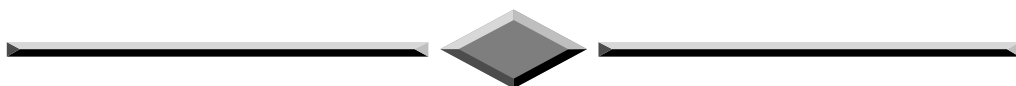


The North Carolina School of
Science and Mathematics

Teaching Contemporary Mathematics Conference

January 27 & 28, 2006



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AGENDA

Friday, January 27

<u>Time</u>		<u>Place</u>
7:15-8:00	Shuttle from the Durham Marriott to NCSSM	
7:45-8:15	Registration	ETC Lobby
7:45-8:15	Coffee	ETC Student Center
8:15-8:45	Welcome and Overview of Conference Donita Robinson, NCSSM	ETC Auditorium

General Information for the Conference:

- Many talks are offered twice during the conference.
- The computer labs in Watts 309 and Watts 313 will be open during talks and breaks during the conference. (User name and password will be provided at the conference.)
- Please turn off cell phones during sessions.
- NCSSM is a smoke-free campus.

9:00-9:50

Session 1 - Choose One

Sequences and Series – A Recursive Approach

Nils Ahbel, Deerfield Academy, Deerfield, MA

The traditional approach to sequences and series emphasizes the explicit form. A recursive approach opens up learning to a world of interesting applications that extend far beyond arithmetic and geometric sequences. The examples and ideas in this session are appropriate for use in Advanced Functions and Modeling or in any other course with a unit on sequences and series. Whet your appetite! Go to www.ahbel.com for instructions on how to get to the on-line course which includes the problems we will cover (parts of Chapter 8) and many other resources. Both Excel and TI InterActive! will be demonstrated.

(Also Saturday 10:50)

E-Lab

Capture/Recapture Revisited

Floyd Bullard, NCSSM and Duke University, Durham, NC

The "capture/recapture" strategy for estimating population sizes is fairly well-known to math teachers and is often taught in middle school as an application of proportions. In this session we'll revisit the problem as a classroom simulation activity with the goal of estimating not only a population size, but also a reasonable margin of error. The activity makes a nice first-day-of-school lesson for a statistics class and may also enrich the Precalculus or Advanced Functions and Modeling curriculum.

(Also Friday 2:30)

Lecture Hall

Continued... 9:00-9:50	<p>Let's Play Taxman! <i>Tom Walters, Bradley, CA</i> This session will provide an introduction to and analysis of a number theoretic game called Taxman. In its simplest form, Taxman can be played by elementary school students, but as the level of difficulty increases it can be used to promote mathematical discussion, produce verbal arguments or proofs, and, at the Algebra II or Precalculus level, apply algebraic skills to analyze theoretical versus possible results. (Also Saturday 11:55)</p>	Watts 301
	<p>Getting to the Fundamental Theorem of Calculus via Euler's Method <i>Peggy Craft, NCSSM, Durham, NC</i> Most Calculus books jump from <i>derivative</i> to <i>area under a curve</i> and then connect the two via the Fundamental Theorem of Calculus. Instead, we'll start with the function $f'(x) = \frac{dy}{dx}$, use Euler's Method to determine displacement on the graph of $y = f(x)$, and then see how this is equivalent to the area under the graph of $f'(x) = \frac{dy}{dx}$. (Also Friday 3:55)</p>	Watts 306
	<p>Data Analysis: The Residual Effect <i>Tamar Castelloe, NCSSM, Durham, NC</i> Some phenomena are well-modeled by combinations of functions. We will work through a problem that demonstrates the use of residuals to help construct and refine our model. This talk is most appropriate for teachers of Advanced Functions and Modeling and Precalculus. (Also Saturday 9:45)</p>	Watts 315
9:50-10:20	CONTINENTAL BREAKFAST	ETC Student Center
10:25-11:15	<u>Session 2 - Choose One</u>	
	<p>Movies (and Curve Fitting) in Math <i>John Goebel, NCSSM and Durham Academy, Durham, NC</i> An Algebra II lab activity where students throw a ball as close to vertical as possible and capture the entire path using the "movie" feature of a digital camera will be shared in this session. By using any three points (frames), students can find the quadratic function that models the height of the ball. They can use this function to check the residuals for the other points, predict the highest point, and find the time when the ball hits the ground. (Also Friday 3:55)</p>	E-Lab
	<p>Using Calculus to Cross a Street <i>Dan Teague, NCSSM, Durham, NC</i> If cars are coming at a rate of 12 per minute and it takes you 15 seconds to walk across the street, how long will you have to wait before you can cross? This problem involves exponential and geometric distributions from statistics and integrals, derivatives, and infinite series from calculus. (Also Friday 1:25)</p>	Lecture Hall

Continued... 10:25-11:15 **Exploring Probabilistic Runs Using Recursion, Excel and the TI-84** **Watts 301**
Chris Jones, Horace Mann School, Riverdale, NY
If you flip a coin 1000 times, what is the probability that somewhere in the 1000 flips there will be a run of at least 10 consecutive heads? What is the expected value of the longest run of heads in 1000 flips? How likely is it that a career .300 hitter will get 6 consecutive hits at some point in a 600 at-bat season? In this session we will examine recursive approaches to solving problems like these, and we will use the power of Excel spreadsheets and the TI-84's programmable features to generate numerical solutions.
(Also Saturday 9:45)

Discovering Trigonometry **Watts 306**
Susan Keeble, Phillips Exeter Academy, Exeter, NH
If you had no textbooks, how would your students learn the principles of trigonometry? Through a series of problems, we will develop some of those principles in a way that will make your students believe they have discovered them for the first time!
(Also Friday 2:30)

World Oil Production – Have We Reached Our Peak? **Watts 315**
Maria Hernandez, NCSSM, Durham, NC
Using Precalculus and Calculus methods, we can analyze world oil production data and predict when world oil production will reach its peak. This problem is suitable for Precalculus students using compositions and transformations of functions. The problem is also suitable for Calculus students using difference quotients and differential equations.
(Also Saturday 10:50)

11:30-12:20

Session 3 - Choose One

Fun with Calculus **E-Lab**
Kay Fenton, Episcopal High School, Baton Rouge, LA
Calculus can be fun! I will share games and activities that reinforce calculus concepts in a meaningful and creative way. Topics included will be related rates, optimization, integration, volume, and more. Handouts will include ready-to-use projects and activities.
(Also Friday 2:30)

Reflecting on Our Pedagogy **Lecture Hall**
Carol Malloy, University of North Carolina, Chapel Hill, NC
Pedagogy that teachers use daily is an important part of their teaching and the learning of their students. After every class, teachers naturally reflect on what occurred during the class and question if their pedagogy addressed the needs of students and was effective in delivering the intended content. The goal of this session is to provide a rationale for a tool that will help teachers reflect on and modify their pedagogy to maximize student learning and understanding.
(This session will not be repeated)

Age Structured Population Models **Watts 301**
Allen Martin, Loyola High School, Los Angeles, CA
We will examine linear models that allow us to gain insight into how populations with distinct age groups, or developmental stages, can behave. These models utilize elementary matrix algebra at a level appropriate for a Precalculus course. The models will include those of Leslie and Usher. Bring your TI-83 or TI-84 calculator; programs will be shared.
(Also Saturday 9:45)

Continued... 11:30-12:20	<p>Just “Plane” Math <i>Philip Rash, NCSSM, Durham</i> See how some fun with a GPS (Global Positioning System) receiver can lead to some interesting math. We’ll analyze "real-life" distance and speed versus time data, as well as explore connections to parametric equations, trigonometry, regression, and maybe more. (Also Saturday 11:55)</p>	Watts 306
	<p>Variances Add (Sometimes): Confirmation and Consequences for AP Statistics <i>Gloria Barrett, NCSSM, Durham, NC</i> This session will provide activities to confirm the important property that variances for the sum and difference of independent random variables add and demonstrate that this property is not true when variables fail to be independent. We will also look at how this property underlies several topics in the AP Statistics curriculum. (Also Saturday 10:50)</p>	Watts 315
12:20-1:20	LUNCH	NCSSM Cafeteria
1:25-2:15	<u>Session 4 - Choose One</u>	
	<p>Using TI Navigator Activity Center with Graphical Transformations of Functions <i>Fred Ferneyough, Harold Brathwaite Secondary School, Brampton, Ontario</i> TI Navigator is a powerful teaching tool that can change the way we teach mathematics. In particular, the Activity Center adds a completely new dimension to our classrooms. In this session I will demonstrate how I have used the Activity Center to engage students in the study of graphical transformations of functions. (Also Saturday 10:50)</p>	Watts 5
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	<p>Sampling: Strategies, Simulations, and Rationale <i>Peter Flanagan-Hyde, Phoenix Country Day School, Paradise Valley, AZ</i> This session will examine the three basic types of sampling that are part of students’ introductory experience with statistics: simple random sampling, stratified sampling, and cluster sampling. We’ll look at how and when each of the sampling methods is most appropriate and at the rationale for each of the methods based on elements of sampling theory. Calculator simulations that support the understanding of these rationales and lead to a better understanding of sampling variability with each of the methods will be presented as well. (Also Friday 3:55)</p>	Watts 301

Continued... 1:25-2:15	<p>New Data Collection Activities <i>Dedra Eatmon, NCSSM, Durham, NC</i> Looking for some new data collection activities? Try your hand at moving root beer with straws, adjusting a rope swing by tying knots, or predicting how the oscillations of a spring dampen over time. Small groups will collect data, find a model, use the model to make predictions, and share results with the whole group. (Also Friday 3:55)</p>	Watts 306
	<p>Sickle Cell Anemia and Malaria <i>Julie Graves, NCSSM, Durham, NC</i> The presence of sickle cell alleles in the gene pool is both a blessing and a curse. A person with one sickle cell gene is protected from malaria; a person with two sickle cell genes will have the sickle cell trait. Using some simple probability models and recursive equations, we will study the proportion of sickle cell alleles in the gene pool and how it changes from one generation to the next. (Also Saturday 9:45)</p>	Watts 315
2:30 - 3:20	<u>Session 5 - Choose One</u>	
	<p>Recursion – From Both Mathematical and Computer Science (Python) Perspectives <i>Anna DeConti and John Morrison, NCSSM, Durham, NC</i> We will discuss several problems involving recursive models from both the mathematical and computer science perspectives. Participants will experiment with these using both the TI-84 and the Python interactive shell. No prior knowledge of programming is assumed. (Also Saturday 11:55)</p>	E-Lab
	<p>Capture/Recapture Revisited <i>Floyd Bullard, NCSSM and Duke University, Durham, NC</i> The "capture/recapture" strategy for estimating population sizes is fairly well-known to math teachers and is often taught in middle school as an application of proportions. In this session we'll revisit the problem as a classroom simulation activity with the goal of estimating not only a population size, but also a reasonable margin of error. The activity makes a nice first-day-of-school lesson for a statistics class and may also enrich the Precalculus or Advanced Functions and Modeling curriculum. (Also Friday 9:00)</p>	Lecture Hall
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Continued... 2:30-3:20	<p>Advanced Functions and Modeling Alternative Assessments <i>Stefanie Buckner, Wake Forest Rolesville High School, Wake Forest, NC</i> Various assessment tools for AFM, ranging from in-class "labs" to take-home projects, will be presented. In addition, I will share tried-and-true grading rubrics and proven tactics for assessing these alternative assessments. (This session will not be repeated)</p>	Watts 306
	<p>Discovering Trigonometry <i>Susan Keeble, Phillips Exeter Academy, Exeter, NH</i> If you had no textbooks, how would your students learn the principles of trigonometry? Through a series of problems, we will develop some of those principles in a way that will make your students believe they have discovered them for the first time! (Also Friday 10:25)</p>	Watts 315
3:20-3:50	REFRESHMENTS	ETC Student Center
3:55-4:45	<u>Session 6 - Choose One</u>	
	<p>Movies (and Curve Fitting) in Math <i>John Goebel, NCSSM and Durham Academy, Durham, NC</i> An Algebra II lab activity where students throw a ball as close to vertical as possible and capture the entire path using the "movie" feature of a digital camera will be shared in this session. By using any three points (frames), students can find the quadratic function that models the height of the ball. They can use this function to check the residuals for the other points, predict the highest point, and find the time when the ball hits the ground. (Also Friday 10:25)</p>	E-Lab
	<p>One More Box Problem <i>Landy Godbold, The Westminster Schools, Atlanta, GA</i> Can you really build a box like that? Take a mathematical look at real boxes to investigate what is, and is not, possible. See what carpentry, graph theory, and the topology of the sphere have in common. <i>You might be surprised!</i> (Also Saturday 10:50)</p>	Lecture Hall
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Getting to the Fundamental Theorem of Calculus via Euler's Method
Peggy Craft, NCSSM, Durham, NC

Watts 315

Most Calculus books jump from *derivative* to *area under a curve* and then connect the two via the Fundamental Theorem of Calculus. Instead, we'll start with the function $f'(x) = \frac{dy}{dx}$, use Euler's Method to determine displacement on the graph of $y = f(x)$, and then see how this is equivalent to the area under the graph of $f'(x) = \frac{dy}{dx}$.

(Also Friday 9:00)

5:00-5:30

Shuttle from Watts Lobby to the Durham Marriott Hotel

BANQUET AT DURHAM MARRIOTT HOTEL

6:00

Social Hour (Cash Bar)

**Durham
Marriott Hotel**

7:00

DINNER

**Durham
Marriott Hotel**



Saturday, January 28

7:30-8:15 Shuttle from Durham Marriott to NCSSM

7:45-8:20 CONTINENTAL BREAKFAST

ETC Student
Center

8:30-9:30

Plenary Session

ETC Auditorium

Seeking Common Ground

Jeremy Kilpatrick, University of Georgia

The so-called math wars have generated intemperate statements of all shapes and sizes. I'll describe some efforts to get consensus in our efforts to teach a mathematics that is both contemporary and classical. In particular, I'll discuss how the Mathematical Association of America is attempting to facilitate the peace process and where that attempt seems to be leading.

9:45-10:35

Session 7 - Choose One

Sickle Cell Anemia and Malaria

E-Lab

Julie Graves, NCSSM, Durham, NC

The presence of sickle cell alleles in the gene pool is both a blessing and a curse. A person with one sickle cell gene is protected from malaria; a person with two sickle cell genes will have the sickle cell trait. Using some simple probability models and recursive equations, we will study the proportion of sickle cell alleles in the gene pool and how it changes from one generation to the next.

(Also Friday 1:25)

New Problems from Old

Lecture Hall

Dan Teague, NCSSM, Durham, NC

We will consider linear equations in general form $ax + by = c$ with various restrictions on a , b , and c . Students can make conjectures and offer proofs to support their conjectures about the behavior of this family of lines. We will then consider how we can modify our initial problem to create new, and more challenging problems and how we will need to modify our proofs to handle the new situation. The mathematics is Algebra II, but the problems will challenge top precalculus students.

(This session will not be repeated)

Exploring Probabilistic Runs Using Recursion, Excel and the TI-84

Watts 301

Chris Jones, Horace Mann School, Riverdale, NY

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(Also Friday 9:00)

10:50-11:40 **Session 8 - Choose One**

Sequences and Series – A Recursive Approach **E-Lab**
Nils Ahbel, Deerfield Academy, Deerfield, MA
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Continued... 10:50-11:40	<p>Variations Add (Sometimes): Confirmation and Consequences for AP Stats <i>Gloria Barrett, NCSSM, Durham, NC</i> This session will provide activities to confirm the important property that variances for the sum and difference of independent random variables add and demonstrate that this property is not true when variables fail to be independent. We will also look at how this property underlies several topics in the AP Statistics curriculum. (Also Friday 11:30)</p>	Watts 306
11:55-12:45	<u>Session 9 - Choose One</u>	
	<p>Recursion – From Both Math and Computer Science (Python) Perspectives <i>Anna DeConti and John Morrison, NCSSM, Durham, NC</i> We will discuss several problems involving recursive models from both the mathematical and computer science perspectives. Participants will experiment with these using both the TI-84 and the Python interactive shell. No prior knowledge of programming is assumed. (Also Friday 2:30)</p>	E-Lab
	<p>Population Growth Models – Discrete and Continuous <i>Dan Teague, NCSSM, Durham, NC</i> In this session, we will compare discrete and continuous models for population growth, and see why continuous models are sometimes used even when discrete models seem to be more realistic descriptors of the true situation. (This session will not be repeated.)</p>	Lecture Hall
	<p>Let’s Play Taxman! <i>Tom Walters, Bradley, CA</i> This session will provide an introduction to and analysis of a number theoretic game called Taxman. In its simplest form, Taxman can be played by elementary school students, but as the level of difficulty increases it can be used to promote mathematical discussion, produce verbal arguments or proofs, and, at the Algebra II or Precal level, apply algebraic skills to analyze theoretical vs possible results. (Also Friday 9:00)</p>	Watts 301
	<p>Just “Plane” Math <i>Philip Rash, NCSSM, Durham</i> See how some fun with a GPS (Global Positioning System) receiver can lead to some interesting math. We’ll analyze "real-life" distance and speed versus time data, as well as explore connections to parametric equations, trigonometry, regression, and maybe more. (Also Friday 11:30)</p>	Watts 306
	<p>Sharing AFM Ideas and Experiences <i>Dot Doyle, NCSSM, Durham, NC</i> AFM teachers will share experiences of using extended problems in real-life settings to achieve specified goals of the NC Standard Course of Study for AFM. This session is designed as a follow-up to the AFM summer workshops of June 2004 and June 2005; however, anyone who is interested is welcome. We will also look at ways to implement good ideas we have heard at this conference. (This session will not be repeated.)</p>	Watts 315
12:45-1:45	LUNCH Letters of Participation Distributed in Cafeteria	NCSSM Cafeteria
1:00-2:00	Shuttle from the ETC Lobby to Durham Marriott Hotel	

