He Ui a He Ninau: Embracing Traditional Hawaiian Culture and Spirituality through Authentic Inquiry-Based, Thematic Learning: A Student/Teacher/Scientist Collaboration

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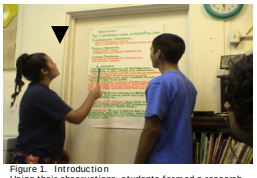

Figure 1. Introduction
Using their observations, students formed a research question. Researching for background information helped students develop a hypothesis.

History

Halau Lokahi is a K-12 Hawaiian culture-based public charter school currently located in the culturally- and economically-challenged urban community of Kalihi/Palama on the island of O'ahu. The primary goal of Halau Lokahi curriculum is to meld traditional Hawaiian values, culture, and spirituality with Western perspectives and standards in all areas of education. Our 18 month old school is now evaluating and revamping its approach for accomplishing this goal. We are currently engaged in aligning our curriculum in accordance with those changes that are necessary to revamp science education (National Research Council, 2000; Louis, 1997; Russo, 1997; "Science Literacy is National Concern," 1995) not only in Hawaii, but also across the U.S. and abroad.

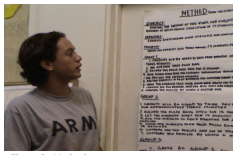

Figure 2. Method
Students planning their study, choosing the subjects, listing materials needed, and devising the procedure.

Introduction

This poster describes an inquiry approach to education that we are beginning to incorporate into our high school science curriculum. It is based on student-initiated and directed, faculty-guided research investigation projects that are consistent with and support the current educational theme adopted by Halau Lokahi.

This first attempt at scientific inquiry projects was based upon a school-wide theme: the heart. Neither students nor teachers were familiar with the Research Investigation Process (RIP), therefore, a haumana-kumu-scientist partnership was formed. Both teachers and students, under the guidance of a scientist, Dr. Robert Landsman, collaborated on two scientific experiments using the RIP. Halau Lokahi students were introduced to the RIP through projects that required learning a number of techniques. These techniques were consequently used to test hypotheses and decision making in science. They included observation (Fig. 1), formulating and posing research questions (Fig. 4), gathering background information, constructing hypotheses, designing studies to test the hypotheses (Fig. 2), data summary, data analysis, discussion of the results and conclusions, and presentation of the findings (Fig. 10). The elements of the program described below are in accordance with the State of Hawaii Science Content and Performance Standards as well as the National Science Educational Standards.

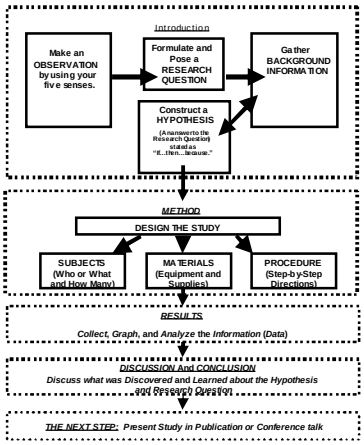

Figure 13. Research Investigation Process (RIP) Flowchart.

Figure 3. Scientist guiding students through RIP.

Observations

- Our school has a goal to reach, but last year we experienced challenges in formulating a path for successfully achieving that goal.
- Some teachers and administrators were introduced to the Research Investigation Process (RIP) at the start of this school year.
- This inquiry-based approach appeared to be inspirational and motivational to the participants.

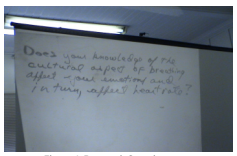

Figure 4. Research Question.

Research Question

Could the RIP be applied to the curriculum at Halau Lokahi, and so serve as a path to successfully meet the school's goal?

Hypothesis

If we infuse the RIP process into our school's curricula, then we can begin to pave a successful path towards our goal.

Figure 5. Their proficiency, understanding, and confidence increased beyond the boundaries of science, incorporating other Hawaii State Content Standards.

Methods

Subjects
The subjects in this investigation were students, teachers, and administrators at Halau Lokahi.

Materials

- Professional Science Education Specialist and practicing scientist.
- Standard scientific/multimedia technology equipment found in most high schools.
- Facilities that can be utilized as a laboratory and classroom.
- Time.

Figure 6. Students pipetting Daphnia under teacher's supervision.

Procedure

- The school brought in the education specialist.
- The teachers developed criteria for choosing a theme around which to center the curriculum projects.
- The school then adopted a theme for a designated period of time (one quarter/marking period).
- Teachers were guided by the scientist in and practiced the use of inquiry-based instructional techniques (i.e. use of Socratic Questioning) during an in-service workshop.
- All teachers gained exposure to and practiced the RIP by serving as researchers (Fig. 13).
- Technology was made available for this RIP inquiry program.
- Students were introduced to the RIP process through a series of inquiry activities facilitated by the scientist.
- Students then took the lead by raising questions based on their own observations related to the school theme and developed their own research investigations, completed their studies, and presented them at this meeting.
- Students were consistently evaluated to measure their progress so that the program could be adjusted as necessary.

Figure 7. Fusion of video camera technology/dissecting microscope/TV monitor/computer to view effects of 'Awa (kava) on daphnia(water flea).

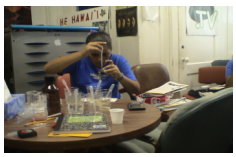

Figure 8. Student independently pipetting daphnia for her study.

Results

This program resulted in the following:

- Melding of indigenous culture and Western concepts in science education (Figs. 11-12).
- Addressing of Hawaii and National Science Education Standards for student learning.
- Addressing of National Science Education Standards for teacher development.
- Halau Lokahi spiraled into new areas of science and technology.
- Students developed understanding and skills for data analyses, including statistics and graphing.
- Students and staff developed an enhanced sense of commitment, prevailing despite extreme adversities posed by the lack of financial resources, inadequate facilities, time constraints, in addition to a plethora of personal challenges not uncommon to any professional.
- Implementation of authentic assessment through professional evaluation of the end-products (Figs. 11-12).

Figure 9. Through oral discussions, problem solving, and experimental processes, we watched as the students surmounted one obstacle after another.

Figure 10. Data analysis employing both PC and Macintosh platforms, and creation of digital movie files to document results of the experiments.

Figure 11. Tool for authentic assessment. End product of the student-generated research investigation melding Western and indigenous perspectives.

Discussion and Conclusion

- Students in our program not only succeeded in addressing the standards of true scientific inquiry, but also contributed new information to both the scientific and cultural communities. They demonstrated the ability to learn science through the same processes that are used by scientists to acquire new information. They generated and conducted truly "authentic" research resulting in new scientific findings.
- Inquiry-based learning provided the motivation necessary for students to begin engaging in self-directed learning of standards-based, culturally-relevant content. Students demonstrated self-motivated behaviors, indicating successful acquisition of positive learning habits. Students exhibited development of leadership qualities and attributes characteristic of successful learners.
- This project has enabled a young school, still in its developmental stages, to establish a common path leading to collaboration between teachers and students in the learning process. Students were active learners throughout the projects, taking responsibility for their own learning with teachers and scientist serving as guides. Teachers were active learners throughout the projects sharing responsibility for their own learning, with both Science Education Specialist/practicing scientist and students serving as guides.
- We believe that the continuation of the program that we have described here will lead to a model approach that could be applied to other indigenous-based learning environments in Hawaii, the U.S., and beyond. Thematic approaches to learning provide opportunities to interweave a variety of cultural perspectives and approaches across disciplines through projects. The inquiry-based approaches to education can be applied across a diversity of themes, disciplines, and cultures.
- This type of program is a positive approach to reconciling the effects of the colonization of an indigenous community, while embracing both Western and native knowledge bases. Students and teachers shared in the opportunity to become active learners in support of one another. Students were motivated to malama their kuleana in both Western science and Hawaiian social contexts.

Figure 12. Tool for authentic assessment. End product of the student generated research investigation melding Western and indigenous perspectives.

Acknowledgements

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References

National Research Council. (2000). Inquiry and the National Science Education Standards: A Guide for Teaching and Learning. Washington, D.C.: National Academy Press.
Lewis, R. (1997). Study highlights need for more scientists in classroom. The Scientist, 11(17), 1, 6-7.
Russo, E. (1997). Undergraduate summer research provides taste of lab life. The Scientist,11, 1.
Science Literacy is National Concern. (1995, March). APS Observer, 8