

Navigating Rough Waters: Hawaiian Science Teachers Discuss Identity

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“I got hooked on science...through the ability of teachers to engage me in science through cultural stuff. Doing natural products research and looking at Native Hawaiian herbs, herbal medicine and exploring microbiology through cultural eyes...it excited me because it validated who I was as a Hawaiian.” (Kalaimeola, personal narrative)

“Learning to sail a double-hulled canoe as well as learning the art of celestial non-instrument navigation motivated me to learn science. It taught me to observe and to look at a natural system and how it’s related...how they’re connected...how they may be disconnected. Culture has helped ground me in applying contemporary scientific methodology.” (Ku’ulei, personal narrative)

The question of how schools can better meet the educational needs of a diverse population of students has been hotly debated for many years. Since the unveiling of Project 2061 (American Association for the Advancement of Science, 1989), *science for all* is a concept that has become the cornerstone of curriculum reform efforts. While these efforts are to be commended, there is still much that science educators do not know about “science for all,” especially the science education of populations traditionally underrepresented in the sciences, and chief among these, indigenous peoples.

Over the past several years a body of research focusing on closing the gap between school science and indigenous knowledge has emerged and has provided insights into the attitudes, instructional practices, and curriculum developments that have proven to be successful at inspiring and supporting indigenous students in the sciences (Boyne, 2003; Chinn, 2007; Sing, Hunter, & Meyer, 1999).

As part of my master’s degree in the Department of Educational Foundations in the College of Education, I conducted a pilot project¹ that explored Native Hawaiian science teachers’ influences in pursuit of a science-related career. This project involved three science educators of Native Hawaiian

ancestry and sought to understand the supports and barriers they encountered (and continue to encounter), the role of cultural identity and heritage in science and science teaching, and connections they have made between Hawaiian cultural practices and science.

Statistics regarding Native Hawaiian student achievement are staggering. Native Hawaiians made up approximately 23 percent of Hawai’i’s general population and 27.6 percent of all public school students in the state of Hawai’i during the 2007–2008 school year. Seventy-nine percent of public schools that are predominantly Hawaiian (≥ 50 percent of school population) are in some form of corrective action. Despite improvements, standardized test scores of Hawaiian students are the lowest among all major ethnic groups. Their test scores consistently lag behind total Hawai’i Department of Education (HIDOE) averages by at least nine percentiles, and they achieve Adequate Yearly Progress (AYP) at a lower rate than schools with fewer than 50 percent Native Hawaiian students. Additionally, these same schools have the highest percentage of teachers with emergency or provisional credentials (25.9 percent in 2005–2006 compared to an overall average 14 percent). Hawaiian students are overrepresented in the special education system, with 14.8 percent of

Hawaiian students classified as requiring special education compared to 8.9 percent of non-Hawaiians. The graduation rate of Hawaiian students has increased since 2002 at the same rate as for the state population overall, but is still among the lowest in the HIDOE, 71.2 percent in 2006 compared to the state average of 78 percent. Hawaiian adolescents have the highest rates of juvenile arrest (40.5 percent of the 1,250 juvenile arrests in 2001), are more likely than their non-Hawaiian counterparts to use drugs (12.6 percent of Hawaiians had used some type of drug by the 6th grade, compared to 8.3 percent statewide), and engage in early sexual activity with 11 percent reporting having sexual intercourse before age thirteen (Kana'iaupuni & Ishibashi, 2003). Needless to say, these are truly rough waters through which our Native Hawaiian students must navigate to be successful.

Research with Native Hawaiian science teachers is contributing to a better understanding of issues relating to equity in science education, and towards improving science curriculum to support Native Hawaiian students as well as support systems for Native Hawaiian students interested in pursuing higher education and science-based careers. Additionally, this research supports the voices of individuals like the participants. In this way, the shared inspirations, influences, and challenges they encountered can inform both the Native Hawaiian and scientific communities.

There were two research questions central to the project:

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 Native Hawaiian?

It is the belief of some scholars, past and present, that so-called "Western science" and Native Hawaiian culture are separate islands in a tumultuous ocean that few have dared to bridge. This belief raises the following questions: Is the disconnection between these two identities so wide and irreconcilable that

Hawaiians interested in becoming science teachers must identify themselves singularly as a Hawaiian *or* a science teacher? How do Hawaiian science teachers navigate this apparent science teacher / Hawaiian divide? Before exploring the experiences of current Native Hawaiian science teachers, I would like to briefly survey some of the current literature as it pertains to science and Indigenous culture, knowledge, and language. The literature explored here provides an academic framework from which we can think about and analyze differing viewpoints of identity. While this literature is thought-provoking, it lacks the experiential quality that personal narratives from teachers navigating these points-of-view can provide.

Literature Review

Include Indigenous Knowledge in Science Curriculum?

Until recently, science education materials and programs designed specifically for use with Indigenous peoples were geared specifically towards assimilation into the dominant culture and acceptance of western scientific methods over native cultural beliefs. Recently there has been a paradigmatic shift by some in the scientific, educational, and philosophical community to find a way to bring balance to this curriculum by focusing on the educational strengths of Native Hawaiians and other Indigenous peoples. Articles by and on the subject of Hawaiians and education (Chinn, 2007; Kana'iaupuni, 2005; Meyer, 1998; Sing et al., 1999) concern themselves with Native Hawaiian epistemology and curriculum reorganization. These scholars challenge misconceptions "based on foreign perceptions of reality" (Kana'iaupuni, 2005, p. 32) that non-Hawaiians have of Hawaiians, especially in the sciences. This challenge, and the research that stems from, it is an effort to improve student performance through cultural experiences (Kaholokula, 2003; Meyer, 1998; Michie, 2002) during and after school, the creation of a native teaching force (Au, 1998), the use of strengths-based approaches to education (Kana'iaupuni & Ishibashi, 2003; Simonelli, 1994a), and the creation of Hawaiian

culture-centered schools (Kaholokula, 2003; Meyer, 1998; Simonelli, 1994c).

Singular Identity

Various authors have approached the issue of identity from an array of vantage points. The literature on which I will elaborate relates to the construction and basis of arguments presented by researchers who have aligned themselves with the singular identity framework.

Multiculturalists (Brickhouse & Kittleson, 2006; Kawagley & Barnhardt, 1998; O'Loughlin, 1992; Siegel, 2002; Simonelli, 1994a; Stanley, & Brickhouse, 2000; Stanley, 1994) have examined science curriculum and apparent disconnections between Western science with other ways of knowing by calling for more of a "world view" within the science textbooks and the curricula they espouse. Stanley and Brickhouse (2000) pose three important questions that multiculturalists seek to answer: "Whose culture are we teaching? Whose knowledge is of most worth? Who benefits and who is harmed by current approaches to curricula?"

Infusionists (Aikenhead, 1997; Boyne, 2003; Corsiglia & Snively, 2000; Michie, 2002; Simonelli, 1994b) have sought to reconcile 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, as Kawagely, Norris-Tull & Norris-Tull (1995) note, 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 (p. 42)" while ignoring the contributions of Indigenous Peoples. Aikenhead (1997) goes on to examine the curricular focus on "think[ing] like a scientist" while acculturating students into the "mechanistic, reductionist, empirical, mathematically idealized, exploitive, impersonal, and elitist" (p. 220) ways of science.

Both Native and Non-Hawaiian Universalists, on the other hand, believe that casting such a wide net over the term 'science' can be detrimental to both the so-called "Western" conception of science as well as various forms of Indigenous knowledge. With any challenge to the *status quo* come questions

of appropriateness and feasibility. Debate among Universalists centers around the addition of the word 'science' when discussing ways of knowing (i.e. Native Science and Indigenous Science). Both types of science, so-called Western and Indigenous, "consist of a set of explanations which seek to make sense of the natural world" (Baker, 1996, p. 18) and involve prediction, theory formation, experimentation, and explanation. However, Native/Indigenous Universalists view science in its role in the history of subjugation and colonization. Accordingly, there is no such thing as Native science because the word 'science' itself is a Western word and a philosophical construct that has no Native meaning.

The Western Universalist viewpoint is characterized by the belief that Indigenous science and Western science are the same as long as the knowledge and methods used to obtain it meet certain 'scientific' criteria. Proponents of this view insist there is only one kind of science and that scientific methods can include, but are not reliant upon, processes such as spirit, emotion, and imagination.

Teachers' Life Histories

The subject and core idea of this research project was to learn how Hawaiian science teachers² have navigated and reconciled the seemingly incompatible identities of being both a Hawaiian and a science educator. The purpose of talking story with Hawaiian science teachers was not, as Seidman (2006) notes, "to get answers to questions, nor to test hypotheses, and not to 'evaluate' as the term is normally used," but to understand the, "lived experience of other people and the meaning they make of that experience" (p. 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. While modern Hawaiians also utilize written language as a method of sharing ideas and knowledge, "oracy...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, pp. 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 (2001) explains that this (qualitative) methodology emphasizes “the way humans experience the world” and “the stories that they tell” (p. 157). Additionally, this framework co-mingles 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” (p. 143).

Method

Participants

The participants were three individuals of Native Hawaiian ancestry who, at the time of this project, were employed as science educators in the state of Hawai‘i. Two of the teachers teach at the secondary school level; one on O‘ahu and one on Hawai‘i Island. The third is employed by a non-profit organization that focuses on environmental restoration and education efforts on O‘ahu. The participants, Kalaimeola, Ku‘ulei and Lopaka³, represented a spectrum of scientific disciplines and professional experience that ranged from seven to over fifteen years.

- ❖ Kalaimeola is a veteran high school biology teacher at a school on Hawai‘i Island. He grew up in Hawai‘i and attended university in the continental United States. He is pursuing a master’s degree and is involved in a variety of activities including a fellowship in New Zealand, school and district science fairs, the Office of Hawaiian Affairs, Department of Hawaiian Homelands, and various charter schools on Hawai‘i Island.
- ❖ Ku‘ulei considers herself to be more of a native practitioner than a science educator, although she has taught biology through a project-based format for almost ten years. She attended university in

Hawai‘i, where she earned her bachelor’s degree and teacher’s certification. She currently works for an environmental education organization that partners elementary and secondary students with researchers from colleges and universities.

- ❖ Lopaka teaches biology and physics at a secondary school on O‘ahu. He attended private schools on O‘ahu, graduated from a university in the continental United States and returned to earn his graduate degree at a university in Hawai‘i. He spent time in the Peace Corps, is a member of a local science teacher’s organization, and helps run a summer program for high school students, which focuses on the ahupua‘a system of land management and conservation. Lopaka is also very light-skinned, a factor that affects how other Native Hawaiians perceive his Hawaiian-ness.

Qualitative Methodology

The subject and core idea of this research project was to learn how Hawaiian science teachers have navigated and reconciled the identities of being both Hawaiian and a science teacher. To facilitate this, life histories and personal narratives were collected through interviews as well as follow-up phone calls and e-mails. Each narrative was collected during three one-hour semi-structured interviews. The first interview focused on life context and history and included questions about parents, community, neighbors, home life, cultural upbringing, (e.g., food and language), childhood, schooling, movement, and early employment. The second interview, focused primarily on areas of expertise and schools and organizations they are presently involved with, addressed the question “how and why did you decide to...” as it relates to their professional lives, and explored details of their experiences in professional life. The third interview allowed us to reflect and make meaning together from personal and professional experiences.

Research Plan

The research plan for this project focused data collection around the following themes:

- ❖ Identity: Cultural identities; specifically ethnic and professional identity. This included their views of their own cultural identities, familial and educational influences on identities, as well as influences on the development of their professional identity as a scientist/science teacher; the significance of cultural and professional identities and their relevance both in and out of the classroom; and changes in teachers' views of cultural and professional identity were also explored.
- ❖ Supports/Barriers: The role of family as both a support and a barrier in terms of their cultural identity and emergent professional identity. This discussion included family educational history as well as experiences with bias based on socio-economic status, ethnicity, skin color, and gender. The role of self-esteem was also dealt with as participants shared experiences related to their pursuit of higher education in science, college experiences, positive and negative occurrences related to being Hawaiian and a science teacher, and how their professional identity has developed and evolved.
- ❖ Connections: Information was collected on how each teacher has reconciled their personal and professional identities. This included programs that they each support, experiences with their families and colleagues, and the incorporation of Hawaiian culture into the science classroom and/or making the science curriculum a cultural experience. Changes in teachers' attitudes regarding Hawaiian culture and science were discussed including concerns regarding scientism, Hawaiian sovereignty, Hawaiian identity, and constructivist approaches to both science and "Hawaiiana" curricula.

Overview of Research Findings

Plural Identity

The primary theme that arose through this project concerned the pluralistic identity that the participants formed as a result of their experiences. As discussed previously, many 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 epistemological base. Scientism and its supporters see science as being acultural. 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 see both their Hawaiian and scientist identities as crucial to who they are. All of them, therefore, exist within a plural identity model.

All three subjects in this study readily identified themselves as being Hawaiian, see "being Hawaiian" as an important part of who they are, and value their culture as a guide to beliefs and actions. However, they do not see "being Hawaiian" as the sole facet of their being or as the singular defining identity of their lives. In the same vein, two of the three participants identify themselves as science teachers, but they do not view this as the sole defining characteristic of their being. Instead, the participants see the salience of their science teacher and Hawaiian identities as being malleable and adjustable depending upon their situation. The navigation of these identities could be imagined segments of a multi-segmented/colored/cultural mirror. Whereas looking into a standard mirror gives a single reflection (identity), looking into a multi-segmented/colored/cultural mirror or mosaic generates many different colors, angles, and reflections (identities). The separated-yet-interconnected nature of this mosaic is representative of their overall identity and is made up of and supported by a variety of personal, professional, and cultural identities.

Naturally, the degree of importance and salience that participants place on their Hawaiian identity varies and has developed over the course of their lives and individual experiences. For example, Lopaka's Hawaiian identity may be a smaller segment of his total identity compared with the other participants, Kalaimeola and Ku'ulei. Lopaka identifies, empathizes, and works to encourage Native

Hawaiian students to go into science. However, his Hawaiian experience varied greatly from that of the other participants. He has had to navigate several discouraging challenges from the Hawaiian community based on his very light skin color, his level of education, and his decision to pursue a science-related career. On the other hand, I would argue that Ku'ulei and Kalaimeaola do not have a Hawaiian mirror segment. Instead, they are looking into a Hawaiian mirror, where "being Hawaiian" is one of their most salient identities, with different segments reflecting various Hawaiian identities. As individuals who see "being Hawaiian" as a foundation of their lives, we must recognize that they see, act, and live within a Hawaiian mindset and are "Hawaiians doing things."

Although the mirror analogy provides a visual representation of different identities, it is not completely accurate. The Hawaiian and science teacher identities are very important to each of the participants. However each stressed the changeable nature of these two identities and the need to navigate through, between, and around them at separate times in each of their lives based on their backgrounds, associations, and social activities. 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 salience of a particular identity depends upon the context. This is not to say that in particular situations participants stop being science teachers or stop being Hawaiian, instead they project which identity they wish to emphasize in a particular situation. This process, as understood by the participants, is both conscious and unconscious and is reflective of the individual situations in which they find themselves as well as their cumulative life experiences.

Are these identities different? All of the participants agreed that they are. Do these identities conflict with each other? Kalaimeaola and Ku'ulei would say yes in respect to the way that knowledge is passed to students. Kalaimeaola 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. For Kalaimeaola, Ku'ulei, and Lopaka, their Hawaiian identity is an important one. However, all of the participants recognize that navigating the turbulent ocean of life using one lens does not diminish or negate the value of the lenses of their other identities. In fact, all of the participants felt that their Hawaiian identity enhances their other identities and their ability to make decisions relating to social, political, personal, and professional matters.

Facilitations and Impediments

A second theme connecting the three participants relates to the encouragement they received, and in some cases continue to receive, and impediments they have encountered in their journey to become science teachers. Kalaimeaola was 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. Ku'ulei and Lopaka's challenges, on the other hand, went to the very heart of who they are and their interests. Ku'ulei's was discouraged from pursuing her interests by her academic advisors in both high school and college because she is Hawaiian and a woman. This is especially disturbing because academic advisors are people who should be encouraging students to pursue careers based on their strengths and interests. Lopaka, on the other hand, was challenged as a youth, not because of his interest in science but because of his light skin color and the pre-existing belief of what Hawaiians are supposed to look like. This challenge has remained an issue for both Lopaka and his wife ever since their return to Hawai'i, when they reestablished old friendships and as Lopaka continues to encourage more Native Hawaiians to go into science and technology fields.

In contrast to these impediments are the positive impacts and the 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. Work on the pond not only helps to preserve Ku'ulei's culture, it also enables her to practice ancient and modern environmental and scientific techniques with students of all ages. 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. His participation comes from a desire to support Hawaiian students of all backgrounds and colors.

Connecting Hawaiian and Science Teacher Identities

None of the participants see themselves as either solely Hawaiian or solely as science teachers; instead they see themselves as Hawaiians who are also science teachers (or science teachers who are also Hawaiian). In the framework of 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. They discussed the challenges they have faced personally as well as the challenges that have faced and continue to face as Native Hawaiians looking for legitimacy within the scientific community.

Lopaka, for example, uses his status as a Native Hawaiian to educate members of the scientific community on issues that are important to him. He also views his Hawaiian identity as a form of leverage giving him additional credibility with students, other scientists, and politicians. Additionally, Ku'ulei leverages Hawaiian culture and identity and encourages her students to take an active role in the restoration and maintenance of ancient Hawaiian fishponds. She helps students relate Hawaiian

language, traditions, beliefs, and practices to scientific applications such as salinity, pH, alkalinity, and dissolved oxygen/nitrogen. Kalaimeaola also utilizes traditions of both the past and present to connect students' cultural identity to the scientific world to see that the two go hand-in-hand. These have included lessons dealing with astronomy and chemistry as well as anatomy and physiology.

While all three participants connect their Hawaiian identity to a variety of scientific disciplines in different ways, they are all in agreement on one issue. Hawaiians were excellent scientists before Western contact, 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 observation, theory development, and hypothesis testing in agriculture, and also in their construction of fishponds, crop rotation, and the establishment of the ahupua'a system. These techniques enabled ancient Hawaiians to survive and thrive in an isolated place for centuries.

Educational Contributions of Research

In the past, efforts to improve the quality of education for the majority of Native Hawaiian youth has been hampered by identity disregard—"ignoring, or neglecting altogether, the influence of any sense of identity with others, on what we value and how we behave" (Sen, 2006, p. 20). Additionally, multiculturalist 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" (ibid).

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. The participants in this project 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 counters 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. In recent years, the concepts of both 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 Hawai'i. Much of the impetus for the creation of these types of schools came about from the renaissance 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.

However, the standards-based movement, as noted by Forbes (2000), 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" (p. 1). Ever 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" (p. 3). 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 and student.

In order to "hook" more students into science and science education, 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. 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. 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 they may not have had a word that corresponds to "science." The Hawaiian community must also take an active role in the field of education. Specifically, Hawaiian students should be encouraged to become teachers (both formal and informal) in all subject areas. Listening to the voices of Native Hawaiians pursuing undergraduate and graduate science degrees as well as those who have made careers in science-related fields will be an important step in this process.

The educational 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 formally through various means. First, interested persons can be trained through programs within college/university colleges of education as well as the HODOE. Second, college outreach programs can target middle and high school students to create and encourage interest in teaching. Third, students majoring in Hawaiian language/cultural studies should be encouraged to pursue teaching degrees as well. On a less formal level, classroom teachers can invite and welcome kupuna from the Hawaiian community to help teach students in and out of the classroom. The formal inclusion of Hawaiian culture as well as informal inclusion of the community in the classroom can help students connect information that is learned in the classroom to their own realities outside of the classroom. In this way, members of the Hawaiian, educational, and scientific communities can all help today's students and tomorrow's scientists to navigate the rough waters that surround the multiple dimensions of their identity.

REFERENCES

- Aikenhead, G. S. (1997). Toward a First Nations Cross-Cultural Science and Technology Curriculum. *Science Education, 81*(2), 217–238.
- American Association for the Advancement of Science, (1989). Science For All Americans: A Project 2061 Report on Literacy Goals in Science, Mathematics, and Technology. Washington, D.C.
- Au, K. H., & Maaka, M.J. (1998). Ka Lama o ke Kaiaulu: Research on Teacher Education for a Hawaiian Community. *Pacific Educational Research Journal, 9*(1), 65–85.
- Baker, D. (1996). Does “Indigenous Science” Really Exist? *Australian Science Teachers Journal, 42*(1), 18–20.
- Boyne, G. (2003). Utilizing Traditional Knowledge in a Scientific Setting. *Winds of Change, 18*(1), 52–52.
- Brickhouse, N., & Kittleson, J. (2006). Visions of Curriculum, Community, and Science. *Educational Theory, 79*(3), 337–339.
- Chinn, P. W. U. (2007). Decolonizing Methodologies and Indigenous Knowledge: Role of Culture, Place and Personal Experience in Professional Development. *Journal of Research in Science Teaching, 44*(9), 1247–1268.
- Corsiglia, J., & Snively, G. (2000). Rejoinder: Infusing Indigenous Science into Western Modern Science for a Sustainable Future. *Science Education, 85*(1), 82–86.
- Forbes, J. D. (2000). The new assimilation movement: standards, tests and anglo-american supremacy. *Journal of American Indian Education, 39*(2), 7–27.
- Kaholokula, N. (2003). A Model for Hawaiian Education. *‘Oiwī, 3*.
- Kana’iaupuni, S. M. (2005). Ka’akālai Kū Kanaka: A Call for Strengths-Based Approaches from a Native Hawaiian Perspective. *Educational Researcher, 33*(9), 32–38.
- Kana’iaupuni, S. M., & Ishibashi, K. (2003). Left Behind? The Status of Hawaiian Students in Hawai’i Public Schools. *PASE Report 02-03:13*. Honolulu, HI: Kamehameha Schools
- Kawagley, A. O., & Barnhardt, R. (1998). Education Indigenous to Place: Western Science Meets Native Reality. *Alaska University, Alaska Native Knowledge Network*.
- Kawagley, A. O., D. Norris-Tull, and R. A. Norris-Tull. 1995. Incorporation of the World Views of Indigenous Cultures: A Dilemma In the Practice and Teaching of Western Science. In *International History, Philosophy, and Science Teaching Conference*. Minneapolis, MN. Merriam, S. B. (2001). *Qualitative Research Methods and Case Study Applications in Education*. San Fransisco: Jossey-Bass Publishers.
- Meyer, M. A. (1998). Native Hawaiian Epistemology: Sites of Empowerment and Resistance. *Equity & Excellence in Education, 31*(1).
- Michie, M. (2002). Why Indigenous Science Should Be Included in the School Science Curriculum. *Australian Science Teachers Journal, 48*(2).
- 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).
- Seidman, I. (2006). *Interviewing as Qualitative Research: A Guide for Researchers in Education and the Social Sciences* (3rd ed.). New York: Teachers College Press, Columbia University.
- Sen, A. (2006). *Identity and Violence: The Illusion of Destiny*. New York: W. W. Norton.
- Siegel, H. (2002). Multiculturalism, Universalism, and Science Education: In Search of Common Ground. *Science Education, 86*(6), 803–820.
- Simonelli, R. (1994a). Finding Balance by Looking Beyond the Scientific Method. *Winds of Change, 9*(4), 106–112.
- Simonelli, R. (1994b). Sustainable Science: A Look at Science Through Historic Eyes and Through the Eyes of Indigenous Peoples. *Bulletin of Science, Technology & Society, 24*(1).
- Simonelli, R. (1994c). Toward a Sustainable Science. *Winds of Change, 9*(2), 36–37.
- Sing, D. K., Hunter, A., & Meyer, M. A. (1999). Native Hawaiian Education: Talking Story with Three Hawaiian Educators. *Bulletin of Science, Technology & Society, 39*(1), 4–13.
- Smith, L. T. (2004). *Decolonizing Methodologies: Research and Indigenous Peoples*. Dunedin: University of Otago Press.
- Stanley, W. B., & Brickhouse, N. W. (2000). Teaching Sciences: The Multicultural Question Revisited. *Science Education, 85*(1), 35–49.
- Stanley, W. B., N. (1994). Multiculturalism, Universalism, and Science Education. *Science Education, 78*(4), 387–398.

ENDNOTES

- ¹ This pilot project was later expanded in to a dissertation project within the same department ten individuals of Native Hawaiian ancestry employed or involved in various STEM-related careers.
- ² The term “Native Hawaiian science teachers” refers to science teachers who are of Native Hawaiian ancestry as opposed to teachers of Native Hawaiian science.
- ³ In an effort to maintain anonymity, each participant chose a pseudonym for this project.