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Going beyond access: On-line education in Hawaii and the Pacific Islands

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Abstract This paper discusses several approaches to Web-based learning, on-line learning and IT instruction that have been implemented at the University of Hawaii, including studio-based learning, techniques for implementing critical evaluation skills when utilizing on-line sources, virtual museum use, the use of metacognitive prompts in on-line instruction and outreach to other Pacific Island communities. The paper also addresses aspects of ICT and on-line instruction and community building in multicultural settings that represent some of the most geographically isolated regions on the planet, with socioeconomic disparities spanning the digital divide. This paper shows how technology can be used to promote higher order thinking, metacognition and critical evaluation skills that encourage students to use ICT in more discriminatory and evaluative ways. The paper also shows that using virtual museums for sharing cultural knowledge and using metacognitive prompts for critical analyses are other ways of enriching knowledge through the use of the Internet. Furthermore, technology can be used for communicating with different populations regardless of income or ethnicity, and the Internet can improve access to higher education for rural populations that would not consider university access a possibility without being provided with the support that technology can give.

Keywords Culture · Studio-based learning · Credibility · Critical thinking · Metacognition · Teacher education · Virtual museums

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1 Introduction

Hawaii and the Pacific Islands represent some of the most geographically isolated places in the world. To provide geographic context, Hawaii is the 50th of the United States. It is located in the central northern Pacific and is 2563 miles (4,125 km) from the United States mainland. It consists of 7 major inhabited islands and numerous smaller islands in the Northwestern Hawaiian Chain, spread out over 2,400 km. The demographic background of the population consists of persons of Asian American descent (39 %), European American (27 %), multiethnic (21 %), Pacific Islander (9 %), Latinos (9 %) and African Americans (2 %). Culturally, there is a "local" culture, arising out of the mixtures of different people who came to work on sugar and pineapple plantations. The mixture has also resulted in a Creole language, Hawaiian Creole English.

Historically, the initial settlers in Hawaii were the Hawaiian people, Polynesians with their own language and monarchy. The Hawaiian monarchy was overthrown by US businessmen in 1893, and Queen Lili'uokalani, was placed under house arrest. Hawaii became a state in 1959, and in 1993 President Clinton issued an official apology for the overthrow to the Native Hawaiian people who have developed various sovereignty movements throughout the years and have petitioned the US government for federal recognition as an indigenous group. An understanding of this brief historical and cultural milieu is important for understanding the context in which the instructional approaches that follow are situated.

1.1 Early on-line instruction in Hawaii

In order to provide the neighbor islands with access to courses, the University of Hawaii (UH) has incorporated distance education for many years. One of the earliest initiatives occurred in 1971 when the state of Hawaii had a moratorium on the purchase or lease of computers. At this time, Professor Norman Abramson was funded by DARPA to link Hawaii to the ARPANET and he brought an advanced time sharing computer to Hawaii. This system was named the BCC-500 because it could accommodate approximately 500 simultaneous users and over 2,000 terminals. This was significantly more capability than the standard commercial time sharing systems that only supported around 32 interactive users simultaneously. The architecture of the BCC-500 permitted such a large number of interactive users to compute without experiencing degraded service. Since UH had a large computer time sharing system and a well developed computer network (the Aloha system), the Department of Information and Computer Sciences was able to use them to hold computing classes that originated on the Manoa (Honolulu) campus and were delivered via teletype machines to high schools across the state, including neighbor island cities such as Hilo which were several hundred miles away.

Since this beginning, on-line instruction has become common in many subject areas at the University of Hawaii. In the following sections, we describe our research that relates to improving learning from the Web and on-line instruction.

1.2 Learning to work with Web-based materials: Credibility determinations

Most teachers/professors have been faced with situations where students use sources of questionable credibility as research references. Additionally, the general public can find Web sites that contain information of questionable veracity and be swayed in dangerous directions, such as buying into various financial and health care scams. For example Benotsch et al. (2004) showed that less educated and literate people who were HIV positive were more susceptible to purported cures that actually were fraudulent than their more educated counterparts. In response to these findings, Kalichman et al. (2006) carried out a successful two-month intervention focusing on improving computer literacy and critical consumer evaluation skills.

In Hawaii, Nguyen's (2000) research indicated that most teachers assumed another teacher (e.g., the English teacher) had already covered critical Web site information evaluation skills. Iding et al. (2002) carried out a four-day intervention with high school seniors in biology classes, teaching them critical information evaluation skills. Their work demonstrated that it in a short time it was relatively easy to affect change in students' lists of criteria that they would consider in evaluating Web sites and in the amount of time that they said they would spend in evaluating credibility aspects of Web sites in the future.

The authors carried out several studies examining how students determine whether on-line resources are credible or not (Iding et al. 2009). Although these studies involved university students and graduate students, results are relevant to secondary school populations as well. For example, they found that while respondents used plausible criteria for determining Web credibility (e.g. information focus, corroboration with other material) they did not adequately consider Website authors' potential vested interests in creating on-line materials, especially with respect to noncommercial Websites (e.g., educational sites). The authors recommend further direct instruction in this area. Further, the authors caution against using confidence in users' own determinations about Web site accuracy as an indicator of accuracy itself, as in other research they found that the more educated the users, the less confident they were in their accuracy determinations (Iding et al. 2006).

1.3 Using virtual museum resources

Virtual museum resources have the potential for effective instruction at the high school and elementary levels. Students can have exposure to museum resources that they would not otherwise have exposure to due to disability (Bouck et al. 2008), geographic distance, and socioeconomic limitations. Virtual museum resources are frequently used as adjuncts or follow-ups to museum visits, although the material can be valuable as central instructional resources (Eakle 2009). Furthermore, museums are in the process of redefining themselves as community gathering places and as places where information is truly shared—not only its display but also the determination of what is shared and how, so that cultural repositories related to indigenous people can be co-created and co-curated (Srinivasan et al. 2009).

Iding and Nordbotten (2010) worked with teachers-in-training to determine how they would evaluate two award-winning virtual museum Web sites. Results indicated that Web site design factors such as layouts, did not influence their selections of

virtual museum resources for their students' use. Instead, participants focused on information content characteristics and whether the sites were able to generate or maintain interest, and determined that they would use the sites for different purposes (e.g., introducing a topic or as a supplement for research). It appears that virtual museum resources can be valuable instructional resources, especially when community and school partnerships can be created, as described in Srinivasan et al.'s (2009) research.

1.4 Using metacognitive prompts

One of the challenges of effective on-line collaboration is effectively expressing one's own level of understanding to group members so that groups can achieve consensus and move forward. In this work, Iding (2007) relied on experiences with peer writing responses to facilitate students' productive responses to drafts of each others' writing. She provided metacognitive prompts (i.e., repeated queries prompting students to articulate what they understood, didn't understand and what would they have needed to facilitate their understanding). Use of metacognitive prompts in off-line settings facilitated higher frequencies of comments than had been the case in prior research with peer writing responses. Iding has since piloted further use of metacognitive prompts in off-line settings, but it appears that online environments would lend themselves ideally to this activity. Clearly, more research is needed in this area.

1.5 Creating on-line communities

Given the multiethnic, multicultural context of the Pacific Islands, and the geographic constraint of smaller islands separated by many miles of ocean, one of our goals is to facilitate on-line community and instruction that extends to other parts of the Pacific. Many of our students are from the US-affiliated states and territories, such as the Federated States of Micronesia (1,046 km east of Guam and southwest of Hawaii), and the US territory of American Samoa (4,184 km southwest of Hawaii), and immigrations from these areas for employment and educational purposes have increased with the economic downturn. Although Pacific Islanders are often subsumed into larger demographic categories such as Asian/Pacific Islander and described as "information rich" (Iding and Skouge 2005), realities can be vastly different from those of others in Hawaii or elsewhere in the Pacific. To illustrate, the 2002 Chuuk State Census described the average family income for a family of 7 as $2,445 USD, which is much lower than the median income in Hawaii. Pacific island communities such as these clearly exemplify aspects of the digital divide—a few computers exist at the community college, for example, yet all of the problems associated with remote locations and limited infrastructure exist—low bandwidth, frequently outdated machines, power outages and outer islands with no electricity. Despite this, computer and Internet use is very popular among young people. The Internet serves as a way for distant people to connect with friends and family (a sort of Pacific Island Diaspora for those who have left), and a way to pursue higher education on-line (Iding et al. 2008). Regardless of the many challenges associated with computer-based instruction, popularity is unflagging, especially in social media sites such as Facebook, perhaps

bolstered by tight-knit village, village, family and church communities that could be seen as aspects of collectivist, rather than individualistic orientations.

To pursue higher education often means having to leave one's home island to travel to the U.S. or elsewhere. For example, Chuuk (formerly Truk), one of the four states of Micronesia, has a community college, but no university, so students have less exposure to university graduates and limited ideas about what going away to college would be like. To facilitate young people's interest in further education Iding et al. (2007) created a project Pacific Islander Role Modeling Project in which they interviewed successful university Pacific Islander graduates from these communities about their experiences. DVD's were created and sent back to home communities so that children and young people might be similarly and realistically inspired to pursue higher education.

The purpose of this work was also to honor the Pacific Islander graduates as leaders for their home communities. This work is consistent with the goals of Bishop and Glynn (1999) in their approach developed in New Zealand called Kaopapa Maori. The approach supports creating shared leadership structures between the non-indigenous groups and indigenous Maori (Polynesians) in the educational realms, both in research and instruction. The idea is that goals should be developed in a true collaboration between indigenous and non-indigenous cultural groups. Bishop and Glynn also called for a discourse that disembraces the "deficit" model. We believe that these goals would also benefit many of our Pacific Island regions that have been dominated by American and other school systems.

1.6 Studio-based learning

In order to develop, implement, evaluate and propagate an innovative pedagogical approach to computing instruction in the undergraduate curriculum, a project at UH refined and evaluated a "studio-based" pedagogy that actively engages undergraduate students in collaborative, design-oriented learning, and built a regional and national community of computing educators interested in applying this approach and assessing its impact (Hundhausen et al. 2008). Borrowed and adapted from architectural education, the "studio-based" instructional model emphasizes learning activities in which students (a) construct personally-meaningful representations of computing concepts under study, and then (b) present those representations to their instructors and peers for feedback and discussion within the context of so-called "design crits" (design criticisms). We have implemented and evaluated various forms of the studio-based instructional (SBL) model in several courses at several different high schools and universities. In so doing, we have found several promising outcomes of the studio-based approach. In particular, the approach has led to:

- Increased enthusiasm and excitement about the course topic;
- A stronger sense of community;
- The development and use of critical thinking skills; and
- Positive transfer-of-training from representation-building activities to actual computer programming.

For example, at the University of Hawaii -Manoa, we adapted the SBL methodology to several undergraduate computer science courses. We first

focused on the implementation and evaluation of CS0 (Programming through Animations), CS1 (Introduction to Computer Science I) and CS2 (Introduction to Computer Science II). Offerings of each of these courses were taught using both the traditional and SBL methodologies. Students from the SBL sections were enthusiastic and their improved performance convinced additional CS faculty members to try using the SBL methodology. As a result, while continuing the evaluation in CS0, CS1, CS2, we added new classes CS2.5 (Program Structure), HCI (Human Computer Interaction) and a very large and a popular non-required computer literary class taken by students from a diverse set of majors called Tools for the Information Age (CSL), thus exposing over a thousand new students to the SBL methodology.

We found the SBL methodology primarily successful for the participating classes; however, the UH-Manoa implementation of SBL was labor intensive, and therefore a problem particularly for our large classes. The next phase of our research was to examine the extent to which technology could be used to facilitate the SBL methodology. We developed a software environment to support on-line studio-based learning (OSBL). The tools were designed to automatically capture students' activity as they participated in assignments that consisted of a series of complex and meaningful activities for which they had to construct workable solutions. An objective was to determine exactly how the CSL students interacted with each other using an on-line informal virtual social network for both traditional and SBL methodologies. We investigated the extent to which the SBL methodology contributed to the students' knowledge of social networking tools and environments. The exercises used involved different challenges related to social networking tools and environments. Preliminary results from using these tools in an on-line CS1 are promising and the analysis is currently in progress.

2 Conclusion

In conclusion, we see on-line instruction, instruction utilizing computer-based resources and ICT instruction as moving out of their infancy as they more closely facilitate the learning processes used in the off-line world. Part of this relates to elements of access that cross and eliminate the digital divide and part relates to the advanced development of computer based and ICT learning environments. As we work to develop instructional approaches with future teachers serving secondary students, and as we work to develop more effective ways to deliver ICT, we recommend the following instructional approaches:

- Students at all levels require instruction in critical Web literacy and Website evaluation skills. They need to address questions regarding Web site authors' vested interests in posting information on the Web, whether that information is historical, political, educational or healthcare-related.
- Students need to be taught how to be productive members of on-line communities or participants in on-line instruction by being able to clearly evaluate their own and others' levels of understanding and engage in effective metacognitive expression in group work.

- Instructors can make use of metacognitive prompts to facilitate students' writing and peer writing responses in on-line environments.
- Instructors need to be made aware of virtual resources, such as virtual museums, that can have high quality content and can serve more central, rather than peripheral roles in instruction.
- Teachers and others should make creative use of students' interest in on-line social networking by creating opportunities for students' social expressions, collaboration, and peer responses in on-line learning environments.
- Teachers and others can work to bridge the digital divide by making the best and most realistic uses of technologies that are available to students within individual cultural and socioeconomic settings.
- Teachers can facilitate on-line and virtual communities by truly partnering with indigenous people and other groups to facilitate community-building and information sharing across geographic, cultural and political boundaries.

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