflections (identities) that makes up their whole identities.

Naturally, the degree of importance that participants place on their Hawaiian identity varies and has developed over the course of their lives and individual experiences. For someone like Lopaka (participant C), some could argue that his Hawaiian identity makes

up a smaller segment of his total identity, compared with both Kalaimaola and Ku'ulei. Although Lopaka identifies, empathizes and works to encourage Native Hawaiian students to go into science, his Hawaiian experience has varied greatly from that of the other participants. Based on their testimonies, I would argue that Ku'ulei and Kalaimaola do not have a Hawaiian mirror segment. Instead, they are looking into a Hawaiian mirror (Figure 5) with different segments reflecting their various Hawaiian identities. As individuals who see being Hawaiian as a foundation of their lives, we come to the realization that they see, act and live within a Hawaiian mindset and are "Hawaiians doing things." Ku'ulei sees her cultural heritage as something that grounds and supports her. Certain qualities of her "Hawaiian-ness" such as family, spirituality and caring for the land are important to her and have guided her decisions through her academic and professional career. Kalaimaola's (participant A) testimony also points us in this direction but also points to an established balance between the cultural and scientific/academic needs of his students.

Although the mirror analogy provides a visual representation of how different identities are reflected back when we look at ourselves, it is not completely accurate. Both the Hawaiian and science teacher identities are very important to each of the participants, but they each also stressed the changeable nature of these two identities. This pluralistic concept of themselves takes into account the identities of different kinds that occur at separate times, in each of their lives that emerge from their backgrounds, associations and social activities. Some of these identities are chosen for us (i.e. cultural heritage^{xxiv}, place of birth, religion^{xxv}) while others are chosen throughout our lives (i.e. profession, marital status, organizational membership). What each of the participants has

had to decide as they have navigated through their lives is whether a particular identity is – or is not – important to them, by how much and when.

In all cases, the participants have placed value on both the identities of being Hawaiian and a science teacher. However, the relative importance of a particular identity depends upon the social context. For instance, being Hawaiian was an essential identity for participants A & C during the years they attended Kamehameha Schools whereas being interested in science was not. In their professional careers, membership in organizations such as the National Science Teachers Association (NSTA) and the Hawai'i Science Teachers Association (HaSTA) or attendance at a science conference is more dependent upon their science teacher identity rather than being Hawaiian. This is not to say that in these particular situations participants stop being science teachers or stop being Hawaiian, instead they make a decision as to which identity will be emphasized during a particular situation. Are these identities different? All of the participants agreed that they are.

Do these identities conflict with each other? Kalaimeola and Ku'ulei would say yes in respect to the way that knowledge is passed to students. Kalaimeola and Lopaka would agree that they also conflict in terms of time management. Since there are only twenty-four hours in a day, they expressed frustration that they sometimes have to choose which organizations (Hawaiian or science) to support with their time and effort. Even more interesting is that all of the participants see each of these two identities enhancing and supporting each other. Kalaimeola utilizes portions of his Hawaiian culture in the classroom to engage, support and connect with his students. Ku'ulei uses her culture everyday as she cares for ancient Hawaiian fishponds and educates students from various

schools about them. But she also uses modern scientific techniques to manage the fishpond and encourage students to go into the sciences as a way to *mālama* (care) for Hawai‘i in years to come. Lopaka has used his status as both a Hawaiian and a science teacher for a variety of purposes during his career. These include training Hawaiian students for future careers in science, traveling and meeting with other science teachers to educate them about Hawaiian environmental practices and advocating for scientific research into particular aspect of Hawai‘i.

As Sen (2006) notes about the apparent conflicts between religious, specifically Muslim, beliefs and social/political priorities, “the domain of one’s religious identity does not vanquish all other aspects of one’s understanding and affiliation. If being a Muslim were the only identity of anyone who happens to be Muslim, then of course that religious identification would have to carry the huge burden of resolving a great many other choices a person faces in other parts of his or her life” (67). For Kalaimeaoala, Ku‘ulei and Lopaka, their Hawaiian identity is an important one. However, all of the participants recognize that it does not “vanquish” their other identities. In fact, all of the participants felt that their Hawaiian identities enhances their other identities, and their ability to make decisions relating to social, political, personal and professional matters.

Facilitation/Impediment

A second theme connecting the three participants relates to the encouragement they received and impediments they have encountered in their journey to become science teachers as well as continue to receive as science teachers. In Kalaimeaoala’s experience, he has been fortunate to have been encouraged to pursue his interests in science, but has encountered some discouragement from colleagues when it comes to his integration of

Hawaiian culture into his science curriculum. The type of discouragement Ku'ulei and Lopaka have experienced could be considered more individual and personal as compared to Kalaimeaola's experience. While Kalaimeaola has experienced some general criticism for the methods he employs in his science classroom, Ku'ulei and Lopaka's experience with discouragement went to the very heart of who they are and what their interests are. In Ku'ulei's case, she was discouraged from pursuing her interests by her academic advisors in both high school and college. This is especially disturbing as these are the very people whose job is supposed to be to encourage students to pursue their strengths and interests. Lopaka, on the other hand, was challenged as a youth not because of his interest in science but because of the color of his skin and people's pre-existing notion of what a Hawaiian was supposed to look like. This challenge has remained an issue for both Lopaka and his wife since their return to Hawai'i, reconnected with old friends, and as he works to encourage more Native Hawaiians to go into science and technology fields.

In contrast to these impediments are the positive impacts and support that all the participants have received. Kalaimeaola has sought to incorporate Hawaiian culture into the science curriculum at his school. As a result, his students not only gain an academic understanding of science and the universe around them, they also leave with a better understanding of themselves. Ku'ulei has worked tirelessly with friends, colleagues and family members to form an educational group that manages and protects an ancient Hawaiian fishpond. This pond not only preserves the culture of Ku'ulei and students but also enables them to practice ancient and modern environmental and scientific techniques. Lopaka remarked how he has turned his negative experiences into a positive

one for future generations. He now works during the summers with a program that teaches Native Hawaiian students various scientific techniques to preserve the environment. Part of this participation comes from his desire for Hawaiian students, of all colors and backgrounds, to see someone who looks like him as a Hawaiian. Regardless of their experiences, all remarked on the support of their families (*'ohana*), direct and extended, as well as the support of friends and colleagues in the pursuit of their interests in and out of science education.

Connecting the Hawaiian Identity to the Science Teacher Identity

As mentioned earlier, none of the participants see themselves as either solely Hawaiian or solely as science teachers; instead they see themselves as Hawaiians who are science teachers (or science teachers who are Hawaiian). Within these two identities, all of the participants cited the need to identify the importance of Native Hawaiian culture as it relates to scientific methods, theories and practices. In addition, they also discussed the challenges they have faced personally as well as the challenges that have faced and continue to face Native Hawaiians looking for legitimacy within the scientific community. Lopaka uses his status as a Native Hawaiian to educate members of the scientific community on issues that are important to him. He views his Hawaiian identity as a form of leverage, giving him additional credibility with students, other scientists and politicians he meets during the course of his research and programs in addition to receiving state and federal funding for the programs he works with.

As a native practitioner, Ku'ulei uses culture and Hawaiian identity to encourage her students to take an interest and active role in the restoration and maintenance of ancient Hawaiian fishponds. She helps students connect their language, traditions, beliefs and

practices to scientific applications such as salinity, pH, alkalinity, dissolved oxygen/nitrogen allowing her students to see that the two can go hand-in-hand for the preservation of their home and its resources. Kalaimeaola utilizes traditions of both the past and present to connect students' cultural identity to the scientific world. These have included lessons dealing with astronomy, chemistry as well as anatomy and physiology. As I stated earlier, he feels that making these kinds of connections with the students help them to understand the world and themselves in a deeper way.

While all three participants help connect Hawaiian identity to a variety of scientific disciplines in different ways, they are all in agreement in one area. Hawaiians were excellent scientists, as shown by their abilities and practices that are only now being (re)discovered by others around the world. This scientific ability, according to the participants, is evidenced by their use of the "scientific method," specifically observation, theory development and hypothesis testing. There is also evidence of their knowledge of agriculture and the natural world around them in their construction of fishponds, crop rotation and the *ahupua'a*^{xvii}, as well as their ability to construct devices capable of satisfying requirements to survive in an isolated place for thousands of years.

Concerns About the Hawaiian Identity

Though not necessarily related to science, both Kalaimeaola and Lopaka raised concerns regarding Hawaiian identities of the past, present and for the future. The first concern, mentioned by all three participants in one way or another, relates to the overall negative attitude scientism takes towards Native Hawaiian and other indigenous knowledge. This is compounded by the recent adoption of such sustainability methods derived from indigenous agricultural and natural resource techniques, as well as the use

of native herbs for medicinal purposes without giving proper recognition to originators of this knowledge. On the one hand, the participants admitted that the widespread use of this knowledge would have a positive impact on the world. On the other hand, it has left members of the Native Hawaiian community, including the participants, feeling as if the knowledge ancient Hawaiians possessed and passed on will only be considered legitimate and “scientific” knowledge when mainstream science has accepted and assimilated it into its body of knowledge.

A second concern raised by the participants relates to Native Hawaiian students being taught how to be Hawaiian. In the past, Hawaiians were not taught how to be Hawaiian. As Kalaimaola explained about his parents and as Lopaka can attest to personally, schooling for Hawaiians was meant to westernize rather than help develop a cultural identity. Over the past twenty years there has been a renaissance of Hawaiian culture in the Hawaiian Islands, and with this revival has come some positives and negatives. All of the participants look favorably upon the reintroduction of Hawaiian culture, particularly Hawaiian language, and see it as constructive and necessary for the reconstruction of a vibrant Native Hawaiian community. Yet there is concern among some of the participants that the pendulum of change has swung too far and that schools such as Kamehameha are trying to too hard to infuse Hawaiian culture into the curriculum. Furthermore, with an increase in the number of Hawaiian language immersion schools some participants are very interested to see how students from these schools will function in the modern world. According to some participants, the students they have seen and worked with are knowledgeable in some areas but are deficient in

other areas, such as science and technology, which people like Lopaka feel are essential to surviving and functioning in today's society.

Lopaka raised the final identity concern with respect to the question of to how members of the Hawaiian community judge others to be or not be Hawaiian based on subjective qualities. While he identifies himself as and empathizes with the Native Hawaiian community, he is still sometimes looked upon as a non-Hawaiian or not Hawaiian enough by both Hawaiians and non-Hawaiians alike based on qualities such as the color of his skin, the way he dresses and speaks. He also commented that both friends and colleagues have harassed him because he does not have a Hawaiian name. Lopaka's comments raise an issue of discrimination for Hawaiians that may not "look Hawaiian" within the Native Hawaiian community. At times he feels that individuals and groups are hijacking (what some believe is) Hawaiian identity to use it for their own purposes rather than for the benefit of the community as a whole, and has often left him feeling like an outsider looking in.

Chapter 5. Discussion, Recommendations and Conclusions

Discussion

As I mentioned earlier much of the current literature focuses on the relationship, or lack thereof, between indigenous people and so-called western science using a singular identity model. This model assumes that people have one predominant identity that can be used as a means to a) distinguish and separate them from others and/or b) place individuals into groups based on this single identity. The creation of an environment in which individuals choose and view themselves through the lens of a single identity makes statistical analysis amazingly simple for social theorists, communitarian thinkers and theorist of cultural politics. However, the intricacies of what make an individual unique and the concept of plural identities, as expressed by all three participants, “are obliterated by seeing each person as firmly embedded in exactly one affiliation (Sen 2006).” This is unfortunately the case in scientific, multiculturalist and infusionist literature.

This thesis is an effort to reaffirm the fact that we all have multiple identities. This was done in two ways. First, by offering a critique of the current scholarly literature pertaining to indigenous peoples and science education. In chapter 2, I outline some of the arguments from scientific, infusionistic, and multiculturalistic literature followed by a critique based on the writings of Kwame Appiah and Amartya Sen. Secondly, I interviewed three individuals who are Native Hawaiian science teachers, something that almost none of the literature does^{xxvii}. The result of these interviews is that we gain a better understanding of the reality that these individuals face while navigating between these and their many other identities.

The educational history of indigenous cultures around the world following their contact with European and American forces is regrettable. The fact that very little has been done to actively improve the educational, and resulting socio-economic, standing of these cultures in recent years is unforgivable. In the past, efforts to improve the quality of education for the majority of Native Hawaiian youth has been hampered by *identity disregard* – the “ignoring, or neglecting altogether, the influence of any sense of identity with others, on what we value and how we behave.” Multiculturalists and infusionist scholars, while their intentions have been good, have gotten caught up in a *singular affiliation* framework – “which takes the form of assuming that any person preeminently belongs, for all practical purposes, to one collectivity only (Sen 2006 p. 20).”

Many researchers, scientists and members of the Native Hawaiian community see being Native Hawaiian and a science teacher as contrasting identities while the participants do not. In fact, the participants in this research see being a Hawaiian as a means to support and enhance their science teaching, allowing them to form better connections with their students in and out of the classroom. The non-contrasting identity attitude that the participants have regarding their culture and profession can be attributed to the assumption that scholars have made that a person can be defined strictly by a single identity, and that this identity is static regardless of the situation. These scholars have failed to take into account the participant’s multiple and plastic identities that have allowed them to navigate through their personal, academic and professional lives. Each of the participants has admitted that there have been conflicts, but the ability to adjust your identity to meet the need of a given situation has allowed them to be successful in the ways that they measure success.

In recent years both the concepts of singular affiliation and identity disregard have become prominent for various reasons on the local and national educational stages. Locally, singular affiliation has aided in the establishment of Hawaiian language immersion schools throughout the Hawai'i. Much of the impetus for the creation of these types of schools came about from the rediscovery of ancient Hawaiian traditions, the growth and determination to increase the number of Hawaiian language speakers, and desire for self-determination from the Hawaiian community. In my opinion, however, self-determination and the construction of a curriculum that encourages and supports Hawaiian learners should not come about through a "separate system," as Manu Myers (1998) has suggested. Separating individuals into groups based on arbitrary identities will only serve to fortify the single affiliation attitude. An attitude in which students' only identity is an unchosen one and they must forsake all others, including the idea that they belong to the much larger human identity.

The standards-based movement, which has come to forefront of educational debate in the past ten years, threatens to re-marginalize groups of people through its complete disregard for cultural identities "in spite of strong pressures in the direction of multiculturalism, globalism and interethnic understanding and reconciliation (Forbes 2000)." Since 49 of the 50 states adopted "standards" to gauge levels of learning, teacher and students have been rewarded or punished based on standardized test scores. Such tests are created, distributed and ranked nationally. Therefore these tests "have to be the same in Mississippi as in Hawai'i or Alaska, states with vastly different cultural traditions and social values" (Forbes 2000). While state and national standards are pushing education in a direction of identity disregard, all of the participants have tried to help

their students in different ways by including certain aspects of Hawaiian culture into their science curriculum. Kalameaola and his students celebrate the end of their pig dissection by cooking it in a traditional *imu*. Ku'ulei combines modern scientific measurement and practices with Hawaiian knowledge of ancient fishponds to teach biology and ecology. Lopaka works with students during the summer to teach them about land management and conservation using the *ahupua'a* methods used by ancient Hawaiians. With varying degrees of difficulty each of these science teachers have been able to incorporate Hawaiian values into science curricula and have exposed students to a paradigm where their unchosen identity (being Hawaiian) works with, supports and is supported by a chosen identity (scientist/science teacher). With the state of Hawai'i adopting standards that originate without a Hawaiian sense of place^{xxviii} and schools increasingly being judged based on test-scores, more schools will be forced to forgo cultural enhancements in the classroom.

This "top-down" approach to education taken by the standards movement as well as the multiculturalists and infusionists ignores the needs, efforts and experiences of the native (Hawaiian) science teacher. In fact, I was able to find only one article (Boyne 2003) written about and from the perspective of a native (American) science teacher regarding connections he found between Navajo sand painting and radiation discussions by a native nuclear physicist. Research looking at the actions and experiences of native science teachers, and any science teacher, could be invaluable to creating a science curriculum that is more inclusive and shed light on techniques that they have used to capture the attention of minority students. In their interviews, each participant discussed how they were "hooked" into science by a particular topic and/or teacher that they

encountered during their school years. In order to “hook” more students into science and science education we (science teachers) need to re-examine the current science curriculum with an eye for developing those aspects of the curriculum that can act as catalysts for Hawaiian students to become interested in science. While I do not advocate a full infusion of culture into the science curriculum, I do support the utilization of aspects of Hawaiian epistemology to generate interest in science. Using key aspects of Hawaiian culture in the classroom can enhance learning for both native and non-native students and show value in the knowledge generated and passed along for thousands of years. For native students, it creates cross-curricular opportunities, takes ancient Hawaiians out of history books and into today’s world, and generates ownership and interest in the subject matter. For non-native students it helps to foster respect for the host culture of the Hawaiian Islands.

Additionally, the community needs to actively encourage Native Hawaiians to think and see themselves as scientists and science teachers within the local, state, national and international communities. This can be accomplished through project based learning, forming partnerships with a colleges /universities or partnering with organizations such as Keaholoa STEM program^{xxix} at UH Hilo, Pacific American Foundation and the Hawai’i Science Teachers Association. The Native Hawaiian community also needs to look inward and discuss what it has done and what it will do to encourage students to pursue careers in science. While the scientific community needs to develop and appreciate the value in Hawaiian knowledge, the Hawaiian community must also find value in scientific knowledge including the acknowledgement that ancient Hawaiians *did* science, even though this term may not have been used. This will be challenging since

“scientific” knowledge has been used as a tool to discriminate, subjugate and trivialize Hawaiian culture. However, if Native Hawaiians are to be stakeholders and competitors in today’s markets, they must be knowledgeable in the ways of science and technology.

The Hawaiian community must also find value in education, become teachers (both formal and informal) and share helpful and constructive knowledge as was done in the past. The ancient Hawaiians had a rich oral tradition of passing along, adding and improving knowledge over thousands of years, and the time has come to re-embrace this aspect of their cultural heritage to help build a Native Hawaiian teaching force. Although students of color could achieve high academic, personal and social performance when taught by teachers of different ethnic groups, studies such as the National Collaborative on Diversity in the Teaching Force (October 2004) have shown that students of color tend to have higher performance levels in these areas when taught by teachers from their own ethnic group. Having a Native Hawaiian teaching force will “increase the number of role models for (Hawaiian) students; provide opportunities for all students to learn about ethnic, racial and cultural diversity; be able to enrich diverse students’ learning because of shared racial, ethnic and cultural identities; and serve as cultural brokers, able not only to help students navigate their school environment and culture, but also to increase the involvement of other teachers and their students’ parents” (NCDTF^{xxx} 2004, p. 6).

This can be accomplished formally through the creation of programs within the department of education in which interested persons can be trained, early outreach/pre-collegiate programs for middle and high school students to create interest in teaching, and college outreach programs. State and federal governments should also enact legislation to increase and support the number of teachers of color both in the pipeline and in the

classroom. They must work to make teaching an attractive career choice by increasing wages to be competitive with private industry, removing or restructuring standardized tests to represent our native population and their knowledge and provide financial compensation/incentives for teachers to pursue advanced degrees in education and/or their content area. On a less formal level, classroom teachers can invite and welcome elder members of the Hawaiian community (*kupuna*) to help teach students in and out of the classroom. This inclusion of the community in the classroom will help students connect information that is learned in the classroom, to their own reality outside of the classroom. Additionally, by opening the classroom to members of the community parents, grandparents, and other family members begin to take ownership in their child's education rather than leaving it the sole responsibility of the school.

Recommendations

After having conducted, reviewed and discovered several important educational themes through the three interviews contained in this thesis there are several areas I would recommend exploring. First, the number of participants needs to be expanded to accurately represent the diversity of personal and professional experiences within the Native Hawaiian community. While the three participants in this thesis provide a hint as to the collective experiences of Native Hawaiian science teachers, altogether they barely scratch the surface of the richness of experiences in the community as a whole. Certain groups of individuals should be sought to maximize the diversity of the study group. These groups should include, but are not limited to retired Native Hawaiian science teachers, Native Hawaiian students studying to be science teachers, individuals not living in Hawai'i. Second, a thorough gender analysis of Native Hawaiian science teachers could provide insight into the challenges that minority women face in the sciences and could be invaluable to colleges of science and/or education, as well as other organizations whose mission is to encourage minorities to go into the sciences.

Perhaps the biggest limitation of this study is that all of the participants are in some way connected with Kamehameha Schools. In future studies, participants should be sought that have little or no connection to this particular school. That way a comparison can be made of students who have benefited educationally from Kamehameha schools and those who have not. Other limitations of this study include the relationship between age/experience and the participants' view of science and education as a whole. While participants were sought from as wide range of socio-economical, political, educational and educational positions, the nature of the study itself created a limitation.

Lastly, some questions that I would like to see answered in future studies include: Do more older and/or retired teachers have a differing viewpoint on the relationship between their culture and science education? Do the attitudes and strategies used by older Native Hawaiian science teachers differ from those used by their younger counterparts? Additionally, it would interesting to see how science is perceived by members of the Native Hawaiian community who are not actively involved in a “science” field.

Conclusions

Scholarly works on indigenous peoples and science education separate the two identities (science teacher and Hawaiian). In reality, the participants themselves view them as two (of many) parts that make them whole. The participants Kalaimeola, Ku'u lei and Lopaka see themselves as both Hawaiian and science teachers existing at the same time with shifts in emphasis depending upon the social situation. The navigation between the two has been turbulent. But the steps they have taken throughout their lives has allowed them to develop a pluralistic view of themselves with each refusing to be compartmentalized and categorized as solely Hawaiian or a science teacher.

We all have multiple identities – some chosen and some unchosen. Some of my identities include being male, Caucasian, Jewish, thirty-years-old, a son, born in New Jersey, living in Hawai'i, a member of the National Science Teachers Association, a member of the Hawai'i Science Teachers Association, a husband, the state director for the Hawai'i State Science Olympiad, a brother, an Eagle Scout, a balding brunette, near-sighted and right-handed. Each of the aforementioned qualities is an identity that I possess but none of them are static. Instead they are moldable and changeable depending on the social situation, personal attitude shifts over time, and some, like my age, change despite my best efforts to the contrary. Characterizing an individual by a single identity may give you a glimpse of that person but misses the essence of what makes that person who they are.

Appendixes

Quantitative Interview Protocol

Participant Demographical Information

1. Age
2. Current residence
3. Highest Level of Education Attained
4. Education institution(s) attended
5. Occupation
6. Status in Scientific Community (ie. student, professional, retired, etc.)

Participant Professional Information

1. How long have you been a scientist?
2. What type of science do you specialize in?
3. Are you involved in any science organizations?
4. Are you involved in any Native Hawaiian organizations?
5. Are you involved in any Science and/or Native Hawaiian education initiatives?
6. Do you (or did you?) identify yourself as a Native Hawaiian?

Qualitative Interview Protocol

1. Talk about your family and how you were raised in regards to Native Hawaiian culture.
2. Overall, were you and your family “Hawaiian?” Why or why not?
3. When and how did you become aware/interested in your culture?
4. When and how did you become aware/interested in science?
5. When and how did you decide to become a scientist?
6. Do you feel that being Native Hawaiian enabled or diminished your ability to be a scientist?
 - a. If enabled, how?
 - i. Did you always feel enabled or did it happen over time? How?
 - ii. Did anyone (teacher, parent, kupuna) help enable you?
 - iii. Did anyone (teacher, parent, kupuna) hinder you?
 - b. If diminished, how?
 - i. Did you always feel diminished or did it happen over time? How?
 - ii. Did anyone (teacher, parent, kupuna) help diminish this ability?
 - iii. Did anyone (teacher, parent, kupuna) help enable you?
7. Do you feel that being a Western scientist enabled or diminished your ability to be Native Hawaiian?
 - a. If enabled, how?
 - i. Did you always feel enabled or did it happen over time? How?
 - ii. Did anyone (colleague, friend, spouse, relative) help to enable you?
 - iii. Did anyone (colleague, friend, spouse, relative) hinder you?

- b. If diminished, how?
 - i. Did you always feel diminished or did it happen over time? How?
 - ii. Did anyone (colleague, friend, spouse, relative) help diminish this ability?
 - iii. Did anyone (colleague, friend, spouse, relative) help enable you?
- 8. What does “being Hawaiian” mean to you?
- 9. Do you feel that you now have more perspective on the dis/connection between Western Science and being Native Hawaiian?
- 10. What changes, if any, would you make to science curriculum used in schools today?
- 11. What advice would you give to Native Hawaiian students looking to become a member of the Western scientific community?

References

- Aikenhead, G. (1997) Toward a First Nations Cross-Cultural Science and Technology Curriculum. *Science Education* (81)2: 217-238.
- Aikenhead, G. (2001) Integrating Western and Aboriginal Sciences: Cross-Cultural Science Teaching. *Research in Science Education* (31)3: 337-355.
- Aikenhead, G. (2002) Cross-Cultural Science Teaching: Rekindling Traditions for Aboriginal Students. *Canadian Journal of Science, Mathematics and Technology Education*, (2)3: 287-304.
- Aikenhead, G. (2002) Whose Scientific Knowledge? The Colonizer and the Colonized. *Science Education As/For Sociopolitical Action* (edited by Wolff-Michael Roth and Jacques Desautels). Pp. 151-166.
- Aikenhead, G. & Huntley, B. (1999) Teachers' Views on Aboriginal Students Learning Western and Aboriginal Science. *Canadian Journal of Native Education*, (23)2: 159-175.
- Alaska Native Knowledge Network (1998) Alaska Standards for Culturally Responsive Schools.
- Appiah, K. (2006). *Cosmopolitanism – Ethics in a World of Strangers*. W.W. Norton & Company, Inc., New York.
- Baker, D. (1996) Does “Indigenous Science” Really Exist? *Australian Science Teachers Journal*, (42)1: 18-20.
- Benham, M. & Heck, R. (1998) *Culture and Educational Policy in Hawai'i: The Silencing of Native Voices*. Lawrence Erlbaum Associates, Publishers, London.
- Bogdan, R. C. & Biklen, S. K. (2003). *Qualitative research for education: An introduction to theories and methods*. Boston: Allyn and Bacon.
- Boyne, G. (2003) Utilizing Traditional Knowledge in a Scientific Setting. *Winds of Change*, (18)1: 52-53.
- Brickhouse, N. & Kittleson, J. (2006) Visions of Curriculum, Community and Science. *Educational Theory*, (56)2: 191-204.
- Brickhouse, N. & Stanley, W. (1995) Response to Good. *Science Education*, (79)3: 337-339.
- Cajete, G. (2000) *Native Science: Natural Laws of Interdependence*. Clear Light Publishers, Santa Fe, New Mexico.

- Coburn, W. & Loving, C. (2001) Defining "Science" in a Multicultural World: Implications for Science Education. *Science Education*, (85)1: 50-67.
- Corsiglia, J. & Snively, G. (2000) Rejoinder: Infusing Indigenous Science into Western Modern Science for a Sustainable Future. *Science Education*, (85)1: 82-86.
- Costa, V (1995) When Science is "Another World": Relationships Between Worlds of Family, Friends, School and Science. *Science Education*, (79)3: 313-333.
- Creswell, J. (1998). *Qualitative inquiry and research design: Choosing among five traditions*. Thousand Oaks, CA: Sage Publications.
- Dewey, J. (1997). *Experience & Education*. Simon & Schuster, New York.
- Forbes, J. D. (2000) The New Assimilation Movement: Standards, Tests and Anglo-American Supremacy. *Journal of American Indian Education*, (39)2: 7-28.
- Gauch, Jr., H.G. (2006) Science, Worldviews, and Education. *Science & Education* via www.springerlink.com.
- Good, R. (1995) Comments on Multicultural Science Education. *Science Education*, (79)3: 335-336.
- Harding, Sandra. (1998) *Is Science Multicultural?* Indiana University Press, USA.
- Jegede, O. J. & Aikenhead, G. (1999). Transcending Cultural Borders: Implications for Science Teaching. *Journal for Science & Technology Education*, (17)1: 45-66.
- Kaholokula, N. (2003) A Model for Hawaiian Education. *Oiwi*, (3): 53-57.
- Kana'iaupuni, S. (2005) Ka'akālai Kū Kanaka: A Call for Strengths-Based Approaches from a Native Hawaiian Perspective. *Educational Researcher*, (33)9: 32-38.
- Kawagley, A. and R. Barnhardt. (1998) Education Indigenous to Place: Western Science Meets Native Reality, 1-17. Alaska Native Knowledge Network via www.ankn.uaf.edu/EIP.html
- Kawagley, A., Norris-Tull, D. & Norris-Tull, R. (1998). The Indigenous Worldview of Yupiag Culture: Its Scientific Nature and Relevance to the Practice and Teaching of Science. *Journal of Research in Science Teaching*, (35)2: 133-144.
- Kawagley, A., Norris-Tull, D. & Norris-Tull, R. (1995). Incorporation of the World Views of Indigenous Cultures: A Dilemma in the Practice and Teaching of Western Science. *Presented as paper for the Third International History, Philosophy and Science Teaching Conference*: 3-8.

- Lincoln, Y. S. & Guba, E. G. (1990). *Naturalistic Inquiry*. Newbury Park, CA: Sage Publications.
- Loving, C. (1995) Comment on “Multiculturalism, Universalism, and Science Education.” *Science Education*, (79)3: 341-348.
- Manuelito, K. (2003) Building a Native Teaching Force: Important Considerations. *Eric Digest (ED482324 2003-12-00) www.eric.ed.gov*.
- McKinley, E. (2005). Locating the Global: Culture, Language and Science Education for Indigenous Students. *International Journal of Science Education*, (27)2: 227-241.
- Merriam, S. B. (2001). *Qualitative research methods and case study applications in education*. San Francisco: Jossey-Bass Publishers.
- Meyer, M. (1998). Native Hawaiian Epistemology: Sites of Empowerment and Resistance. *Equity & Excellence in Education*, (31)1: 22-28.
- Michie, M. (2002) Why Indigenous Science Should Be Included in the School Science Curriculum. *Australian Science Teachers Journal*, (48)2: 36-40.
- Native Hawaiian Education Council & Ka Haka ‘Ula O Ke’elikōlani (2002) *Nā Honua Mauli Ola: Hawai’i Guidelines for Culturally Healthy and Responsive Learning Environments*.
- Naone III, L. K. (1995). Indigenous Science: The Heart of Our Culture. *Po ‘e Hawai’i*, (2)1: .
- O’Loughlin, M. (1992) Rethinking Science Education: Beyond Piagetian Constructivism Toward a Sociocultural Model of Teaching and Learning. *Journal of Research in Science Education*, (29)8: 791-820.
- Padilla, M. (2005). Developing a World View for Science Education; A Message from the NSTA President. *Journal of College Science Teaching*, (35)1: 8.
- Patton, M. Q. (1990). *Qualitative Evaluation Methods*. Thousand Oaks, CA: Sage Publications.
- Rimmer, M. (2003). Legal Protection of Indigenous Traditional Knowledge and Cultural Expression: Blame it on Rio – Biodiscovery, Native Title, and Traditional Knowledge. *Southern Cross University Law Review*, (7): 1-49.
- Sen, A. (2006) *Identity and Violence: The Illusion of Destiny*. W.W. Norton & Company, Inc., New York.

- Siegel, H. (2002) Multiculturalism, Universalism and Science Education: In Search of Common Ground. *Science Education*, (86)6: 803-820.
- Simonelli, R. (1994) Toward a Sustainable Science. *Winds of Change*. (9)2: 36-37.
- Simonelli, R. (1994) Finding Balance by Looking Beyond the Scientific Method. *Winds of Change*, (9)4: 106-112.
- Simonelli, R. (1994) Sustainable Science: A Look at Science Through Historic Eyes and Through the Eyes of Indigenous Peoples. *Bulletin of Science, Technology & Society*, (24)1: 1-12.
- Sing, D. K., Hunter, A. & Meyer, M. A. (1999) Native Hawaiian Education: Talking Story with Three Hawaiian Educators. *Journal of American Indian Education*, (39)1: 4-13.
- Smith, L. (1999) Decolonizing Methodologies: Research and Indigenous Peoples. Zed Books Ltd., London.
- Snively, G. & Corsiglia, J. (1998) Discovering Indigenous Science: Implications for Science Education. *Paper presented at the Annual Meeting of the National Association for Research in Science Teaching (71st, San Francisco, CA, April 19 – 22, 1998)*.
- Stanley, W. & Brickhouse, N. (1994) Multiculturalism, Universalism, and Science Education. *Science Education*, (78)4: 387-398.
- Stanley, W. & Brickhouse, N. (1995) Science Education Without Foundations: A Response to Loving. *Science Education*. (79)3: 349-354.
- Stanley, W. & Brickhouse, N. (2000) Teaching Sciences: The Multicultural Question Revisited. *Science Education*, (85)1: 35-49.
- Tabak, I. (2005) Are Disciplinary Distinctions Pertinent to Multicultural Education? A View from Science. *Multicultural Perspectives*, (7)4: 33-38.
- Tapestry. "The Processes of Native Science." Tapestryweb.
<http://www.tapestryweb.org/nativescience/processes.html>
- Taylor, S. J., & Bogdan, R. C. (1984). *Introduction to Qualitative Research Methods*. New York: Wiley.
- Wilson, A.L. (1999). Creating Identities of Dependency: Adult Education as a Knowledge-Power Regime. *International Journal of Lifelong Education*, (18)2: 85-93.

Yow, V.R. (2005, 2nd ed.). Recording Oral History: A Guide for the Humanities and Social Sciences. Altamira Press, NY.

Notes

ⁱ Indigenous is a term used to refer to groups of people including Inuit (first peoples), Native American, Hawaiians and other Polynesian peoples, Maori and Aboriginal peoples of Australia. In this study, the term indigenous and native will be used interchangeably.

ⁱⁱ The term Hawaiian or Native Hawaiian in this study will refer to the indigenous peoples of Hawai'i as opposed to an individual of any cultural heritage that lives in Hawai'i.

ⁱⁱⁱ Some researchers both for and against so-called Indigenous/Native Science have referred to this process as "elevating" the status of Indigenous knowledge. I have chosen not to use this word because it automatically implies that Indigenous knowledge has a lower status and/or is less important than "scientific" knowledge. This power relationship inhibits discussion rather than fostering it.

^{iv} I will use the term Indigenous science to represent Indigenous science, native science and traditional ecological knowledge (TEK).

^v Suggested by Lord Norman Tebbit a conservative English politician as a way of gauging loyalty to England by immigrants. If an immigrant cheered for the English team at a cricket match they were fine, as they had demonstrated their loyalty to England over their country of origin. This test is both simple and inflammatory assuming that individuals can only maintain a single identity, in this case either citizens of England or their country of origin.

^{vi} The term "Native Hawaiian science teachers" refers to science teachers who are of Native Hawaiian ancestry not teachers of Native Hawaiian science.

^{vii} Although each interview utilized the qualitative interview protocol as listed in the Appendix, the actual interviews were conducted in a less formal manner allowing the participants' thoughts, ideas and memories to flow freely. Rather than a strictly formal interview, each meeting was more of an in depth conversation and may be used interchangeably with the term "talk story" by both the three participants and myself.

^{viii} This project has a "centering of the landscapes, images, languages, themes, metaphors and stories in the indigenous world (p. 146)" that have enabled Hawaiian science teachers to negotiate through their professional and personal lives.

^{ix} "Story telling and oral histories (p. 144)" are fundamental parts of Hawaiian culture and have thus become vital to research with Hawaiian people. "Each individual story is powerful. But the point about the stories is not that they simply tell a story, or tell a story simply. These new stories contribute to a collective story in which every indigenous person has a place."

^x "Reframing is about taking much greater control over the ways in which indigenous issues and social problems are discussed and handled (p. 153)." This issue is key is the examination of the plural identities Hawaiian science teachers have as opposed to the singular identities the literature claims.

^{xi} Protecting "is concerned with protecting peoples, communities, languages, customs and beliefs, art and ideas, natural resources and the things that indigenous peoples produce (p. 158)" and is the basis for interviewing participants rather than utilizing only literature.

^{xii} This concept "is about discovering Western science and technology and making science work for indigenous development (p. 160)." Even according to Smith there are "very few indigenous scientists who remain closely connected to their own indigenous culture." The goal of this project is to find out how Hawaiian science teachers have negotiated two major facets of their lives and whether being a science teacher indeed inhibits their ability to be Native Hawaiian.

^{xiii} Any school or department within the University of Hawai'i system will be designated using UH.

^{xiv} The designation of "A", "B" or "C" denotes the chronological order in which interviews took place, "A" being the first participant interview and "C" being the third and final participant interview.

^{xv} Meaning biology in Hawaiian.

^{xvi} More common Hawaiian words and place names will not be italicized.

^{xvii} Rimmer, M. (2003).

^{xviii} Meaning "my lei" or "my child" in Hawaiian.

^{xix} While there is much discussion on what “Native Hawaiian epistemology” means, according to authors such as Meyer (1998) and practitioners such as Ku’ulei, learning (of anything) involves both a physical, spiritual and emotional connection to knowledge. Instead of standing apart and viewing knowledge, especially scientific knowledge, as separate and outside of culture this type of epistemology uses culture and knowledge together to support and enhance each other.

^{xx} At the time of writing and publication, the governor of Hawai‘i is Linda Lingle.

^{xxi} Haole is a term that originally referred to any foreigner in Hawai‘i. Over time it has evolved to almost exclusively refer to a white/Caucasian person or someone that may have very light colored skin. It is generally regarded as a derogatory term.

^{xxii} When asked to define “Hawaiiana,” Lopaka informed me that this term refers to skills, religious and cultural practices, songs, and other assorted lessons about the Hawaiian culture that he and other students received at school. From here on, this term will relate to this definition.

^{xxiii} Refers back to the days when much of Hawai‘i was sugarcane and pineapple plantations with a rigid hierarchy with whites (management/owners) on top and Hawaiians on the bottom with other ethnicities (Japanese, Chinese, Filipino) in between. Each group had a separate and distinct role in this system. This term is used in the local lexicon to refer to the idea that one cannot change their station in life, like the rigid caste system still used in India.

^{xxiv} Theologically, some cultures and their norms are intertwined with their religious views and practices. Some examples of these are ancient and some segments of modern Judaism and ancient Hawaiians. In this thesis I will be separating culture from religion.

^{xxv} For the purposes of this argument, religion will be represented as a static and unchosen identity. Some will argue that religious views are inherited or passed down from parent to child. Others can argue that religious views can in fact be chosen. In some cases, people will choose which aspects of a religion to follow while disregarding others they do not agree with. In other cases, individuals can convert from one religion to another.

^{xxvi} Commonly referred to as “ridge-to-reef,” this concept embodies the interconnectedness of the ancient Hawaiian society making everyone responsible for the health and maintenance of a particular valley within the Hawaiian Islands thus ensuring sustainability of natural resources for all the residents of an area for generations.

^{xxvii} The exception would be Grace M. Boyne’s 2003 article *Utilizing Traditional Knowledge in a Scientific Setting* for *Winds of Change* (18,1) where Dr. Fred Begary, a Native American physics teacher, is interviewed.

^{xxviii} The Hawai‘i Content and Performance Standards (HCPS) II included a Hawaiian culture-based section of standards. HCPS III adopted in December 2005 does not include this section.

^{xxix} Keaholoa STEM Program is a federally funded program out of the University of Hawai‘i at Hilo with a mission to encourage and support Native Hawaiians interested in science, technology, engineering and math.

^{xxx} National Collaborative on Diversity in the Teaching Force