

Summer Academy

"Innovations Using Technology in the Middle and Secondary School Classroom"

June 28 to 30, 2006 • The University of Maine • Orono, ME

Please note: Each of these courses may be taken as a workshop for CEUs or continued into the Fall 2006 semester as a one-credit graduate course. Registrants are responsible for tuition and fees. Additional workshops will also be available during the Summer Academy.

Sponsored by: The University of Maine - Center for Science and Mathematics Education Research

Academy Registration

Last Name: _____ First Name: _____ Middle Initial: _____

eMail: _____

Select the courses you wish to participate in below (at most one from each time slot, Section 3 and the Aquaculture workshop are off site and will each take the full time).

SMT598 Section 1: Learning Mathematics with Excel

Through this course, students will learn many features of Excel that make it a powerful learning tool. Students will participate in, and design, activities to promote mathematical understanding.

Target audience: Pre-service or in-service middle or high school mathematics and science teachers.

Taught by: John Donovan, Assistant Professor of Mathematics and Mathematics Education

Initial meetings: Wednesday and Thursday afternoons

SMT598 Section 2: UV-Spectroscopy: Compounds, Color and Concentration

This course will teach the basics of UV-visible spectroscopy with applications to determination of chemical concentration and identification of chemical compounds. Participants will adapt existing curriculum materials to their own needs and will have access to instrumentation for their students.

Target audience: Science teachers in grades 7-12.

Taught by: Mitchell Bruce and Francois Amar, Associate Professors of Chemistry

Initial meetings: Thursday and Friday mornings

SMT598 Section 3: Data Data Everywhere! Making sense of environmental inquiry in a sea of online data

This course includes how to locate, download, and learn from environmental data available on the Web. Participants will learn science and technology skills needed to answer original and meaningful questions by downloading and interpreting different kinds of data about Maine's environment. A goal is to stimulate opportunities for students to think critically and solve interesting and meaningful questions about their local and regional environment. Participants will develop evidence to support an answer to an original question using archived environmental data available online. They will then design a lesson plan that engages students in their own evidence-based environmental research activity using online data.

Target audience: In-service and pre-service middle and high school science or mathematics teachers, Maine Learning Technology Initiative teachers, and environmental educators at public and private environmental education institutions.

Taught by: Molly Schaffler, Assistant Professor, Climate Change Institute and Center for Science and Mathematics Education Research (Adjunct)

Initial meetings: Wednesday afternoon through noon Friday, at the Schoodic Education and Research Center; housing will be provided.

SMT598 Section 4: Using Computer Tools to Diagnose Student Reasoning

This course will make use computer-based diagnostic instructional tools for middle and high school teachers and students. These tools, which include web-served assessments, are aligned with National Standards and Benchmarks in science and mathematics. Resources in this project have been developed and tested by teachers and are based on research into the teaching and learning of math and science. The program, DIAGNOSER, is designed for formative assessments (e.g., assessments to inform learning and instruction rather than assign scores.) Students receive feedback on their thinking as they work through their assignment. Teachers can access reports on students' thinking related to the assigned content. Participants will learn the software tools and how to implement them in their courses.

Target audience: In-service and pre-service secondary and middle school science and mathematics teachers.

Taught by: Michael Wittmann, Assistant Professor of Physics and Cooperating Assistant Professor of Education

Initial meetings: Wednesday and Thursday afternoons

SMT598 Section 5: Geometer's Sketchpad for Standards-Based Middle School Mathematics

In this course we will examine and develop *Geometer's Sketchpad* activities that directly address topics in the *Connected Mathematics Project* curriculum.

We will also investigate available research results that support student learning through technologies such as *Geometer's Sketchpad* and through standards based-curricula such as the *Connected Mathematics Project*.

The teacher-participants in the course will work in pairs on a curriculum piece which they implement and assess in their classroom during fall 2006. The teacher-participants will subsequently report out to the rest of the class about their curriculum project (either face to face or using distance-education technology) and

will create web materials which would enable other teachers to learn about their project and contact them if interested in implementing the curriculum.

Target audience: Middle school in-service and pre-service mathematics and science teachers

Taught by: Robert Franzosa, Professor of Mathematics

Initial meetings: Wednesday and Thursday afternoons

SMT598 Section 6: Using Data Acquisition Tools to Enhance Learning in Secondary Physical Science

Connecting real-world events to the physics (such as the motion of an object or the changing temperature of a fluid) is often difficult for students. Decades of research has shown that well-designed instructional materials can help students gain much deeper insight into processes and events that were previously hard to observe or calculate. The software does the tedious work, the students do the thinking. Participants in this workshop will work with data acquisition software (DataStudio from Pasco) to create teaching lessons in which data are shared among students, communal understanding of a situation is developed, and an appreciation for the nature of science is fostered.

Target audience: In-service and pre-service physical science teachers

Taught by: Michael Wittmann, Assistant Professor of Physics and Cooperating Assistant Professor of Education

Initial meetings: Thursday and Friday mornings

SMT598 Section 7: Real-Time Data Collection Software Use in Algebra, Pre-Calculus, and Calculus

Logger Pro is a real-time data collection and analysis software. In this course we will examine and develop activities using *Logger Pro* to investigate rates of change in a variety of applications, beginning with the basic idea of the slope of a line, working our way up through the concept of second differences (rates of change of rates of change) and its implication on the shape of graphs of functions. We will also investigate available research results that address student understanding of rates of change and that support student learning through data collection and analysis software. Participants in the course will work in pairs on a curriculum piece which they implement and assess in their classroom during fall 2006. They will subsequently report out to the rest of the class about their curriculum project and create web materials which would enable other teachers to learn about their project.

Target audience: Middle and high school in-service and pre-service mathematics teachers

Taught by: Robert Franzosa, Professor of Mathematics

Initial meetings: Thursday and Friday mornings

Aquaculture Workshop: Domestication of Aquatic Organisms

This mini-workshop (3 days) is designed to provide middle and high school level educators with background information and a conceptual framework for using aquaculture as a hands-on tool for teaching science. The workshop will include topics such as, 1) working with small scale aquaculture systems (aquariums) for classroom based demonstrations of basic aquariology, water chemistry, filtration (biological, chemical, mechanical), the aquatic food web, and the biology of different types of aquatic organisms, 2) gaining experience with the tools and techniques for monitoring an aquaculture system, 3) learning about and developing links to aquaculture research programs at The University of Maine and elsewhere in the state.

To boost production, the aquaculture industry has turned to both traditional applied breeding programs and the use of biotechnology. In recent years, however, a tremendous amount of controversy has arisen over the production and marketing of "genetically modified organisms" (GMOs). Yet, what constitutes a genetically modified organism is not always clear or easily defined. This institute will 1) introduce teachers to basic genetic concepts that historically have formed the cornerstone of genetic improvement programs and which are used in aquaculture research programs at the University of Maine, 2) help educators gain experience in using computer software for classroom demonstration of these principles, and 3) establish links that will allow teachers and their students to work "in-silico" with aquaculture and applied breeding programs research programs at UMaine.

This workshop will be held at the Schoodic Education and Research Center June 28th through June 30th.

Presented by: Dr. Paul Rawson, School of Marine Sciences, University of Maine and Neil Greenberg, Aquaculture Research Complex, University of Maine