Abstracts for Contributed Papers: 2013 Section Meeting

(Note: due to scheduling constraints, some talks may be moved to other sessions)

Session: Undergraduate

Speaker: Blane Burge
Title: Becoming a High School Teacher…Everything You Wanted To Know (In 10 Minutes)
Abstract: My presentation will provide information regarding my becoming a secondary mathematics educator and the daily procedures I have experienced as a student teacher this semester at Wagoner Public Schools. I will discuss topics such as the process of becoming a teacher, the certification requirements in Oklahoma, the advantages/disadvantages of being a secondary teacher, and my personal experiences to date during my full internship.
Faculty Mentor: John Diamantopoulos

Speaker: Courtney Simmons
Title: The Fundamentals of Functions: Transforming Basic Definitions into Tangible Relations
Abstract: Many students find the transition from computational mathematics to the rigor of proof work difficult. By introducing tangible, colorful objects into traditional lectures, instructors can engage visual and kinetic learners and help demystify perplexing topics. Using this tactile approach, we've developed a collection of objects that can be used to illustrate relations and functions.
Faculty Mentor: Kristi Karber

Speaker: Samantha Driskill
Title: A Study of Subracks
Abstract: Racks were introduced in 1959 by G. Wraith and J. Conway as a wreckage of groups, and have been used in various topics of mathematics. In this project, we aim to establish certain classical results known for subgroups on subracks.

Speaker: Alberto Argot
Title: Oklahoma's Largest Brachistochrone and Other Gymnasium-Sized Curves of Descent
Abstract: Inspired by a viral "youtube" video of a giant water-slide, we take the brachistochrone problem to great heights. We reexamine the classic 17^{th} Century problem regarding curves of quickest descent on the largest scale we could manage, namely the wall of a gymnasium. We design, build, and evaluate several curve candidates (brachistochrone, linear, power-curve, exponential, sinusoidal), and compare their descent times as well as their match with theoretical predictions. We also answer, along the way, whether the video corresponds to reality.
Faculty Mentor: Brian Turner

Speaker: Stephen B. Gregg & Juan Orozco
Title: Modified Tower of Hanoi Puzzle, A Difference Equations Approach
Abstract: We explore ways to find the minimum amount of moves to complete a modified version of the Tower of Hanoi puzzle using difference equations. First we demonstrate how the minimum number of moves for the original game can be found using this approach. Next we show how our modified puzzle differs, and how we can apply the same techniques to this puzzle.
Faculty Mentor: B. Hopkins, K. Karbar, T. Milligan

Speaker: Bobby Carnes, Stephanie Maas, Bailey Sinnett, and Daniel Somers
Title: Statistical Analysis of Attendance in the NBA and NCAA
Abstract: We use regression analysis to see what various factors determine attendance at home basketball games. Since attendance affects revenue, this problem has value to any basketball program or venue. In particular, we compare factors that drive attendance at the professional and college level and whether they are different or not.
Faculty Mentor: Andrew Wells

Speaker: Glendon Jenkins
Title: Mathematics of Quantum Computation
Abstract: This paper examines the concept of quantum computing. The theoretical processes of quantum computation are examined and some possible mathematical representations for representing the particles and executing appropriate algorithms is investigated.
Faculty Mentor: Matt Myers

Speaker: Stephen Adams
Title: RSA, Malwares and Algorithms… Profit?
Abstract: The RSA encryption used to protect messages from prying eyes relies on the complexity of factoring large integers. But with the increased sophistication of algorithms and the access to more powerful computers and wider networks, this security is becoming more and more elusive. This study investigates the size of the RSA keys needed to ensure an optimal level of protection for important information.
Faculty Mentor: Matt Myers

Speaker: Heather P. Magee
Title: Bound Smoothing Using Euclidean Squared Distance Matrices
Abstract: A distance matrix A which encodes squares of pairwise distances in matrix form is known as a Euclidean Squared Distance Matrix (ESDM). Bordered ESDMs are useful in determining the embedding dimension of points in space. We investigate known methods that use these bordered ESDMs to improve the bounds on unknown distances of four points in three dimensional space (using the tetrangle inequality) and extend these ideas to five points.
Faculty Mentor: Thomas Milligan

Speaker: Matthew Manning
Title: Introduction to the Exterior Matrix Method
Abstract: I will introduce the Exterior Matrix Method to compute the approximate eigenfrequencies for serially connected elements, each governed by a system of four first order linear partial differential equations.
Faculty Mentor: William Paulsen

Speaker: Andres Calderon Jaramillo
Title: Modeling Jazz Artist Similarities Mathematically
Abstract: This project attempts to quantitatively model similarities among jazz piano artists by building a relatively simple probabilistic system. We limit our study to monophonic melodies which we assume retain much of the essence of an artist's style. Our current model makes use of Markov chains to capture the substance and structure of a musical piece.
Faculty Mentor: Larry Lucas

Speaker: Chris Eckler
Title: The Fermat Point and its Properties
Abstract: Discussion over Pierre de Fermat and the discovery of the Fermat Point and it's properties.
Faculty Mentor: Anne Fine

Speaker: Laura White
Title: Constructions and Properties of Optimal Statistical Designs
Abstract: This project examines statistical designs called non-regular fractional factorial designs. Regular fractional factorial designs are widely used experimental designs for studying effects of two or more variable simultaneously, but leave large gaps in run size. Non-regular fractional factorial designs can be constructed for every run size that is a multiple of four, which allows run size flexibility and economy. My research focuses on construction of optimal designs of size 32 runs using graphic processing unit (GPU) technology, with a primary objective of providing, for the first time, comprehensive design tables for the best 32 runs designs available. Creating design tables make it possible for engineers and scientist to plan experiments for any combination of runs and number of variables to be studied.
Faculty Mentor: Hong Zhou

Speaker: Richard Hwang
Title: Endomorphism Approach to_(a,b,c)-Sequences
Abstract: An (a,b,c)-sequence is a certain recursive sequence depending on three parameters. To find a general form of the n^{th} (a,b,c)-number it is required to make at least n steps. In this presentation, by using matrix representations of special endomorphisms of R^3 a special computing program is created to reduce the number of steps in computation of the (a,b,c)-number.
Faculty Mentor: Andrew Bucki

Speaker: Matthew Harding
Title: Investigating an Interesting Case of Critical Points
Abstract: In this project we consider three functions in R^3. Each function has critical points that also fail to pass the second derivative. With that we examine the graph and determine the common properties between the different functions.
Faculty Mentor: Heather Hannah

Speaker: Jack Surine
Title: Subspace approach to_(a,b,c)-sequences
Abstract: An (a,b,c)-sequence is certain recursive sequence depending on three parameters. To find a general form of the n^{th} (a,b,c)-number it is required to make at least n steps. In this presentation, by using subspaces of special vector spaces, the special computing program is created to reduce the number of steps in computation of the (a,b,c)-number.
Faculty Mentor: Andrew Bucki

Speaker: Princess Hays
Title: Dynamics of the Spread of Co-Colonized Staph Infections in Hospitals
Abstract: We investigate the in-hospital transmission dynamics of two Staphylococcus aureus(MRSA) strains, also referred to as staph: hospital-acquired Staphylococcus aureus (HA-MRSA) and community-acquired Staphylococcus aureus (CA-MRSA). Staph is a bacterium that causes serious infections in humans and is resistant to treatment with the widely used antibiotic methicillin.Under the assumption that patients can only be colonized with one strain of MRSA at a time, global results show that competitive exclusion occurs between HA-MRSA and CA-MRSA strains; the strain with the larger basic reproduction ratio will become endemic while the other is extinguished. Co- colonization has a different effect than single colonization. Mutual exclusion does not exist when co-colonization is present; however, competitiveness is still present. Population of patients infected with both staph strains ultimately has greatest population. Decolonization will remove or extract one staph strain at a time.Patients will transfer to either CA-MRSA state or HA-MRSA state before being able to transfer to Susceptible state.
Faculty Mentor: Abebaw Tadesse & Andrew Bucki

Speaker: Andrew Patrick Noel
Title: Spontaneous Symmetry breaking of SU(2) to discrete subgroups
Abstract: Spontaneous symmetry breaking is observed throughout nature, in particular, hidden symmetries of the Special Unitary group of order 2 [SU(2)]; for example in the study of the Higgs Boson. Here I motivate the study of symmetry breaking with some simple examples and motivate the study of a 5 and 6 dimensional representation with applications in particle physics. Then I quote some known results and I present some new results for the 4 index [5 dimensional] representation. This could help explain stable dark matter in the universe. I finish with some comments on other applications of this study.
Faculty Mentor: Kaladi Babu

Speaker: Natanya Clark
Title: Mathematical and Numerical Approaches on Dynamic Contact of Thermoelastic Rods
Abstract: We study mathematical tools and numerical schemes for solving a system of PDEs that describes the displacement and temperature of a theroelastic rod. We set up time discretized numerical formulations using a hybrid of the midpoint rule and the implicit Euler method. FEM is applied for the fully discrete case. The stability of the formulations is examined.
Faculty Mentor: Jeongho Ahn

Speaker: Austin Christian
Title: Rational Approximations to Irrational Numbers
Abstract: We will discuss how well irrational numbers can be approximated by rational and classify them by this measure of "approximability". We will make mention of Louiville's theorem and transcendental numbers and, if time permits, touch on the more recent accomplishments of Roth in this field.
Faculty Mentor: Steve Smith

Speaker: Ryan Berkley
Title: Cumulative Probability of events with the same expected value
Abstract: Given events of probabilities p and q, whose expected values are equivalent, I am looking to calculate the probability of reaching one cumulative threshold of a specific number of occurrences of the two events.
Faculty Mentor: Mark Buckles

Speaker: Jeremy Acre
Title: An Investigation of the Game Hi Ho! Cherry-O Using Markov Chains
Abstract: We explore the use of Markov chains in board games; specifically we apply them to the game *Hi Ho! Cherry-O*. Our main goal is to see how changing the game's rules will affect the number of turns the game takes to complete. Using Markov chains and matrices we were able to calculate the expected length of a game. We found that changing the values of the different sections on the spinner affected the game length differently. Particularly, the cherry sections changed the game length more than any other section.
Faculty Mentor: Nicholas Zoller

Session: Graduate

Speaker: Dipendra Regmi
Title: Introduction to the global regularity of the dynamical systems
Abstract: In this talk we introduce the ordinary differential equations and partial differential equations with some applications. The global regularity of the dynamical systems especially Navier-Stokes equations and Magnetohydrodynamic equations will be discussed.

Speaker: Kritika Chhetri
Title: Modeling Riemann Sum: A journey from informal to more formal mathematics
Abstract: This study focuses on the mental challenges that students face and how they resolve those challenges in constructing a formal mathematical structure of Riemann sum while modeling "real life" contexts. In this talk, I will emphasize how two Calculus I students' ways of acting and reasoning about their first two tasks supported them in reasoning about a third task.

Speaker: Melissa Mills
Title: A Multidimensional Analysis of Instructor Questions in Advanced Mathematics Lectures
Abstract: This study is an investigation of the questions that are asked by four faculty members who were teaching advanced mathematics. Observations of each classroom were conducted, and the questions asked by the instructor were analyzed along two dimensions: the expected response type of the question and the Bloom's Taxonomy level.

Speaker: Kazuo Yamazaki
Title: On the stochastic Navier-Stokes equations
Abstract: We study the problem of stochastic Navier-Stokes equations and discuss recent progress in this direction.

Speaker: Ashton Erwin
Title: Bounded Area Tests For Comparing the Dynamics Between ARMA Series
Abstract: This talk presents a new test for discerning whether or not two independent, causal autoregressive moving average (ARMA) processes have the same autocovariance structure. This test utilizes a specific geometric feature of a time series plot of observations - namely, the area bounded between the line segments that connect adjacent points and the time axis. It will be shown that if you sample two ARMA processes and calculate the magnitudes of the two resulting bounded areas, then a significant difference among these areas tends to imply a significant difference in autocovariance structures. The raw numerical difference in areas specifically ends up being the pivot of a test statistic that is shown to be asymptotically normal. Simulations are used to assess the performance of the so-called bounded area test when it is put up against other tests which also aim to compare series dynamics.

Speaker: Wilhelmina Wise
Title: Potential Theory and Geometry of the Farthest Distance Function
Abstract: The farthest distance function of a compact set can be expressed via the potential of a unique unit measure. In the case of polygons this measure is equivalent to a sum of certain angles. We use this relationship and a result of Gardiner and Netuka, originally conjectured by Laugesen and Pritsker, to obtain a geometric statement about sums of certain angles.

Speaker: Barbara Trigalet
Title: Teaching Methods and Student Performance in Calculus I
Abstract: Preliminary results of a descriptive study on the teaching methods employed in Calculus I classrooms at Oklahoma State University and performance of students on the Calculus Concept Inventory and final examination.

Speaker: Melissa Mills
Title: Finding a SET-less Set
Abstract: This talk describes a relationship between the cards of the game SET and the field F_81. In particular, we will show how to use the field structure to generate a maximal collection of cards that does not contain a SET.

Speaker: Robert Monteforte II
Title: The Space Elevator: It's Mathematical Model
Abstract: In this work, we use Timoshenko Beam Theory to model the contact of a space shuttle on a spare station rigidly attached to a space elevator. Fully numerical schemes are considered based on a time discretization over the time space and the finite element method over the spatial domain.

Speaker: Benjamin Wescoatt
Title: Student Conceptions of Verifying Trigonometric Identities: Using Word Clouds in Educational Research
Abstract: Word clouds are visualizations of texts that are generated according to the frequency of words in the texts. Originating from blogs and other website applications, word clouds (also known as tag clouds and content clouds) have potential usage as a complimentary research tool. This talk will discuss the manner in which word clouds, created by wordle.com, acted as a unifying technique for a mixed methods study. In the study, students assessed five verification attempts of a trigonometric identity and explained each assessment score. Clouds generated from the score explanations confirmed and informed a quantitative analysis of the scores. Additionally, the clouds provided a "quick and dirty" qualitative analysis, forming initial themes for an in-depth qualitative analysis of the explanations. Results of the analyses, including several word clouds, will be shared.

Session: General

Speaker: James R. Choike
Title: A Brief History of the OK-AR Section
Abstract: This year marks the 75th Anniversary of the OK-AR Section. In this session I would like to review the early history of the Mathematical Association of America (MAA) and the early history of the OK-AR Section of the MAA. The session will highlight important members and events that were instrumental in forming the MAA and the OK-AR section.

Speakers: Kenneth Ward
Title: Counting points over prime fields
Abstract: We investigate the relationship between basic differential equations, and point counting over finite fields. Our results reveal some interesting upper bounds on the number of rational points for functions associated with transcendence theory and elliptic curves.

Speaker: Fred Worth
Title: Which Baseball Triple Crown Winner was most dominant?
Abstract: With Miguel Cabrera's 2012 triple crown, interest has been restored in the accomplishment which had not happened since 1967. We will consider what "dominant" should mean in this context and which triple crown was most dominant.

Speaker: Marcel B Finan
Title: The Actuarial Science Discipline: A Career Option for Math/Stat/Business Majors
Abstract: Becoming an actuary can be a very rewarding job option for students majoring in Mathematics, Statistics, or Business. In this presentation, we will discuss issues related to the actuarial science discipline that might be of interest to mathematics educators.

Speaker: Thomas Milligan
Title: The Cone of ESD Matrices
Abstract: It can be shown that the set of Euclidean Squared-Distance (ESD) Matrices form a convex cone, related to the cone of positive semi-definite (PSD) matrices. We explore some basic facts about this relation to better understand the geometry of this cone.

Speaker: Linda Hand
Title: Searching for Zenith Passage in the Temples of Indonesia – Places the History of Math has Taken Me
Abstract: In 2003, I became involved with the Maya Exploration Center when I attended a Chautauqua course in Palenque, Mexico. The directors, Dr. Christopher Powell and Dr. Ed Barnhart, were studying geometry in the structures and artwork of the Maya. They also studied building alignments and architecture to discover what the Maya knew about astronomy and how they used that knowledge. Over the past ten years, we have traveled to Peru to study Inca structures and to Cambodia to study ancient Khmer architecture in the temples at Angkor. Last October we went to Indonesia to examine the temples in hopes of finding knowledge of zenith passage like we had found in Mexico and Cambodia. Although I will not be discussing very much math, the importance of the study of the history of math, at least in my life, will be a feature of the talk.

Speaker: Mark Buckles
Title: The Forest of Ordinal Numbers
Abstract: The purpose of this talk is to define the notion of a well ordered set and the notion of an ordinal number. I will also to look creatively at different ways of representing large sections of the ordinals and show how they can be used to tell us things about the natural numbers.

Session: Algebra

Speaker: Andrei Pavelescu
Title: Some Maximal Commutative Matrix Rings
Abstract: The motivation for the results present in this paper lies with an open problem from Charles Weibels online version of *The K-Book: An Introduction to Algebraic K-Theory*. In the second chapter of the book, Weibel generalizes the notion of $K_0(R)$ for non-commutative rings R, provided one can show that maximal commutative subrings of simple Artinian rings are finite products of zero dimensional local rings. In this paper we prove a slightly stronger result.

Speaker: David J. Wright
Title: Cubic Equations and Cubic Fields
Abstract: We will show how to solve cubic equations by means of "completing the cube" using linear transformations, as an introduction to studying cubic number fields by means of the representation of GL(2) in the space of binary cubic forms. We will then briefly discuss examples of new identities relating cubic fields of positive and negative discriminants as conjectured by Ohno and proved by Nakagawa and reformulated and generalized in Dioses' Ph.D. thesis, Oklahoma State University, 2012.

Speaker: Nathan Bloomfield
Title: On partial algebras of difunctional relations
Abstract: We examine the (partial) algebra of difunctional relations on a fixed set X; these relations are the isomorphisms among quotients of X, analogous to permutations (isos on X) and one-to-one partial functions (isos among subsets of X). We also give an axiomatization of these algebras, analogous to the classes of groups and inverse semigroups.

Speaker: Guy R. Biyogmam
Title: Leibniz homology of the Generalized Poincare algebra
Abstract: In this talk, we discuss how Lodder's structure theorem for Leibniz homology can be used to calculate the Leibniz homology of the Generalized Poincare algebra. In particular, we present our construction of several relativistic invariants in terms of balanced tensors and the Leibniz homology in terms of these invariants.

Session: Analysis

Speaker: Tom McNamara
Title: Automorphisms of Nilpotent Lie Groups
Abstract: We discuss an interesting realization for automorphisms of free, two-step, nilpotent Lie groups. Further, we show how these pertain to harmonic analysis on these non-abelian groups.

Speaker: Abebaw Tadesse & Andrew Bucki
Title: Compact Composition Operators on Schatten Class composition operators on certain weighted Bergman spaces of simply connected domains.
Abstract: For a simply connected domain *G* properly contained in $\mathbb{C}$ we apply the results ofWolf, et al (2001) and J. H. Shapiro, et al (2003) to extend the results of Tadesse, A. et al (to appear) to Schatten Class composition operators on certain weighted Bergman spaces of simply connected domains $A^2_\nu(G)$.

Session: Applied Math

Speaker: Chen Zhang
Title: Spatially Explicit Population-genetics Modeling in a Discontinuous Habitat and in the Presence of an Allee Effect
Abstract: We introduce a population-genetics model with an Allee effect in a discontinuous habitat. We numerically obtain a number of fixed points, analyze them and obtain asymptotic approximations for them. We observe and study an interesting phenomenon which we call an "explosion ring". Last We explore how the fixed points are affected by changes in the important parameters the resistance of the heterozygote in the toxic crop area and dispersal standard deviation.

Speaker: Brittany Bannish
Title: Modeling the Role of Inhibitors in Blood Clot Degradation
Abstract: Fibrinolysis is the enzymatic degradation of blood clots. Understanding how blood clots degrade is important from both physiological and clinical standpoints. I will discuss my mathematical model of fibrinolysis and how the presence of fibrinolytic inhibitors affects the progression of degradation. The goal of this research is to suggest potential targets for clinical fibrinolytic therapy.

Speaker: Sean Laverty
Title: Population structure and oscillations in epidemics
Abstract: In this talk I will introduce a framework for incorporating individual-level immunological details into traditional population-level epidemiological models. I will discuss dynamics and their implications for public health and pathogen ecology.

Session: Topology

Speaker: Andrew Bucki & Abebaw Tadesse
Title: Geometric Properties of Special Topological Spaces using Algebraic Methods
Abstract: Classical approach to study geometric properties of topological spaces was the use of special invariants of groups of transformations generated by the differentiation of real-valued functions defined on the Euclidean space, that is, the use of methods of Differential Geometry. When the special topological spaces, manifolds, were introduced, the main question was how a given manifold differs from the product manifolds of spheres and/or tori. Recently, apart from the classical differential geometrical methods, researchers started using algebraic methods to answer this question. The existence of special endomorphisms of tangent spaces of a given manifold is equivalent with the existence of a diffeomorphism between this manifold and one of the standard spaces. In this presentation we study some geometric properties of a topological group equipped with a manifold structure, a Lie group, by establishing some properties of its Lie algebra that lead to these properties.

Speaker: Ray Hamlett
Title: Lindelof With Respect to an Ideal
Abstract: A topological space is Lindelof with respect to an ideal I if every open cover has a subcollection which covers all the space except for a set in the ideal. Basic properties including preservation by functions, products, and subspaces are investigated.

Speaker: Jesse Johnson
Title: The shape of data
Abstract: Modern science relies increasingly on the analysis of large, high-dimensional data sets. We usually think of data analysis as the domain of statistics or computer science, but under the hood, most approaches to data analysis rely heavily on geometry, and even topology. This talk will explain how one can reformulate a number of problems from data analysis in terms of classical geometry/topology.

Speaker: Elena Pavelescu
Title: Linear embeddings of graphs via oriented matroids
Abstract: The complete graph on nine vertices, K9, has an embeddeding in R^3 which contains no non-split triple link. But if we restrict to the more rigid linear (straight-edge) embeddings, this is no longer true, every linear embedding of K9 contains a non-split triple link. We prove this last statement via oriented matroids. Matroid theory is an abstract theory of dependence introduced by Whitney in 1935. It is a natural generalization of linear (in)dependence. To every linear embedding of K9 one can associate an oriented matroid, and the oriented matroid captures enough information to determine which pairs of

disjoint cycles in the embedded graph are linked. This is joint work with Ramin Naimi.

Speaker: Fred Worth
Title: Inverse Limits with Set-valued Functions
Abstract: Recently Tom Ingram and others have started looking at Inverse Limits with set-valued functions. We will take a brief, introductory look at the topic.

Session: Mathematics Education and Classroom Notes

Speaker: John Diamantopoulos
Title: An Interesting Student-Posed Question in Linear Algebra
Abstract: During an offering of Linear Algebra during fall semester 2012, a student posed a very interesting question. Especially since I hadn't taught Linear Algebra in some years, I hadn't directly thought about this issue in a long while. I asked the question among the general Project NExT email list to see what other fellows thought an answer might be, only to be reminded that it had been asked on other occasions with the group apparently never coming to consensus. This talk will state the student's question along with a creative solution.

Speaker: Anita Walker
Title: Bits of Logic
Abstract: Throughout the undergraduate studies in both Math and Computer Science, the student is exposed to many different symbols, and the context in which a symbol appears can have an impact on its interpretation. Of particular interest are the symbols 1 and 0. Student success and student retention within specific courses as well as within the major can be adversely affected if a broader understanding of symbolic forms is not acquired at an early stage of undergraduate learning. The presentation deals with questions that arose in a recent Discrete mathematics course.

Speaker: Charles L. Cooper
Title: A Mathematician's Reflection on Contemporary College Algebra
Abstract: College Algebra, its content and organization, has morphed significantly from what it was even 20 years ago. This is partly because of the development of new technologies, such as the graphing calculator, and because of the lack of algebra skills of students matriculating from the secondary system into our institutions of higher learning. Because of this latter trend the course in many places has become almost the equivalent of high school Algebra II. The author will attempt to present his view of what the good, the bad, and the ugly are with respect to this transformation including what he sees as the introduction of many ad hoc procedures for solving problems that have little to do with the development of proper mathematical maturity of freshmen students. Additionally, a new vision will be presented for the content and for the use of

technology in college algebra so as to make it a true college level course again.

Speaker: Clyde Greeno
Title: Mathematics As Common Sense: Why Students Are Confounded by Limits
Abstract: The curricular obscurity of limits of functions is a major factor in causing students' first course in calculus to also be their last course in mathematics. Clinical research discloses three factors which contribute to their difficulties. (1) They do not own the "real-ness" of the real numbers: unaware that the dense line of rationals is perforated by a dense line of holes. (2) They do not grasp that "lim" is an operator that carries each real-valued function, f, on R^n into a corresponding real-valued function, limf, on R^n. (3) The delta-epsilon "tolerance" theorem for limf is unduly complicated as a conceptual definition: the glb-lub definition fits much better with more familiar window-zooming. This presentation sketches one way of melding (1), (2), and (3) into a common-sensible development of limits of functions.

Speaker: Andrew Bucki, Ross Pourdavood & Abebaw Tadesse
Title: Programming Approach in Mathematics Teaching – Illustrative Examples: Part I
Abstract: In this presentation we briefly describe new methods in teaching mathematics using programming approach followed by illustrative examples from Abstract and Linear Algebras.

Speaker: Ross Pourdavood, Andrew Bucki & Abebaw Tadesse
Title: Programming Approach in Mathematics Teaching – Illustrative Examples: Part II
Abstract: This presentation is a continuation of Part I with more illustrative examples from College Algebra.

Speaker: Abebaw Tadesse, Andrew Bucki & Ross Pourdavood
Title: Programming Approach in Mathematics Teaching – Illustrative Examples: Part III
Abstract: This presentation is a continuation of Parts I and II with more illustrative examples from Elementary Algebra.

Speaker: David E. Boliver
Title: When I See Numbers I Get Number
Abstract: A participatory review of learning experiences which proved to be useful in promoting both student engagement and understanding of the nature of mathematics during a teaching career of 43 years ranging from 8^{th} grade to supervising MS degrees. The title is a borrowed bit of verse much used with Freshmen in two colleges.

Speaker: Michael Dougherty
Title: Teaching from your textbook manuscript

Abstract: I will discuss opportunities, pitfalls and other lessons collected as I used my calculus textbook manuscript as a primary source for students in both Calculus 1 and 2.

Session: Research in Undergraduate Math Education

Speaker: Michael Lloyd
Title: MyMathLab College Algebra Effectiveness Study
Abstract: A study from the fall of 2012 at HSU provided evidence that students using MyMathLab in College Algebra did slightly better on average than those who did not. Also, the conversion of all the sections to MyMathLab for the spring of 2013 will be discussed.

Speaker: John Paul Cook
Title: An Inquiry-Based Approach to Ring Theory
Abstract: In the same vein as Chris Rasmussen's faculty workshop, this talk presents inquiry-based instructional materials that support student reinvention of key definitions from introductory ring theory. The tasks, centering on equation solving and the ring cancellation laws, aim to provide the students with an accessible, informal starting point while also serving to develop the more formal methods of reasoning that are used to characterize and investigate algebraic structure. In particular, sample instructional tasks and a sample student learning trajectory will be presented.

Speaker: John Paul Cook
Title: Presentations of Matrix Multiplication in Introductory Linear Algebra Texts
Abstract: This talk reports on a study that examined methods of content presentation across mainstream introductory linear algebra textbooks. One fundamental concept for which the motivation, explanation, and presentation significantly varied was matrix multiplication. In this talk, these differences will be detailed and the resulting pedagogical implications will be discussed.

Speaker: Eileen Durand Faulkenberry
Title: Do you See What I See? An exploration of classroom perceptions
Abstract: Teacher self-reports on their instructional practices in the classroom can provide valuable data for assessing changes in classroom practices. However, there is a long-standing concern about the validity of self-report data. This presentation will examine this validity by comparing teachers' perception of their classroom practices with third-party observations.

Speaker: Sepideh Stewart
Title: Talking Mathematics: An Abstract Algebra Professor's Teaching Diaries
Abstract: A mathematician's mind with all its complexity and precision comprises a fascinating object to study. This research is an account of collaboration between mathematicians and mathematics educators. In order to examine a mathematician's daily teaching activities and his thought processes, we have

employed Schoenfeld's goal-orientated decision making theory to identify his Resources, Orientations and Goals (ROGs) in teaching an abstract algebra class. Our preliminary results report on a positive atmosphere where all involved freely express their views on mathematics and pedagogy.

Speaker: Thomas J. Faulkenberry
Title: Estimating the Working Memory Requirements of Mental Arithmetic
Abstract: Working memory (or short-term memory) is what we use everyday to process simple information, from remembering phone numbers to doing mental arithmetic. In this research, conducted jointly with Sarah Montgomery, we used a multinomial probability model to measure visual working memory capacity in two conditions. In the first condition, participants responded to a visual task involving remembering colors on a screen. In the second condition, an arithmetic problem was placed in the middle of the task. We found that capacity measures were significantly smaller when the arithmetic problem was featured, indicating that the arithmetic problem "used up" quite a bit of the available working memory capacity. Furthermore, problem difficulty played a role: problems involving a "carry" were even more working memory intensive.

Speaker: Jason Martin
Title: What Reinvention Might Look Like in the Classroom: A Classroom Reinvention of a Formal Sequence Convergence Definition
Abstract: Some recent studies have focused on how students come to understand formal limit definitions. In particular, these studies have detailed how students reinvent definitions while working in pairs, not in a classroom setting. This study expands on this body of research by describing how students reinvented a formal sequence convergence definition by utilizing individual and whole class resources while maintaining intellectual autonomy of the students.

Speaker: Clyde Greeno
Title: Mathematics As Common Sense: Mathematically Empowering College Teachers to Repair their College Curricula
Abstract: American instructional media badly fail to make core-curriculum mathematics (arithmetic through calculus, linear algebra and statistics) mathematically sensible to the students, themselves. That fact underlies the dilemma: (1) that 25% of American students drop out of school; (2) that an additional 35% get high school diplomas, but do not even attempt college; (3) that an additional 25% begin college but drop out; (4) that nearly half who begin college are placed in remedial courses in high school level mathematics; (5) that only a small minority of remedial mathematics students later succeed in college-level mathematics courses; (6) that very large numbers of students who enter college with aspirations for STEM degrees shift to non-stem majors after their first college course in calculus; and (7) that over half of all American adults are at least latent victims of moderate-to-severe "math anxiety."

In order to make curricular mathematics common sensible to students, their instructors must own and use mathematical knowledge beyond what is in the students' books. This session is about that special (MKT) kind of Mathematical Knowledge for Teaching, and how it can mathematically enable teachers to make curricular mathematics more common-sensible to students. Examples will be from college-level courses. A MKT Luncheon Forum sequel will immediately follow the OK-AR Section Meeting, nearby.

Session: Educational Technology

Speaker: Krista B. Hands
Title: Enhancing Teaching with an IPad
Abstract: Technology can be a great tool in teaching. However, use of technology needs to be well thought out, cost effective, transportable and transforming. The IPad meets all of these goals and more! This talk will demonstrate how I have used IPad technology with inexpensive recording software to change the way I teach my courses and to change the way we provide online courses. Come learn how IPad technology can enhance the learning in your classroom too.

Speaker: J.C. Price
Title: Using Camtasia Studio and YouTube in Teaching Mathematics
Abstract: In this talk, we will take a look at some of the ways we have used Camtasia Studio, which is a type of screen video capturing software, and YouTube to enhance, supplement, and at times replace traditional lecturing in various math courses.

Speaker: Maggie Rutsch
Title: LearningCurve: Adaptive Learning in Mathematics
Abstract: LearningCurve is an adaptive quizzing and personalized learning program that puts the concept of "testing to learn" into action. Based on research on how students learn, LearningCurve uses game-like quizzing that motivates students to engage with their course, and offers reporting tools help teachers get a handle on what their class needs to focus on. See how it is used in quantitative reasoning, statistics and math for elementary teacher courses.

Speaker: Beth Light
Title: Brief Demonstration of Enhanced WebAssign
Abstract: Enhanced WebAssign is a powerful instructional tool for instructors and students. It delivers an automatic grading solution for math and science courses, and reinforces student learning through practice and feedback. EWA assists teachers in assessing students in a variety of ways and will even provide an individual study plan. Through EWA, we can improve critical thinking and problem solving skills.