



# HCTM Newsletter

HAWAII COUNCIL OF TEACHERS OF MATHEMATICS

January 2008

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## President's Message

Debbie Kula, Sacred Hearts Academy

Haouli Makahiki Hou! Happy New Year! 2008! Happy New Semester! Now that the hustle and bustle and excitement of the holidays and the turning of a new calendar are behind us, we can settle back into the routine of exciting our students with the wonders of mathematics. Settle Back? But this is a new year, filled with new opportunities and excitement. And we have just the opportunity for you to add excitement to your professional life.

Your HCTM Board of Directors has been busily planning our Spring Conference for February 23 at the University of Hawaii at the Manoa Campus Center. Details for the conference can be found in this newsletter as well as our website: <http://hctm.org>. Check it out and join us for a morning of mathematics and collegiality. We have a great slate of presenters and I know you will find several ideas to take back to your classrooms.

In the last newsletter, I invited each of you to become involved, share your expertise, your successes, and your enthusiasm with your colleagues. I have a specific opportunity for you. Though we are still working on our Feb. 2008 conference, we are also beginning work for our 2009 Conference. This is your opportunity to join in the excitement and become a member of the 2009 HCTM Conference committee. Get in on the ground floor and help us to bring presenters and programs that will interest Hawaii's math teachers. Contact me, Debbie, at [dkula@sacredhearts.org](mailto:dkula@sacredhearts.org), or Scott at [david\\_powell@notes.k12.hi.us](mailto:david_powell@notes.k12.hi.us), or one of the other Board members and we will welcome you to the conference team. Happy New Year!

Debbie

## Conference Presenter Highlights

### Don S. Balka

Don S. Balka is professor emeritus of mathematics and mathematics education at Saint Mary's College, an all-women's College in Notre Dame, Indiana. He has taught middle school and high school. In addition, he has worked with K-12 teachers from around the world and has experience teaching mathematics in the elementary school classroom on a regular basis. Balka is author of Developing Algebraic Thinking and Exploring Geometry with Geofix. He is a co-author of the new MacMillan K-5 series, Math Connects.

Get first hand experience with NCTM Focal Points and see how they connect to Hawaii standards in Don's session Hawaii, Algebra, Alignment, Activities, and the Curriculum Focal Points for teachers in Grades 3 to 5. And teachers in Grades 6 to 12 will learn activities that excite and energize students with integers, monomials, binomials, linear and quadratic equations with Games And Activities for Pre-algebra and Algebra.

### Lynda Vaughan

Lynda Vaughan is a former middle and high school teacher, who left teaching to work in other ventures, most recently as a Sales Manager for Key Curriculum Press. She retired in December in order to spend more time "playing" and finds Hawaii is her favorite playground. She attended the University of Hawaii summer school while in college and since then has returned to the islands every year.

Last year at the conference she was displaying an Origami book and many teachers commented that they wished she would show them how to make some of the items...so that was the inspiration to participate in the conference while vacationing on Oahu.

Join one of Lynda's sessions: Have Fun In Your Math Class with Unit Origami! for Origami beginners teaching Grades 6 to 8, or Have Some Fun! Origami Boxes for those with previous origami experience teaching grades 6 to 12.

**Saint Louis School** invites teachers of 7<sup>th</sup> and 8<sup>th</sup> grade students to form a team and compete in the 43<sup>rd</sup> Mathematics Papahana to be held on April 5, 2008 on the Saint Louis School campus. For information, email Martha Carrasquillo at [math@saintlouisHawaii.org](mailto:math@saintlouisHawaii.org) or visit the Papahana site: <http://www.saintlouishawaii.org/math/myweb2/papahana.htm>  
We look forward to having you join us for the fun-filled math competition!

Our thanks to **Tom Craven**, Professor of Mathematics at UH Manoa, for updating our website [www.hctm.org](http://www.hctm.org). We appreciate you!

# Mathematics for Elementary Teachers

Joel L. Weiner

December 28, 2007

The title of this article is the name given to two courses that are now being offered at several campuses of the University of Hawaii. The courses are Math 111 and Math 112. I have been developing these courses over the past 5 years. Starting the Fall semester 2008, they will be required for admission to the Elementary Education program of the College of Education. The purpose of this article is to give the reader some sense of what these courses are about and what they hope to accomplish in preparing students to be future elementary educators.

In some sense, these courses are more about the way mathematics is done than understanding content. Although the content covered is unquestionably very fundamental for understanding elementary school mathematics, it does not require advanced training in mathematics. In fact, students with little or no knowledge in algebra have sufficient preparation for the courses.

How should mathematics be done? What is to be used to give guidance for the skills to be engendered in the students who take these courses? One answer to this last question is to be found in the NCTM Process Standards. Since these standards play such a crucial role in these courses and are motivation for so much that is done, it seems reasonable to present them.

## National Council of Mathematics Process Standards

### Problem Solving

1. Build new mathematical knowledge through problem solving.
2. Solve problems that arise in mathematics and in other contexts.
3. Apply and adapt a variety of strategies to solve problems.
4. Monitor and reflect on the process of mathematical problem solving.

### Reasoning and Proof

1. Recognize reasoning and proof as fundamental aspects of mathematics.
2. Make and investigate mathematical conjectures.
3. Develop and evaluate mathematical arguments and proofs.
4. Select and use various types of reasoning and methods of proof.

### Communication

1. Organize and consolidate mathematical thinking through communication.
2. Communicate mathematical thinking coherently and clearly to peers, teachers and others.
3. Analyze and evaluate the mathematics to express mathematical ideas precisely.
4. Use the language of mathematics to express mathematical ideas precisely.

### Connections

1. Recognize and use connections among mathematical ideas.
2. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.
3. Recognize and apply mathematics in contexts outside of mathematics.

### Representation

1. Create and use representations to organize, records, and communicate mathematical ideas.
2. Select, apply, and translate among mathematical representations to solve problems.
3. Use representations to model and interpret physical, social, and mathematical phenomena.

New mathematical knowledge in Math 111 and Math 112 is primarily learned through problem solving. We ask students to monitor and reflect on their own work and the work of their fellow students. Every effort is made to instill the belief that reasoning and proof are fundamental aspects of mathematics. Students constantly develop and evaluate arguments and proofs. Discussions about how to prepare to write a proof are commonplace. Students write constantly and develop the ability to communicate in a clear, precise and coherent fashion. Students learn to

use the language of mathematics, including symbolism, to describe clearly and precisely what they have observed and what they come to believe is true. Later, after the students have learned new material, students begin to develop the ability to recognize and make connections to those earlier ideas and apply them to the study of new ideas. Students learn to build new ideas on old ones and apply those ideas to contexts outside of mathematics. Students begin to appreciate that the way objects or ideas are represented influences in significant ways one's ability to understand and communicate them.

At the conclusion of these courses, when presented with a problem, we hope all of the students will have learned to slowly and deliberately go through the following activities: Make sure they understand what is being asked of them by reading or listening very carefully to the presentation of the question; identify the main ideas that the question is concerned with and once these ideas have been identified, make sure they are aware of all their prior knowledge regarding those ideas and, in addition, have looked at appropriate examples to ensure they understand what the question concerns and how it is related to those main ideas; organize all of these ideas and observations into a coherent justification of what they have come to know is true; and finally check that they know that they are right and are communicating what they indeed intend to communicate.

This last paragraph reflects the way I, a mathematician, do mathematics, and while it is a lot to ask the students to learn to do, one has to acknowledge that the way teachers do mathematics is the way their students will end up doing it, more or less.

This way of preparing teachers is not new. In fact, they reflect suggestions made in 2001 by the Conference Board of Mathematical Sciences. Here are three of those recommendations (with the numbers the CBMS gave to them); notice how well they fit what was just described.

### **CBMS Recommendations about the mathematical education of teachers**

#### **Recommendation 1.**

Prospective teachers need mathematics courses that develop understanding of the mathematics they will teach.

#### **Recommendation 2.**

Courses on fundamental ideas of school mathematics should focus on a thorough development of basic mathematical ideas. All courses designed for prospective teachers should develop careful reasoning and mathematical "common sense" in analyzing conceptual relationships and in solving problems.

#### **Recommendation 3.**

Along with building mathematical knowledge, mathematics courses for prospective teachers should develop the habits of mind of a mathematical thinker and demonstrate flexible, interactive styles of teaching.

Let me end with two quotes from *Knowing and Teaching Elementary Mathematics* by Liping Ma. The book is subtitled *Teachers' Understanding of Fundamental Mathematics in China and the United States*. If you have not read this book, it is recommended that you do because it is so enlightening about the teaching mathematics in the United States. Here are those quotes:

- The second factor, which may be even more significant, was the [U.S.] teachers' attitudes toward mathematics. In responding to the student's novel claim about the relationship between perimeter and area, the U.S. teachers behaved more like lay people, while the Chinese teachers behaved more like mathematicians.
- Yet there is another deep-seated factor which seems to play an even more important role. That is the acculturation of the Chinese teachers to the discipline. Obviously, these teachers are not mathematicians. Most of them have not even been exposed to any branch of mathematics other than elementary algebra and elementary geometry. However, they tend to think rigorously, tend to use mathematical terms to discuss a topic, and tend to justify their opinions with mathematical arguments.

It is the desire to produce the kind of teachers described in the last line of each of these quotes that motivates what is done in Math 111 and Math 112 as much as anything.

Hawaii Council of Teachers of Mathematics  
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### HCTM Membership Application

Name \_\_\_\_\_

Address \_\_\_\_\_

City, Zip Code \_\_\_\_\_

Home Phone # \_\_\_\_\_ Email: \_\_\_\_\_

School name/office \_\_\_\_\_ Position \_\_\_\_\_

Grade level (if applicable) \_\_\_\_\_ Work Phone: \_\_\_\_\_

Membership status: New \_\_\_\_\_ Renewal \_\_\_\_\_

With this application, please enclose a check made out to HCTM for  
\$15 (general membership) or \$7.50 (college student).

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