

# Supporting Hawai‘i’s Preservice Science Teachers in Designing Culture and Place-Based Instruction

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**INTRODUCTION** Roughly a quarter of all public school students in the state of Hawai‘i identify as Native Hawaiian or part-Native Hawaiian. This is the largest single ethnic group in local public schools and its proportional representation in our classrooms has been steadily rising over the last three decades (Kamehameha Schools 2014). As a kānaka ‘ōiwi (native Hawaiian) teacher educator whose genealogy and personhood is both subtly and profoundly rooted in these islands, I firmly embrace the stance that it is my kuleana (responsibility) to ensure that the preservice secondary science teachers (PSTs) I prepare for licensure to teach science in the state of Hawai‘i have the training and tools to develop and implement culturally appropriate and place-based science curricula and to provide learning opportunities for ‘ōiwi students and their classmates in grades 6–12 that target ka mālama ‘āina (environmental stewardship) and ka wai ola (indigenous rights to self-determination and quality education) (Kaholokula 2014).

Because the College of Education (COE) at the University of Hawai‘i at Mānoa (UHM) produces a significant portion of the Hawai‘i State Department of Education’s new hires, one readily perceives the intense significance of the stakes for incorporating culture and place in teacher preparation. In the 2016–2017 school year (SY), graduates from teacher preparation programs at UHM’s CoE made up roughly 50 percent of Hawai‘i-trained K–12 licensed teachers for the state (Hawai‘i State Department of Education 2017). The Hawai‘i Teacher Standards Board requires that all Hawai‘i educator preparation providers—including teacher preparation programs at UHM’s CoE—must provide evidence that their candidates are prepared to incorporate Hawaiian language, history, and culture into their practice. As a secondary teacher educator at UHM, it has been inspiring and tremendously motivating to see how colleagues and peers have worked and are working towards this goal. And, the fact of the goal is heartening. However, inā e ho‘ohiki

‘oe, e ho‘okō i loko o ka ‘oia‘i‘o (if you give your word, you must fulfill it). Substantial opportunities remain to do more to prepare all preservice teachers, regardless of content area, to create intellectually safe cultural spaces and incorporate culture-based practices, such as pilina kaiāulu (Hawaiian sense of place), hō‘ike (performances requiring multilevel demonstrations of knowledge and skills), mālama ‘āina, and kōkua kaiāulu (community responsibility) (Kana‘iaupuni and Ledward 2013) with the goal of strengthening positive cultural identity development for kānaka ‘ōiwi students.

As classrooms become increasing ethnically and linguistically diverse (Kena et al. 2016), science reform documents including *A Framework for K–12 Science Education* (National Research Council 2012) and the Next Generation Science Standards (NGSS Lead States 2013) call for science teaching that expands all students’ understanding about natural phenomena and the world in which they live through meaningful participation in science both in and outside of the classroom. In thinking about how to prepare new science teachers for equity in Hawai‘i, where NGSS has recently been adopted, it is essential to recognize that local public education has been profoundly shaped by the Hawaiian people’s history of dispossession, loss of language and culture, and subjection to settler colonialism (Tuck and Yang 2012; Goodyear-Ka‘ōpua 2013). The charge to imagine what science education could and should be as we move vigorously into the future with our eyes on the past (Kame‘eleihiwa 1992) presents an incredible opportunity to prioritize kānaka ‘ōiwi epistemologies and indigenous ways of knowing in classrooms throughout the state (Oliveira and Wright 2016).

At the same time that this national call for science reform was being acted upon elsewhere, the Hawai‘i Board of Education developed Nā Hopena A‘o (HĀ), a set of learner outcomes that stress ‘O Hawai‘i ke kahua o ka ho‘ona‘auao

(Hawai‘i is the foundation of student learning) through a process of community dialogue and feedback. These HĀ learner outcomes (Lupenui et al. 2015) underscore that teacher preparation in Hawai‘i needs to equip preservice science teachers to implement NGSS while also promoting powerful science learning infused with Native Hawaiian values, language, and history.

In order to address issues of equity in Hawai‘i’s contexts, it is imperative that the teacher education programs at the UHM CoE increase preservice science teachers’ cultural competency (Ladson-Billings 1995, 2014). The driving goal of any necessary realignment would be to see that emerging educators are well and sufficiently positioned to do this work as community members. With this in mind, as I design coursework and field-based experiences, I grapple with the question: What kinds of pedagogical activities support PSTs in developing Native Hawaiian cultural competency and prepare them to design culturally sustaining and revitalizing science education?

## ❧ PEDAGOGICAL ACTIVITY & LEARNING

**ARTIFACTS** ❧ The context for this design work is a sequence of four secondary science courses—science methods, observation practicum, student teaching, and residency seminar. These courses are required for undergraduate and post-baccalaureate PSTs in the final year of their secondary licensure program. Making diverse goals and motivations commensurable in pedagogical design work is not always easy and can often be intensely difficult. There are few ready-made solutions. However, I have been encouraged and energized by the recently emerging Ambitious Science Teaching (AST) framework (Thompson, Windschitl and Braaten 2013). One of the central tenants of ambitious science teaching is to attend to issues of equity across ethnic, racial, class, and gender divides. My hope has been that by asking PSTs to use this framework as a tool for planning for engagement with important science ideas they will incorporate language, literacies, and cultural pluralism (Paris 2012; Paris and Alim 2014) sensitively attuned to Hawaiian and Hawai‘i contexts into their units. Furthermore, I hope that using a model AST unit that incorporates ‘ōlelo Hawai‘i (Hawaiian language), ‘āina (land), kanaka ‘ōiwi (Native Hawaiian) epistemologies, and focal sense of place will inspire my PSTs to embrace or perceive the possibility and potentials of doings so as well.

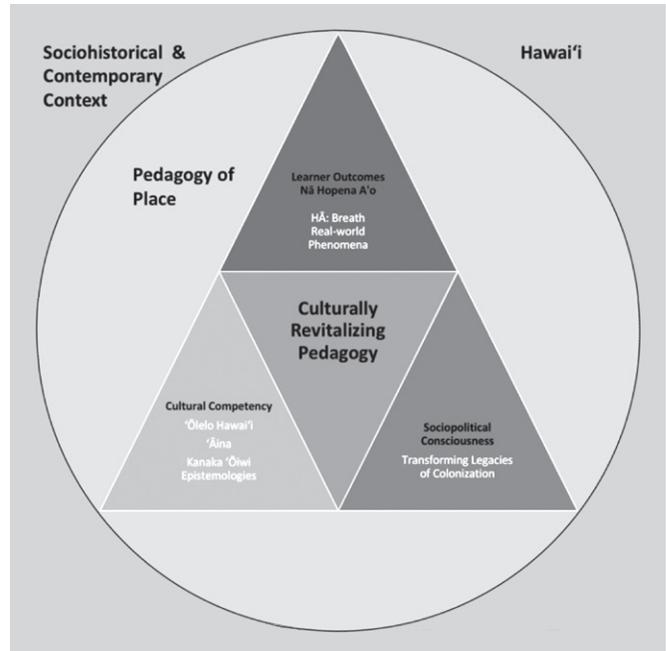
The pedagogical activity that I have been iteratively developing and implementing over the last three years challenges PSTs to design a place-based unit of instruction. The parameters of the assignment are to create a unit that engages secondary science students in making sense of a real-world phenomenon using an anchoring event and essential questions specific to their local-context, which is of course Hawai‘i but could scale down to a specific moku (island), ahupua‘a (traditional land division running from uplands to the sea), or other locally significant place. I scaffold this assignment by teaching a place-based Ambitious Science Teaching unit on nā pō mahina (phases of the moon) framed by Native Hawaiian culture, language, and epistemology. The implicit intentionality of this learner-based activity is to provide a model of a unit that marries culturally sustaining and revitalizing pedagogy (McCarty and Lee 2014) and pedagogy of place (Gruenewald 2003) by drawing on Native Hawaiian cultural competencies including dynamic linkages between social phenomenon (such as time keeping) and cultural knowledge (such as Indigenous expertise or knowledge about processes in nature such as the biological processes of local flora and fauna) through engagement with the lunar calendar.

In the wake of PSTs responses to my modeled AST unit, I have been intrigued by the ways in which the units they design reflect different types of cultural competency. For example, one PST’s unit employed ecological culture by using endemic Hawaiian honeycreepers to engage students in thinking about natural selection. Another leveraged local culture when they used reef rash, the result of a surfing wipeout on the Northshore, to engage students in thinking about mitosis. A third directly leveraged grounded Hawaiian culture by using the traditional practice of cooking in an imu (earth oven) to engage students in thinking about properties of matter and conservation of energy.

**THEORY OF ACTION** ❧ This pedagogical activity of iterative design around nā pō mahina—intended to facilitate an impactful transformation of my PSTs in such a way as to better align them with culture- and place-based learning pedagogical expertise and commitments towards their future students—sits at the intersection of Culturally Relevant Pedagogy [CRP] (Ladson-Billings 1995a, 1995b, 2014), Culturally Sustaining Pedagogy [CSP] (Paris 2012; Paris and Alim 2014), Culturally Sustaining/Revitalizing Pedagogy [CSR] (McCarty and Lee, 2014)

and Pedagogy of Place (Gruenewald 2003) (see figure 1). My theoretical framework builds on Ladson-Billings' premise that linking school and culture in ways that are culturally relevant can benefit the academic success of students who have been traditionally marginalized in school settings (1995a, 1995b) as is the case with 'ōiwi students.

Specifically, my approach adopts three pedagogical domains as fundamental to teaching and the design of learning 1) academic success and intellectual growth; 2) cultural competency—honoring one's personal culture as well as gaining knowledge and fluency in other cultures; and 3) sociopolitical consciousness—utilizing what is learned in the classroom to examine and take action on real-world problems (Ladson-Billings 1995a, 1995b; Ladson-Billings 1995a, 1995b, 2014). I am also motivated by the way in which Paris and Alim (2014) call into view the idea of cultural relevancy positing that in practice it can become a justification for learning about the linguistic, literate and cultural practices of a community versus accepting them unreflectively as normative. For instance, the frequent distillation of Hawaiian culture into glossy posters of 'ōlelo Hawai'i featuring key terms such as pono (righteousness) or aloha (care) with no real context for making these culturally significant words meaningful in classroom activities and learning is an obvious example of a seemingly culturally relevant pedagogical move that has been emptied out of actual content. Paris (2012) proposed the need to go beyond cultural responsiveness and relevancy via what they call culturally sustaining pedagogy that actively strives to nurture and sustain linguistic, literate and cultural pluralism of traditional marginalized students in order to democratize education. McCarty and Lee take this one step further by suggesting that CSP can be used to confront colonizing influences by attending to "asymmetrical power relations and the goal of transforming legacies of colonization" (2014, 103) through the revitalization of language, and community-based accountability. Furthermore, Gruenewald (2003) argues that places are inherently pedagogical and that place-based education must address shortcomings of conventional schools including "increasing the range of opportunities for human perception and experience, examines the interrelationships between culture and place, understanding how spatial form are embedded with ideologies an reproduce relationships of power, appreciating the diversity of life on the margins attending to the health of nonhuman beings and ecosystems and



**FIGURE 1.** Framework for the design of pedagogical activities that support the development of Native Hawaiian cultural competency for equity and teaching in Hawai'i (Gruenewald 2003, Ladson-Billings 1995a, 1995b, 2014; McCarty and Lee 2014; Paris 2012; Paris and Alim 2014)

participating in the process of place making for living well" (646).

Together the insights coming out of these three frameworks carve out a space of possibility for implementing high quality science instruction which is well aligned to Hawaiian students' community and culture. It seeks to do so in a manner that offers material affordances for enhancing student engagement, excitement, and academic success imagined broadly in terms of learner outcomes. And it seeks to do so in a manner that maps or makes perceptible natural phenomena through both indigenous and western scientific lenses.

**❖ IMPLICATIONS ❖** While many of the PSTs I have taught over the last three years designed units around anchoring events and essential questions framed by a local-context, to date only one has really leveraged Hawaiian culture in their planning and instruction. This PST was kanaka 'ōiwi and drew on existing cultural competency through community membership, non-program university coursework such as Hawaiian studies, existing language competency, and access to significant cultural resources in designing their unit. The takeaway is that as an instructor I

need to do more to create assignments that require PSTs to explicitly connect ‘ōlelo Hawai‘i (Hawaiian language), ‘āina (land), kanaka ‘ōiwi epistemologies through huaka‘i (field learning journeys), and nuanced and highly informed kanaka ‘ōiwi sense of place with community action that benefits curriculum development (Chinn 2006). In the next iteration of this assignment, I plan to ask students to use ‘ōlelo no‘eau (Hawaiian proverbs) (Pukui 1983), many of which speak to and illuminate natural phenomena (Oliveira 2014) in conjunction with disciplinary core ideas from NGSS (NGSS Lead States 2013). And, I continue to question how I can dive deeper into our culture of place to provide ever more purchase for PSTs thirsty to align science education with community.

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