“Those don’t work for us”: An Assets-Based Approach to Incorporating Emerging Technologies in Viable Hawaiian Teacher Support Tools for Culturally Relevant CS Education

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ABSTRACT

Hawaiian bilingual language immersion (Kaiapuni) schools infuse curricula with place-based education to increase student connection to culture. However, stand-in teachers often lack the background and tools needed to support immersion learning, resulting in discontinuity for students in their culturally relevant education. This experience report describes a partnership between the Ka Moamoa Lab at the Georgia Institute of Technology and Ke Kula Kaiapuni ʻO Pūʻōhala School to design a teacher-substitute support platform via a hybrid of assets-based design methodology and emerging technology capabilities. We share insights offered by teachers and design requirements for such a platform. We also reflect on how HCI methodologies should adapt to center and respect Native Hawaiian perspectives.

CCS CONCEPTS

• Human-centered computing~Collaborative and social computing~Collaborative and social computing design and evaluation methods~Ethnographic studies • Social and professional topics~User characteristics~Cultural characteristics • Social and professional topics~User characteristics~Race and ethnicity • Social and professional topics~User characteristics~Geographic characteristics • Social and professional topics~Professional topics~Computing education~K-12 education • Computing methodologies~Artificial intelligence



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KEYWORDS

EdTech; Culturally-relevant CS; Place-based computing; Indigenous knowledge; Hawaiʻi

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1 INTRODUCTION

For Native Hawaiian students, cultural barriers born from the impacts of American colonization represent one of the primary barriers to learning computer science concepts and skills [2]. As a result, Native Hawaiian students experience a cultural disconnect between Western CS education and their lived experiences. In response to this, CS curricula standards in Hawaiʻi are being rapidly developed as a result of Acts 51 and 158, which mandate that public schools are required to develop and implement statewide computer science K-12 curricula by 2025 [1, 6]. For Ka Papahana Kaiapuni (Hawaiian language immersion) schools, the Foundational and Administrative Framework for Kaiapuni Education (FAFKE) places culturally relevant educational practices at the forefront of Hawaiian learning [3]. For Ke Kula Kaiapuni ʻO Pūʻōhala (Pūʻōhala School) on the island of Oʻahu, past technology programs have realized this vision for place-based learning in the use of micro:bit sensors and MakeCode at an ancestral fishpond [11]. By centering Native Hawaiian values such as Mālama ʻĀina (caring for the land) in computing projects,

positive learning outcomes were observed in students' reception towards place-based learning that leverages emerging technology.

However, as expertise and capacities at the school have shifted, kumu (teachers) and stand-in teachers of varying backgrounds encounter resource hurdles. These include the lack of access to past curriculum resources, technical knowledge, and unfamiliarity with CS concepts. On top of these hurdles, generalized CS education platforms assume a Western perspective of their users, reinforcing cultural barriers experienced by students learning topics in STEM fields [6]. For example, despite the goal of total language immersion, this immersion is broken each time students are forced to engage with interfaces that lack ʻŌlelo Hawaiʻi (Hawaiian language) support during the school day. These issues present a clear need for better support in the preparation and implementation of a culturally relevant CS curriculum.

This experience report describes an ongoing partnership between HCI researchers of the Ka Moamoa Lab at the Georgia Institute of Technology and Pūʻōhala School in the research and design of a support platform that assists stand-in teachers in implementing a culturally relevant CS curriculum. We describe our hybrid methodology that integrates assets-based design [15] with contextual adoption of emerging technologies (e.g., AI-enabled teaching tools), findings, and design requirements for such a platform to be prototyped and evaluated.

We offer our reflections, methodology recommendations to HCI researchers, and heartfelt gratitude towards Pūʻōhala School teachers who continue to open their community, classrooms, and homes to us in good faith. Broadly, we hope this work helps to infuse Hawaiian perspectives within the design of technology in service of-, and for use by Hawaiian teachers, students, and communities, as well as help pave the way for increased Hawaiian representation in STEM fields through culturally supportive technologies in Hawaiian education. These activities are described in light of significant changes in Kaiapuni education in Hawaii, compounded by teacher turnover and worsening resource availability, as well as the continued emotional, mental, and financial impacts left by the summer 2023 Maui wildfires on our project partners.

2 BACKGROUND AND CONTEXT

This work takes place within a longstanding partnership between the Ka Moamoa Lab at the Georgia Institute of Technology and Pūʻōhala School. The school is a Hawaiian K-9 bilingual language immersion school, which is reflected in its English and ʻŌlelo Hawaiʻi programs and educates a diverse range of students of varying backgrounds ranging from Kānaka Maoli (Native Hawaiian of indigenous descent), Kamaʻaina (Native Hawaiian but not of indigenous descent), and non-Native Hawaiian. In the spring and summer of 2022, the lab supported the school via the preparation of micro:bit controller kits that leveraged solar power and intermittent computing architecture to facilitate outdoor technology classes at Waikalua Loko Iʻa, an ancient Hawaiian fishpond and culturally significant site [7,9,11,10]. Students programmed their own sensors and used them to take various water quality measurements. This program was then adapted for use in the classroom. Students also crafted dioramas depicting ʻŌlelo noʻeau (Hawaiian proverbs) and stories that also incorporated micro:bit controllers. These highly place-based and culturally relevant CS projects serve as an important benchmark for the success of this current work.

According to the *Catching Up to Move Forward* report conducted by the Hawaii Department of Education in partnership with the University of Hawaiʻi at Mānoa which examined the landscape of K–12 computer science education in Hawaiʻi, there is a rising need for Hawaiian schools to create effective support for teachers needing to teach topics in CS [14]. This report came in response to the passing of Act 51 in 2018 that mandated a statewide CS curriculum be developed and at least one CS course be offered in public high schools. In 2020, Act 158 extended this mandate to apply to elementary and middle schools by the year 2025 [4]. According to a study conducted by the Act 158 Computer Science Support Project from 2021 through 2023, sampled school leaders reported a high degree of anxiety related to meeting the increasingly stringent demands of Act 158 as 2025 approaches, commonly citing concerns around the availability of CS teachers, substitutes, and technology committees that could support the Act. These Acts assume that all Hawaiian schools are positioned to support CS curricula equally, which unfortunately for many (including Pūʻōhala School) is simply not true [5].

Of concern to Kaiapuni teachers regarding generalized CS learning platforms, most tools assume a Western perspective of their users, such as Scratch, Google Classroom, and others. These tools, while effective in facilitating the learning of generalized CS material, lack nuance in how their interfaces treat language and cultural references, specifically in its lack of support for ʻŌlelo Hawaiʻi and the richness of Hawaiian perspectives and ways of knowing. This project aims to maximize existing teaching resources by equipping current teachers and stand-in teachers with a CS teaching support platform that acknowledges the need to support both English and ʻŌlelo Hawaiʻi, as well as bias its support towards using embedded Hawaiian imagery, proverbs, stories, and knowledge systems to increase both teacher and student representation and relevance.

This work leverages a hybrid design methodology, integrating the principles of asset-based design with contextual adoption of new technologies, aiming for equitable and culturally respectful research. Assets-based design refers to the practice of working with the available resources of the target demographic within the context of use with the goal of designing a sustainable innovation that is useful long term [15]. Our approach also recognizes external pressures on the school, and the need for thoughtful incorporation of emerging technologies and tools that are, through state policy or other outside forces, unavoidable for teachers. It is not an approach that seeks to inject innovation for the sake of novelty. Rather, it is an effort to meld the existing practices, tools, and mental models of users with emerging technologies, maximizing existing behaviors to increase the sustainability of an intervention or solution long after research activities have concluded.

In the context of teaching CS to students attending Pūʻōhala School, we continue to engage teachers, substitutes, and staff in a process of collaborative research and design. The intent is to create a sustainable intervention that fits within the school's existing capacities while addressing state mandates and external pressures. With these stakes and context in mind, we describe this project's progression from spring to fall of 2023 (and beyond) in the hopes of both defining what an intervention may look like for educators at Pūʻōhala School and how culturally-external HCI researchers should adapt their methods for community-driven, culturally-respectful research.

3 PROJECT ENGAGEMENT

The focus of this current work is to engage in a human-centered design approach to identify existing Pūʻōhala School assets and design an intervention that assists its teachers in the preparation and implementation of technology lessons for stand-in teachers in response to shifting resources and knowledge within and external to the school. A "stand-in" teacher refers to any adult, whether certified by the Hawai'i Department of Education (HIDOE) or not, who is responsible for the education and wellbeing of students in the classroom in the absence of the homeroom or regular teacher.

Beginning in April of 2023, the project team engaged in regular discussions with the technology teacher at the school to discuss project background, past initiatives, and focus, which centered around how Kaiapuni students could be taught computer science/literacy skills in ways that are relatable and draw from Hawaiian knowledge systems. For example, the developing technology curriculum included game-based learning activities for K-6 students in which they learned how to manipulate a computer mouse via computer games set at Waikalua Loko Iʻa, an ancient Hawaiian fishpond and community site. In the game, fish would jump out of the water and students would click on them to increase their scores. Another game had students learn how to click and drag using a mouse by clicking on moving crabs and dragging them into buckets for points. These games center on familiar community sites as vital learning contexts to maximize student engagement and familiarity, and draw relevant connections with computer literacy skills.

With this context in mind, the project team defined a research plan to further these place-based initiatives and investigate how students themselves could inform the developing technology curriculum to increase relevance. Early ideas involved the use of co-design with teachers, students, and their families to develop more personalized computing activities and lessons. However, as the project progressed, several external factors outside the control of the project team changed: the school's technology teacher changed roles, HIDOE application timelines for approving research with students, and shrinking project timelines all contributed to a pivot towards supporting Pūʻōhala School teachers. Additionally, the continued emotional, mental, and financial stressors from the summer 2023 Maui wildfires continued to impact project partners. We describe our two visits to the island of Oʻahu, Pūʻōhala School, and local community sites. We reflect on how these visits influenced our design requirements and how traditional HCI research methods should be adapted to center and respect Native Hawaiian perspectives.

3.1 Visit #1: Pūʻōhala School and Oʻahu

In September of 2023, the project team conducted its first school visits over five days. Before this, through extensive literature review, review of onlinAe media (e.g. documentaries, interviews, etc.), and discussions with the school's technology teacher, the team began to understand the history of Native Hawaiians regarding exploitative Western research practices. For example, Kānaka Maoli have witnessed, time-after-time, Western anthropologists misinterpret and misrepresent their culture and practices, often reinforcing stereotypes or oversimplifying the depth and nuance of Hawaiian culture [13]. With this history in mind, the team applied a high degree of scrutiny to research methods that may be perceived as coldly positivist or alienating to our partners. For example, no footage or audio was captured during school visits, and instead, interactions between researchers and teachers/students were face-to-face and casual. We as researchers would then meet to reflect on our experiences and validate our understanding with our partners afterward. In these ways, the team wished to respect the generosity of those at the school for opening their professional and personal lives to us. It is out of this respect that our primary goal was not to collect data, but to build up authentic personal relationships with teachers, as well as immerse ourselves in the setting by participating as supportive partners in the school environment.

We also observed classes held at the local community center in Kāneʻohe where students engaged in various physical education and music activities such as hula, ukulele, and martial arts lessons. During this time, a teacher had called out absent, resulting in the members of the research team being asked to run two middle school class periods. Five minutes before the class period began, the team improvised a lesson that engaged students in a casual sit-down group conversation about their use of technology, their future career plans, and unplugged activities such as musical chairs. For us, this unexpected experience exemplified just how prevalent and commonplace it is for teachers to rely on stand-ins when faced with unforeseen teacher absences.

Finally, we engaged teachers in talk story (sincere and authentic discussion) during pau hana ("after work is done") meals to learn more about the lives of our new friends and partners. During these moments, we presented ourselves simply as people, engaging our partners in topics unrelated to research and technology. We also visited culturally significant sites and museums (Waikalua Loko Iʻa, Hoʻomaluhia Botanical Gardens, and the Bishop Museum) to gain better familiarity with significant sites, the island of Oʻahu, and its rich history.

3.2 Pūʻōhala School and Schools of the Future

In November, we conducted our second, 5-day visit to the school to further strengthen our teacher-partner relationships and to engage in closer classroom observation with a focus on identifying the assets used by teachers. These assets were

categorized as: (1) teaching methods and classroom management techniques (e.g., SEL cooldowns, mele/song to focus attention, etc.), (2) digital platforms and resources (e.g., Google Classroom, Canva, YouTube, Jamboard, etc.), and (3) physical resources (e.g., outdoor classroom setting, worksheets, whiteboards, smartboards, laptops, etc.).

We participated in a four-hour CS curriculum working session hosted in the home of a former Pūʻōhala School teacher with both our primary teacher contact and another former Pūʻōhala School teacher. During which, the educators worked to define the structure and format of CS lessons by working in parallel English and ʻŌlelo lesson plan spreadsheets, slide decks, and explanatory videos, and engaging in deep discussion around lesson plan details.

We attended the three-day Schools of the Future Conference held in Waikiki, where we heard how Hawaiian educators across the islands were leveraging emerging technologies such as AI in their classrooms. Example uses included using generative AI to aid in parent-teacher communications and creating lesson plans, worksheets, and slide decks. We also learned how Hawaii schools more broadly were responding to Act 158, specifically in the reported levels of anxiety surrounding meeting its 2025 goal [5].

After each visit, the project team synthesized and summarized key classroom observations, teacher behaviors and stories, and researcher reflections.

4 FINDINGS AND DESIGN REQUIREMENTS

The identified teacher assets coupled with our observations and insights offered by teachers indicate various needs that a teacher-substitute support platform could be well-positioned to meet. The following are our key findings and design requirements for such a platform.

1. Stand-in teachers are needed often, sometimes multiple times in the same classroom each semester, and come from many different professional and cultural backgrounds. Through classroom observations and "talking story" (purposefully taking time to discuss ideas and experiences with those around us), we know that it is a common occurrence for teachers to be absent - both with and without warning. When this happens, a stand-in teacher (non-homeroom teacher, certified substitute, retired teacher, parent, or other trusted community member) is called to substitute for the class. Ideally, stand-in teachers for the ʻŌlelo branch must be fluent in ʻŌlelo Hawaiʻi and Hawaiian culture, but certified substitutes are often not from Hawaiʻi. **A designed solution must accommodate a range of backgrounds and expertise of potential users and, importantly, fill the gap in cultural context with technology aids.**

2. Frequent subbing of teachers and teacher turnover breaks continuity in education, especially for ʻŌlelo branch students. Pūʻōhala School experiences a high degree of teacher turnover, due to financial stress, wildfires, tourism impacts, etc., that results in institutional CS knowledge gaps. New teachers don't typically have access or visibility to the resources made by previous teachers. This is paired with the frequent need for stand-in teachers who lack easy access to teaching resources and may not be familiar with the subject matter. In the ʻŌlelo branch, certified substitutes and some stand-in teachers may not speak ʻŌlelo Hawaiʻi, breaking immersion for students and veering away from the school's intended place-based pedagogy. **This means that a designed solution must serve as a connector and steward of resources, including teacher community support and materials in ʻŌlelo Hawaiʻi to aid new and substitute teachers, enabling continuity of students' education.**

We believe this is typical for community-based schools, which are deeply embedded and reliant on members within the community, with little support systems in place to rely on. Significant community disasters, like the Maui wildfires, can have an outsized effect on these centers. In fact, multiple teachers left early during a Friday class to go to Maui to assist friends, family, and the Lahui (Hawaiian People) who needed help after the tragic fires and subsequent rebuilding efforts still ongoing.

3. The ʻŌlelo branch of the school has fewer resources available to it than the English branch. There is a limited pool of ʻŌlelo-speaking substitutes for the school to draw from, a small amount of ʻŌlelo-based teaching resources, and few existing ʻŌlelo-based teaching tools available. ʻŌlelo-branch teachers often create their own resources from scratch or painstakingly modify existing English resources. These efforts consist of more than simple language translation; they demand creating parallels between English knowledge and Hawaiian knowledge, which oftentimes do not exist, and these efforts are often time-consuming. These teacher-made resources are also shared sporadically and on a case-by-case basis. **The designed solution needs to be tailored to the ʻŌlelo branch of the school, with place-based language, pedagogy, and references. It should allow for easy information retrieval for existing ʻŌlelo resources across school-wide repositories such as Google Drive.** This finding potentially mirrors other bilingual immersion schools' lopsided resource distribution, which is due to several factors including enrollment numbers, state/federal funding, location, and ʻŌlelo-speaking t teacher availability.

4. Most teachers do not feel confident teaching CS. This makes it challenging to infuse Cultural Relevance into the curriculum. Compounding the lack of cultural relevance when stand-in teachers substitute, knowledge of CS varies among teachers (even full-time teachers), and reported confidence in teaching CS concepts is consistently low. These concepts are perceived as overwhelming, and teachers report not knowing where to start in terms of educating themselves and their students. This barrier makes it challenging to think critically about computing in the context of culture, as the teachers are not familiar enough with concepts to make cultural connections often. **A designed solution must feel approachable, incremental, and curated in the information presented to not overwhelm teachers with complexity. It must first make CS relevant to the teacher, to help them in making it relevant to their**

students. This could enable teachers with deep connections to Hawaiian culture to start from an informed position when transforming the CS curriculum for student/cultural relevance.

5. Almost all teachers have little confidence with prompt engineering. While many AI-powered teaching tools are available today, many Hawai'i teachers, before exposure to their capabilities, were unsure of how or if AI had a part to play in their teaching practices. With this lack of familiarity, teachers need to be made aware of how to adequately prompt-engineer via hands-on and practical examples in order to spark ideas of how to leverage AI-powered teaching tools. **A designed solution must not require the teachers to engage in unguided prompt engineering and should reflect existing mental models within Kaiapuni education**. Approaches to provide in-app contextual guidance to the user such as onboarding, progressive disclosure of AI capabilities, or tooltips, can improve the learnability and accessibility of AI tools for teachers. Specifically, tuning these tooltips (etc.) towards Kaiapuni teachers, such as suggesting Hawaiian proverbs of relevance, would be required.

6. Kaiapuni schools are nervous about emerging technologies and their implications for data sovereignty. While teachers at Pūʻōhala School share similar concerns with most Hawai'i teachers about AI and their students, such as safety and plagiarism, they have an additional concern regarding sovereignty over their culturally-rooted knowledge. This concern is merited, as language resources developed by teachers (and families) have been appropriated without citation, leading to a deserved mistrust of these tools [8]. **A designed solution should collect data only when absolutely necessary, and store said data in a manner that allows the school's teachers to have full ownership rights.** These include the rights to block access from outside groups, and to edit its contents and access over time.

These key findings paired with a set of design requirements serve as guidelines for creating a solution to support teachers at the school. We aim for these guidelines to ensure that everyone involved including - teachers, the school, and its students - can engage in CS instruction in a manner that is culturally relevant, familiar, and comfortable.

5 POSITIONALITY STATEMENT

As the subject of this report relates to culture, underrepresentation, decolonization, and Computer Science education, we wish to describe our positionality as researchers to these themes.

Hester is of Kānaka Maoli descent and an insider to Hawaiian culture, unlike the other others. All authors are racial/ethnic minorities in the U.S.; Gelder, Baker-Ramos, Uchidiuno, and Hester are underrepresented in Computer Science. Gelder, Baker-Ramos, Cho, and Kolakaluri are MS-HCI graduate students at the Georgia Institute of Technology as lead research and design roles in this collaboration, co-advised by Uchidiuno and Hester. Uchidiuno and Hester are Assistant and Associate Professors of Interactive Computing, respectively. Hester has a long-standing collaboration with Pūʻōhala School in their CS education efforts.

Gelder has a background in user experience research, design, and development, and experience in qualitative research methods and participatory design for education. He is Filipino-American and attended predominantly white, rural New York schools for his K-12 education, with minimal CS instruction.

Baker-Ramos has a background in visual design and history, and experience in decolonization efforts, community-based co-design, and other culturally relevant education efforts in Hawai'i. She is Guatemalan-American and attended predominantly white, North Carolina schools for their K-12 education, with minimal CS instruction.

Cho has a background in behavioral neuroscience and global health, and experience in qualitative user research and data analysis. She is Korean and attended an international school in Seoul for most of her K-12 education, with robust CS instruction.

Kolakaluri has a background in computer science and experience in culturally relevant educational tools. She is Indian and attended schools ranging from rural to urban across India, and an international school in Paris for her K-12 education with varying CS instruction.

Uchidiuno has a background in Human-Computer Interaction and codesigning education technologies and curricula for marginalized communities. She directs the Play & Learn Lab at the Georgia Institute of Technology, which focuses on culturally relevant computer science education and participatory design with communities.

Hester is Native Hawaiian and graduated high school in Hawai'i. His family is active in advocating for Hawaiian sovereignty, education, and environmental protections. He has a background in Computer Science and Engineering. Hester directs the Ka Moamoa Lab at the Georgia Institute of Technology, which focuses on sustainable energy harvesting technologies, conservation, health wearables, interactive devices, and culturally empowering education, motivated by his Kānaka Maoli heritage.

6 LIMITATIONS AND ASSUMPTIONS

Fluency in ʻŌlelo Hawaii. The first four authors are not fluent in ʻŌlelo Hawai'i and are not of Kanaka Maoli descent, which is the primary limitation of this work. Due to this positionality, observations made during immersion hours are less informed, based solely on body language and tone, and can include misinterpretations of situations and dynamics. While this is a barrier, it guides us to where we can be helpful as allies to Kaiapuni CS education and necessitates deep collaboration with teachers.

Technology as the answer. Throughout our research with teachers, students, and the school system in Hawai'i, many pain points emerged that are just as urgent as those we have presented here, but would be better addressed through policy, funding, etc. A limitation of our impact is our professional backgrounds and graduate program focus, which lend us to address technology-

oriented pain points better than others. To acknowledge the pain points that will not be addressed through the platform discussed in this report, we have, in parallel, established a longer timeline of collaboration with Pūʻōhala School, including plans for research artifacts that can be helpful beyond the scope of the described platform.

7 LESSONS LEARNED

As culturally-external HCI researchers working in support of culturally relevant Hawaiian CS education, we reflect on what this experience has taught us about HCI research methodologies and offer our insights to future HCI researchers intending to partner with these communities.

Initiatives should align with both the ground-level needs of teachers and state-level mandates such as Act 158. For the school, the needs of daily classes took priority over preparation for state-level CS course mandates. We hypothesize that by holding both factors in mind when designing an intervention for Hawaiian educators, initial adoption and the probability of a sustained intervention will be increased.

Similarly, taking a hybridized assets-based design approach to understanding Kaiapuni educational practices and the larger educational context outside the control of individual schools, serves as an excellent framing technique for data analysis. By identifying existing teacher assets and emerging technology such as AI, we hope to design concepts that present as familiar and useful to the school's teachers, and for Kaiapuni schools more broadly.

Regarding project management, we found success in tuning the timing of our intended milestones to accommodate the fluctuating circumstances of our partners. We recommend that HCI researchers respect the already-limited availability of educators as well as exercise restraint when soliciting participation. Our group was intentional in building a fund of knowledge around local socio-economic issues (i.e., housing and tourism), dynamics of Hawaiian community relations (i.e., mistrust of various state institutions, including the University of Hawaii and its support of the TMT project [12]), and serious crises (e.g., the Maui wildfires) and how they continue to impact communities across the islands. This knowledge demonstrated care to our partners and helped inform all aspects of this work. On this point, we recommend authentic relationship- and trust-building moments between partners, first and foremost.

Finally, we offer our culturally sensitive research approach that recharacterizes traditional HCI research methods into appropriate formats for Hawaiian research partnerships in hopes that others may consider them for their methodologies: Instead of formal user recruitment and conducting semi-structured interviews, we engaged in talk story (authentic and sincere discussion) during pau hana ("the time after work") over meals with our partners. Instead of competitive analysis, we dedicated significant time to literature review, reviewing online media (e.g., documentaries, interviews, etc.), and attended the Schools of the Future Conference to understand the broader Hawaiian CS education, cultural, and historical context. Finally, instead of engaging in formal ethnographic research, we simply visited the school and offered authentic classroom support to teachers when needed. In these ways, we hope others will be reminded of the "human" and relational foundations that make up the field of HCI.

8 CONCLUSIONS AND FUTURE WORK

This experience report has presented our current research work that informs the design of a culturally relevant teacher-substitute support platform in partnership with Pūʻōhala School. Our research has suggested that such a platform, coupled with identified teacher assets and emerging technologies such as AI, could ensure sustainable support for the school's teachers.

As we move forward, a teacher-substitute support platform will be designed based on our key findings and design requirements mentioned in section 4 (Findings and Design Requirements). In upcoming work, the following design steps will be taken: (1) concept ideation, (2) concept testing, (3) wireframing & prototyping, (4) usability testing, and (5) design iterations. Concept testing and usability testing sessions will directly involve evaluation and feedback from the school's teachers. As culturally-external HCI researchers, we acknowledge their responses are vital for our work to properly align with the needs of the school's teachers while also infusing Hawaiian perspectives within the design of technology in service of-, and for use by Hawaiian teachers.

Based on our investigation, we believe that the lack of a teacher support system for stand-in immersion teaching and teachers' discomfort with teaching CS is not an issue isolated to our partner school. Ultimately, we intend to adapt our work to support Kaiapuni teachers, students, and Hawaiian communities more broadly while centering the significance of local and place-based education. We offer our insights to future HCI researchers intending to partner with Hawaiian communities in efforts to increase Hawaiian representation in STEM fields through supportive and sustainable interventions in Hawaiian CS education.

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REFERENCES

[1] Act 51 Hawaiʻi Revised Statute [§302A-323] Computer science. curricula plan. public schools. https://www.capitol.hawaii.gov/session2018/bills/GM1151_.pdf

[2] F. S. Allaire (2019). Navigating Uncharted Waters: First-Generation Native Hawaiian College Students in STEM. Journal of College Student Retention:

Research, Theory & Practice, 21(3), 305-325. https://doi.org/10.1177/1521025117707955

[3] Hawaii DOE | The Foundational and Administrative Framework for Kaiapuni Education. https://www.hawaiipublicschools.org/TeachingAndLearning/StudentLearning/HawaiianEducation/Pages/FAFKE.aspx. Accessed 4 Feb. 2024.

[4] D. L. Hoffman, and J. Chillingworth. (2022). 2022 Annual Report on Computer Science Courses and Content. Hawai'i State Department of Education and the University of Hawai'i.

[5] D. L. Hoffman, and J. Chillingworth. (2023). Navigating Act 158: Insights from Hawai'i School Leaders on Computer Science Education. 2023 Schools of the Future Conference. Https://Sotfconf.Org/Index.Html, 2023, https://docs.google.com/presentation/d/1JkyUtqweUHLj8FpVPhDiUt5hjCqsHm7FXluoW0YZf-Q/edit#slide=id.g2618cfdf659_0_4346. Accessed 2024.

[6] J. Q. Kerr, D. J. Hess, C.M Smith, and M. G. Hadfeild. (2018). Recognizing and Reducing Barriers to Science and Math Education and STEM Careers for Native Hawaiians and Pacific Islanders. CBE—Life Sciences Education, 17(4). DOI: 10.1187/cbe.18-06-0091

[7] C. Kraemer, A. Guo, S. Ahmed, and J. Hester, "Battery-free makecode:Accessible programming for intermittent computing," Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies, vol. 6, no. 1, pp. 1–35, 2022.

[8] T. Kukutai, and J. Taylor. 2016. Indigenous data sovereignty: Toward an agenda. ANU press, 2016.

[9] Microbit. 2021. Meet the new BBC micro:bit. https://microbit.org/new-microbit/. [Online; accessed 03-February-2024].

[10] Microsoft. 2020. MakeCode: Hands on computing education. https://www.microsoft.com/en-us/makecode. [Online; accessed 03-February-2024].

[11] A. Nelson, A. Guo, M. Worsley, D. Esibill, J. Hester (2023). "Mʻalama ʻ ¯Aina through Micro:bits in Kʻaneʻohe: APlace-Based Approach to Teaching CS in a Kaiapuni (Hawaiian Immersion) Bilingual School Setting," [Unpublished manuscript].

[12] "TMT International Observatory." TIO, https://www.tmt.org/. Accessed 4 Feb. 2024.

[13] H. Trask. From a Native Daughter: Colonialism and Sovereignty in Hawai'i. University of Hawai'i Press, 2005.

[14] T. T. T. Nguyen and M. Mordecai, "Catching up to move forward: A Computer Science Education Landscape Report of Hawai ʻi Public Schools, 2017–2020," Curriculum Research & Development Group, University of Hawaiʻi, 2020.

[15] M. Wong-Villacres, C. DiSalvo, N. Kumar, and B. DiSalvo. 2020. Culture in Action: Unpacking Capacities to Inform Assets-Based Design. In Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems (CHI '20). Association for Computing Machinery, New York, NY, USA, 1–14. https://doi.org/10.1145/3313831.3376329