PVS Lesson Plan Format

Title of Lesson/Activity: Ethnomathematics Calculus Summer Institute
Teacher/Author: Dr. Linda Furuto
School: University of Hawai‘i – West O‘ahu (UHWO)
Grade Level or Course: Ethnomathematics Calculus Summer Institute/University level
Project Time Span: May 28, 2011 (part of a larger institute)

I. Contexts and Background for Lesson:
- Who are your students, their needs, and the school and community contexts?
- Why are you conducting this lesson/activity?
- What cultural, historical, science knowledge will a teacher need to understand and adopt this lesson?
- What content areas are being integrated?

Background
In 2007-2015, the state is projected to need 1,432 qualified mathematics teachers, and in 2007 the total UH system-wide production of mathematics education majors was 28 (Economic Modeling Specialist, 2007; UH IRO, 2010). Only 47.8% of secondary mathematics courses at public schools are being taught by “highly qualified” teachers, leading UH Vice President of Academic Planning and Policy Linda Johnsrud to urge, “We have a math teacher crisis, and we are counting on UHWO to step up and help fill the gap. If what’s been tried is failing, we need to be innovative and draw on the backgrounds and experiences of our future teachers” (Mathematics Summit, October 10, 2008).

As the first mathematician to be hired by UHWO in AY2007-2008, I recognized the need and successfully applied for a National Science Foundation grant to open UHWO’s first Mathematics Center in Spring 2008. The UHWO Mathematics Center provides a combination of academic mentoring, personalized tutoring, and research experiences, all of which are critical to achieve our goal of increased student success and retention, particularly for traditionally underrepresented students. The UHWO Mathematics Center (now part of the No‘eau Center for Writing, Mathematics, and Academic Success) is the central hub for mathematics at UHWO, and has played an instrumental role in servicing immediate needs.

With the backbone provided by the UHWO Mathematics Center, it is critical to now examine our strategic plan in terms of intermediate and long term goals and how these fit in the University of Hawai‘i System. These include providing a bachelor’s degree in middle and secondary mathematics education in the imminent future to address one of the State of Hawai‘i’s paramount challenges.

Ethnomathematics Calculus Summer Institute
In light of these goals, UHWO will be hosting an Ethnomathematics Calculus Summer Institute to focus on the urgent need to prepare more qualified and effective mathematics teachers. The Ethnomathematics Calculus Summer Institute will span a period of eight months from January 1, 2011 to August 30, 2011. I will use the period January through May for preparation, including: background research, identifying pedagogical tools, determining calculus topics to be included, and solidifying connections with community-based organizations. The actual institute will take place from May 25, 2011 – June 5, 2011, with a PVS sail on Noa Noa planned for the evening of May 28, 2011. June – August 30, 2011 will be used for assessment, evaluation, and publication of lesson plans.

Captain Kamaki Worthington has already agreed to be available during May 28, 2011 for the PVS sail, and Ramona Ontiveros has reserved Noa Noa. There will be a total of 15 participants, students/prospective mathematics teachers and current UH mathematics faculty and DOE high school mathematics teachers.

- 8:30-9:00 a.m. Arrive at the METC, meet with Ka'iui/Nainoa for welcome and opening remarks
- 9:00-12:00 p.m. Dry dock
- 12:00-1:00 p.m. Lunch
- 1:00-4:00 p.m. Mokaua Island service project
- 4:00-5:00 p.m. Math lesson back at the METC classroom, tie back into the values and themes of the worldwide voyage
- 5:00-6:00 p.m. Dinner
- 6:00 p.m. Coastal sail with Kamaki on Noa Noa

Previous State of Hawai`i Department of Education Superintendent Patricia Hamamoto stated, “We need to figure out how to reach our students that are different learners. Drill and kill doesn’t work anymore. Our future teachers have to be solid in content and relevant pedagogy” (Mathematics Summit, October 10, 2008). The most successful mathematics education programs address issues of retention and support with a multi-faceted approach involving a variety of teaching/learning strategies that celebrate the diversity and heritage of students, and that is the overarching aim of the Ethnomathematics Calculus Summer Institute (Astin & Oseguera, 2005; Bok, 2006; Hurtado, 2001; National Center for Public Policy and Higher Education, 2006).

II. Goals of the Lesson/Activity

- What are the primary goals of the lesson/activity?

Goals

Students and educators in the Ethnomathematics Calculus Summer Institute will be engaged in calculus-related topics including, but not limited to, the following: vector operations, tangent lines, limits, continuity, derivatives, antiderivatives, integration and basic applications, and more. In addition, field studies grounded in ethnomathematics will be planned for the participants to Mokaua Island Fishing Village, Hawai`i Institute
of Marine Biology’s Coconut Island in Kane‘ohe Bay, hiking down to Kalaupapa on Moloka‘i, and sailing on Noa Noa with the Polynesian Voyaging Society. Examples of potential curriculum design and lesson plans include navigation calculations with geometric properties, caring for each other and number foundations in the environment, natural resources and algorithms, reawakening pride in fishing traditions and algebra, and linear equations in the highest sea cliffs in the world at Kalaupapa.

To integrate UHWO’s dedication to civic engagement, the Ethnomathematics Calculus Summer Institute will integrate practical application in the community. The goal will be to produce a series of lesson plans compiled in a research and practicum-based textbook that will engage current and future mathematics teachers and mathematicians in local classrooms through service-learning opportunities.

III. Student Learning Outcomes

- What will students learn (knowledge) and/or practice (applications) as a result of the lesson/activity.

Student Learning Outcomes

The Ethnomathematics Calculus Summer Institute will allow UH students and mathematics faculty to design and implement mathematics lesson plans grounded in the ethnic, historical, and cultural diversities of the state.

The resulting research and practicum-based product will be a textbook with supplementary calculus lesson plans. The textbook will be used by UH and DOE mathematics faculty to enrich curriculum, and future mathematics teachers as training materials. This will be distributed to the Hawai‘i Council of Teachers of Mathematics, Pacific Islands Mathematical Association of Two-Year Colleges, State of Hawai‘i Department of Education, and mathematics department chairs at each of the 10 UH campuses for use in teacher education programs. At the culmination of the Ethnomathematics Curriculum Project last year, we shared the textbook with universities and secondary schools on Maui, O‘ahu, and the Big Island.

When we respect all students’ invention, experience, and applications of mathematics, we provide them with equal opportunity for access and achievement. Last year, the Ethnomathematics Curriculum Project was featured in articles, press releases, and other forms of media coverage in the Hawai‘i Herald, Hawai‘i Public Radio, Honolulu Advertiser, University of Hawai‘i system-wide News, University of Hawai‘i Mālamalama Magazine, and the Mathematical Association of America (please refer to section on references, resources, and materials).

IV. Assessment

- How will you assess whether or not students learned what you are teaching?
The Ethnomathematics Calculus Readiness Summer Institute involves collaboration between UHWO administration, Pacific Islands Mathematical Association of Two-Year Colleges, Hawai`i Council of Teachers of Mathematics, Polynesian Voyaging Society, and State of Hawai`i Department of Education. I am the Four-Year College Director of the Hawai`i Council of Teachers of Mathematics, UHWO Mathematics Center Director, and am actively involved with the Pacific Islands Mathematical Association of Two-Year Colleges. The strength of these affiliations will greatly assist with project effectiveness.

Evaluation will be done via qualitative and quantitative data, including evaluations of each lesson plan, the number of students and faculty participants, and the distribution of materials. Information from the project will be also be disseminated to the general public through the UH system calendar, newspapers, local radio, television, and the internet. In addition, results will be presented at conferences such as the 2012 Hawai`i Council of Teachers of Mathematics Spring Conference. Based on the successes of this past year, we anticipate featuring the Ethnomathematics Calculus Summer Institute again in articles, press releases, and other forms of media coverage such as the Hawai`i Herald, Hawai`i Public Radio, Honolulu Star Advertiser, University of Hawai`i System-wide News, University of Hawai`i Mālamalama Magazine, and the Mathematical Association of America (please refer to section on references, resources, and materials).

V. Resources and Materials (Books, Websites, Handouts, etc.)

- List Books, Websites; attach Handouts


For DOE Teachers: This lesson/activity addresses the following DOE standards:
N/A.

Teacher Reflection and Evaluation of Lesson
(Due Within Two Weeks After the Lesson/Activity is Completed.)

- Assessment Results (Did students learn what you hoped they would learn? How does your assessment of their learning show this?)
- Student feedback (What did students say they got from the lesson/activity?)
- Teacher's Assessment: What worked well? What would you do differently?

I agree to complete the teacher reflection and evaluation of lesson within two weeks upon completion of the lesson/activity.