MAA Contributed Paper Sessions
Joint Mathematics Meetings
San Antonio, Texas
January 10 – 13, 2015

CONTRIBUTED PAPER SESSIONS WITH THEMES

TCPS #1. Ethnomathematics: A Tribute to Marcia Ascher
Monday morning, January 12
Description: Ethnomathematics, the study of mathematical aspects of the cultures of indigenous peoples, has been an active area of research for many decades. As more institutions strive to present multicultural offerings to their students, courses on or incorporating ethnomathematics are becoming more popular. This session features talks that present research in ethnomathematics or well-tested ideas for its use in teaching. The session is a tribute to Marcia Ascher (April 23, 1935 – June 11, 2013), who devoted much of her career and life to the development of ethnomathematics.
Organizers: Ximena Catepillan, Millersville University; Amy Shell-Gellasch, Montgomery College; and Janet Beery, University of Redlands
Sponsor: HOM SIGMAA

TCPS #2. Cryptology for Undergraduates
Saturday morning, January 10
Description: In increasing numbers, cryptology courses are being developed to serve the needs of undergraduate mathematics and computer science majors. For mathematics majors, cryptology fits into the undergraduate curriculum in much the same way that number theory does. In addition, cryptology is appearing as a topic in mathematics courses for non-majors, as it is a hook to interest these students in mathematics. This contributed paper session solicits presentations that address topics appropriate for undergraduate cryptology courses for mathematics or computer science majors, or presentations of cryptological topics that could interest and motivate non-mathematics majors.
Organizers: Robert Lewand, Goucher College, and Chris Christensen, Northern Kentucky University

TCPS #3. Mathematics and Sports
Saturday afternoon, January 10
Description: The expanding availability of play-by-play statistics and video-based spatial data, for professional and some collegiate sports, is leading to innovative kinds of research, using techniques from various areas of the mathematical sciences. By modeling the outcome distributions in certain situations, researchers can

develop new metrics for player or team performance in various aspects of a sport, comparing actual results to expected values. Such work often has implications for strategic game management and personnel evaluation. Classic areas of study, such as tournament design, ranking methodology, forecasting future performance, insight into rare or record events, and physics-based analysis, also remain of interest. This session will include both presentations of original research and expository talks; topics related to the use of sports applications in curriculum are welcome. With a broad audience in mind, all talks are requested to be accessible to mathematics majors. Undergraduates and their mentors are particularly encouraged to submit abstracts for consideration.

Organizers: R. Drew Pasteur, College of Wooster, and John David, Virginia Military Institute

TCPS #4. Innovative and Effective Ways to Teach Linear Algebra
Sunday morning, January 11

Description: Linear algebra is one of the most interesting and useful areas of mathematics, because of its beautiful and multifaceted theory, as well as the enormous importance it plays in understanding and solving many real world problems. Consequently, many valuable and creative ways to teach its rich theory and its many applications are continually being developed and refined. This session will serve as a forum in which to share and discuss new or improved teaching ideas and approaches. These innovative and effective ways to teach linear algebra include, but are not necessarily limited to: (1) hands-on, in-class demos; (2) effective use of technology, such as Matlab, Maple, Mathematica, Java Applets or Flash; (3) interesting and enlightening connections between ideas that arise in linear algebra and ideas in other mathematical branches; (4) interesting and compelling examples and problems involving particular ideas being taught; (5) comparing and contrasting visual (geometric) and more abstract (algebraic) explanations of specific ideas; (6) other novel and useful approaches or pedagogical tools.

Organizers: David Strong, Pepperdine University; Gilbert Strang, MIT; and Megan Wawro, Virginia Tech

TCPS #5. Helping Students See Beyond Calculus
Sunday afternoon, January 11

Description: Society needs more and better mathematics and science students. Many talented and promising students lose interest in mathematics—some never take a single mathematics course in college—because they never experience the beauty and importance of the many other areas of mathematics beyond Calculus.   Indeed, many high school students think of mathematics simply as Calculus and the topics leading to Calculus. Students would benefit enormously from more exposure to other areas of mathematics before leaving high school.

This session, a first step toward this goal, will be a forum for sharing presentations which are all of the following:

☐   An introduction to a specific mathematical idea or application;

☐   Accessible to high school Calculus students;

☐   Certainly interesting, hopefully entertaining, possibly captivating;

☐   Self-contained;

☐   Less than 45 minutes;

☐   Available online (for now, posted at their authors' own websites);

☐   Comprised of slides (e.g. power points), video or audio clips, tools for experimentation and visualization, etc., and may include worksheets of problems for students to think about or work on.

High school teachers (or anyone else) could download, or access online, the presentations and supporting materials to use in their classes in the weeks after the AP exam. Speakers in this session will share a condensed (10 – 15 minutes) version of their presentation.

Organizers: David Strong, Pepperdine University; Courtney Davis, Pepperdine; Angela Spalsbury, Youngstown State University; and James Tanton, MAA

TCPS #6. Trends in Undergraduate Mathematical Biology Education

Monday afternoon, January 12

Description: Several recent reports emphasize that aspects of biological research are becoming more quantitative and that life science students, including pre-med students, should be introduced to a greater array of mathematical, statistical, and computational techniques and to the integration of mathematics and biological content at the undergraduate level. Mathematics majors also benefit from coursework at the intersection of mathematics and biology because there are interesting, approachable research problems and mathematics students need to be trained to collaborate with scientists in other disciplines particularly biology.

Topics may include scholarly work addressing the issues related to the design of effective biomathematics course content, courses and curricula, the integration of biology into mathematics courses, student recruitment efforts, the gearing of content toward pre-med students, undergraduate research projects, effective use of technology in biomathematics courses, preparation for graduate work in biomathematics and computational biology or for medical careers, and assessment issues.

Organizer: Timothy Comar, Benedictine University

Sponsor: BIO SIGMAA

TCPS #7. Using Flipping Pedagogy to Engage Students in Learning Mathematics

Tuesday morning, January 13

Description: While the expression "flipping a course" is relatively new, this pedagogical strategy has been around for a number of years. Tenets that underlie

this type of pedagogy are that basic definitions, theorems and examples can be delivered via videos or readings prior to class and that time in class can be better spent assimilating and applying knowledge on more complex problems and activities. Recently, inverted instruction or "flipping" pedagogy has gained traction in university mathematics departments. For this session we invite participants to submit proposals about their experiences teaching inverted mathematics courses. We welcome descriptions of curriculum materials, innovative instructional designs, technology, and assessment strategies to support students' engagement and learning in flipped classrooms. Accounts of different models of flipping pedagogy for small and large classes, and in introductory through advanced courses, are also welcome. Reports of results from preliminary studies or comprehensive research projects on flipping pedagogy will also be suitable for this session.
Organizers: Jean McGivney-Burelle, Larissa Schroeder, Fei Xue, and John Williams, University of Hartford

TCPS #8. Teaching Inquiry
Tuesday afternoon, January 13
Description: We need to teach our students more than the content of our courses; we need to teach them how to ask and explore questions - a skill that we call mathematical inquiry. This kind of learning is challenging for students and teachers and requires new methods; sharing these ideas can help us all improve. In this session, we will explore the ways that mathematics instructors support students' mathematical inquiry as well as the ways we prepare students to ask and investigate mathematical questions after they leave the classroom.

This session will include scholarly presentations on (1) successful methods or assignments designed to teach students to ask and explore mathematical questions and (2) the consequences of teaching mathematical inquiry for the students' skills, attitudes, and beliefs. We especially encourage talks about helping students begin to ask novel questions as part of undergraduate research, about mathematics education research concerning student questioning behaviors, and about teaching non-majors to ask good mathematical questions. We also welcome courses from the inquiry-based learning tradition, but ask that they emphasize teaching students to ask questions.
Organizers: Brian Katz, Augustana College, and Elizabeth Thoren, University of California Santa Barbara
Sponsor: PRIMUS: Problems, Resources, and Issues in Undergraduate Mathematics Studies. Papers from this session may also be considered for an upcoming special issue of PRIMUS on Teaching Inquiry.

TCPS #9. The Scholarship of Teaching and Learning in Collegiate Mathematics
Saturday morning and afternoon, January 10
Description: In the scholarship of teaching and learning, faculty bring disciplinary knowledge to bear on questions of teaching and learning and systematically gather

evidence to support their conclusions. Work in this area includes investigations of the effectiveness of pedagogical methods, assignments, or technology, as well as probes of student understanding.

The goals of this session are to: (1) feature scholarly work focused on the teaching of postsecondary mathematics, (2) provide a venue for teaching mathematicians to make public their scholarly investigations into teaching/learning and (3) highlight evidence based arguments for the value of teaching innovations or in support of new insights into student learning.

Appropriate for this session are preliminary or final reports of post-secondary classroom-based investigations of teaching methods, student learning difficulties, curricular assessment, or insights into student (mis)understandings. Abstract submissions should have a clearly stated question that was or is under investigation and should give some indication of the type of evidence that has been gathered and will be presented. For example, papers might reference the following types of evidence: student work, participation or retention data, pre/post tests, interviews, surveys, think-alouds, etc.

Organizers: Jackie Dewar, Loyola Marymount University; Thomas Banchoff, Brown University; Curtis Bennett, Loyola Marymount University; Pam Crawford, Jacksonville University; and Edwin Herman, University of Wisconsin Stevens Point

TCPS #10. Discovery and Insight in Mathematics
Tuesday afternoon, January 13
Description: One new development in the philosophy of mathematics that mathematicians should welcome is an interest in the philosophy of mathematics as actually practiced by mathematicians. This session invites talks addressing philosophical issues concerning two related topics: how mathematics is discovered, and the role of insight in mathematical understanding and discovery. Epistemology studies how we come to know things. A distinction has been made between methods of discovery and methods of justification: that is, the way one discovers a mathematical truth - a conjecture, for example - may be quite different from how it is later justified (by a proof). What are the methods and grounds for such discoveries? What is the role insight plays in these discoveries? How do interconnections between mathematical concepts or subjects lead to discoveries? Talks addressing any of these issues within the philosophy of mathematics are appropriate for this session.

Papers on other topics in the philosophy of mathematics will be considered as time permits.

Organizers: Dan Sloughter, Furman University, and Bonnie Gold, Monmouth University
Sponsor: POM SIGMAA

TCPS #11. Program and Assessment Implications of Common Core State Standards Implementation
Monday afternoon, January 12
Description: The Common Core State Standards for Mathematics (CCSS) have been widely adopted and implemented nationally. Mathematics departments share responsibility with teacher education programs to prepare future teachers who are ready to teach school mathematics so that their students can meet both the content and mathematical practices standards. Mathematics faculty also collaborate with the K-12 system to ensure a smooth transition from school to higher education, one of the primary purposes of the CCSS. We encourage faculty to disseminate information about their experiences with the role of mathematics departments in the implementation of the CCSS mathematics standards by inviting contributed papers that
* Describe projects in undergraduate mathematics and teacher education programs that assess how well their pre service teacher education candidates are prepared with the knowledge and skills necessary to implement the CCSS for mathematics content and practices;
* Discuss work with K-12 partners to implement the CCSS math standards;
* Report findings of such projects; or
* Describe faculty and departmental responses to such findings.
Papers are solicited from any individuals or groups actively involved in assessment and preparation of candidates to effectively teach mathematics in Grades K-12.
Organizers: William Martin, North Dakota State University; Bonnie Gold, Monmouth University; and John Carter, Westlake High School
Sponsors: MAA Assessment Committee and MAA COMET

TCPS #12. Activities, Demonstrations, and Projects that Enhance the Study of Undergraduate Geometry
Sunday afternoon, January 11
Description: This session invites presenters to share activities, demonstrations, and projects used to enhance the study of Euclidean or non-Euclidean geometry in undergraduate geometry courses; presentations related to differential geometry, (low-level) graduate courses, and the Pythagorean Theorem should not be submitted. Presentations should include information about related topics, preliminary material that must be examined with students, and objectives and expected outcomes. Presenters discussing activities and demonstrations are encouraged to perform the activity or give the demonstration, if time and equipment allow, and to discuss the appropriateness of the activity or demonstration for the course level, learning environment, and class size. Presenters discussing projects are encouraged to address how the project was conducted, presented, and evaluated, including grading issues, if any, and the rubric used to appraise student work. Each presenter is encouraged to discuss how the activity, demonstration, or project fits into the course as well as changes made over time, the use of technology, if any, student reaction, and the effect of the activity, demonstration, or project on the students' understanding of related course material and geometry, in general.

Organizer: Sarah Mabrouk, Framingham State University

TCPS #13. Research on the Teaching and Learning of Undergraduate Mathematics

Sunday morning and afternoon, January 11

Description: This session presents research reports on undergraduate mathematics education. The session will feature research in a number of mathematical areas including linear algebra, advanced calculus, abstract algebra, and mathematical proof. The goals of this session are to foster high quality research in undergraduate mathematics education, to disseminate well-designed educational studies to the greater mathematics community, and to transform theoretical work into practical consequences in college mathematics. Examples of such types of research include rigorous and scientific studies about students' mathematical cognition and reasoning, teaching practice in inquiry-oriented mathematics classrooms, design of research-based curricular materials, and professional development of mathematics teachers, with intention to support and advance college students' mathematical thinking and activities. The presentation should report results of completed research that builds on the existing literature in mathematics education and employs contemporary educational theories of the teaching and learning of mathematics. The research should use well-established or innovative methodologies (e.g., design experiment, classroom teaching experiment, and clinical interview, with rigorous analytic methods) as they pertain to the study of undergraduate mathematics education. We also welcome preliminary reports on research projects in early stages of development or execution.

Organizers: Karen Keene, North Carolina State University; Timothy Fukawa-Connelly, Drexel University; and Michelle Zandieh, Arizona State University

Sponsor: SIGMAA RUME

TCPS #14. Mathematics and the Arts

Saturday morning and afternoon, January 10

Description: An appreciation of the connections between mathematics and the arts explores and extends those aspects of our discipline that complement number and rational thought at its center: pattern, shape, and an unmistakable sense of aesthetics. We invite those who work in or only occasionally visit some of the many areas at the intersection of mathematics and the arts to report on these excursions: artists, mathematicians, educators, those claiming hyphenated versions of these titles, and those eschewing classification altogether. We particularly encourage contributions from those who have incorporated into their courses math-art concepts or material that may be appropriate to use with our majors beyond the introductory level. Of course, topics from more elementary or more advanced mathematics, for the classroom or in practice, are always welcome.

Organizer: Douglas Norton, Villanova University

Sponsor: SIGMAA ARTS

TCPS #15. USE Math: Undergraduate Sustainability Experiences in the Mathematics Classroom
Tuesday morning, January 13
Description: Humanity continually faces the task of how to balance human needs against the world's resources, while operating within the constraints imposed by the laws of nature. Mathematics helps us better understand these complex issues that span disciplines: from measuring energy and other resources, to understanding variability in air and water quality, to modeling climate change. Moreover, these and other real world driven sustainability topics have the potential for motivating students to pursue STEM courses and fields of study more deeply. This session seeks proposals from faculty who have integrated sustainability-focused activities, projects, or modules into the college mathematics curriculum, in particular in introductory mathematics classes and statistics courses. Abstracts of accepted papers will be published on the SIGMAA-EM Web site, and authors will be encouraged to submit classroom-ready materials for broad dissemination on the Mathematics/QR Disciplinary page on the Sustainability Improves Student Learning (SISL) website (http://serc.carleton.edu/sisl/sustain_in_math.html).
Organizers: Ben Galluzzo, Shippensburg University, and Corrine Taylor, Wellesley College
Sponsor: SIGMAA EM

TCPS #16. Inquiry-Based Learning in First-Year and Second-Year Courses
Sunday morning, January 11
Description: An inquiry-based learning (IBL) approach challenges students to create mathematics by providing tasks requiring them to conjecture, experiment, explore, and solve problems. Rather than showing facts or a clear, smooth path to a solution, the instructor guides students via well-crafted problems through an adventure in mathematical discovery. There is a growing body of evidence that supports the claim that IBL techniques are effective for teaching mathematics and for fostering positive attitudes about mathematics. While there is a long tradition of using IBL in proof-based classes, it is often a challenge to bring an inquiry-based pedagogy into classes with significant content expectations, a heavy computational focus, or a large number of students.

We invite papers that address the use of IBL in first and second year courses. We especially encourage topics about the use of IBL in college algebra, pre-calculus, calculus, linear algebra, and differential equations. Claims made should be supported by data (student responses, test scores, survey results, etc.) or anecdotal evidence.

Papers from the session may be considered for a special issue of PRIMUS.
Organizers: Dana Ernst, Northern Arizona University; Angie Hodge, University of Nebraska at Omaha; and Theron Hitchman, University of Northern Iowa.
Sponsor: PRIMUS: Problems, Resources, and Issues in Undergraduate Mathematics Studies

TCPS #17. Mathematics Experiences in Business, Industry, and Government
Sunday afternoon, January 11
Description: The MAA Business, Industry and Government Special Interest Group (BIG SIGMAA) provides resources and a forum for mathematicians working in Business, Industry and Government (BIG) to help advance the mathematics profession by making connections, building partnerships, and sharing ideas. BIG SIGMAA consist of mathematicians in BIG as well as faculty and students in academia who are working on BIG problems.

Mathematicians, including those in academia, with BIG experience are invited to present papers or discuss projects involving the application of mathematics to BIG problems. The goal of this contributed paper session is to provide a venue for mathematicians with experience in business, industry, and government to share projects and mathematical ideas in this regard. Anyone interested in learning more about BIG practitioners, projects, and issues, will find this session of interest.
Organizers: Carla Martin, Department of Defense; Phil Gustafson, Mesa State University; and Michael Monticino, University of North Texas
Sponsor: BIG SIGMAA

TCPS #18. Collaborations between Two-Year and Four-Year Institutions that Create Pathways to a Math Major
Monday morning, January 12
Description: As more students start their college education at two-year colleges prior to transferring to a four-year program, it is increasingly important for two-year and four-year mathematics departments to collaborate to create student pathways to the mathematics major and for alignment of credit courses. Models that describe collaborative strategies and programs between two-year and four-year faulty and institutions to attract and retain community college transfers should be submitted. Joint submissions by a faculty member and a student are especially encouraged.
Organizers: Nancy Sattler, Terra State Community College; Judy Ackerman, Montgomery College Rockville Campus; and Elizabeth Teles, National Science Foundation
Sponsors: Committee on Two-Year Colleges (CTYC) and the Curriculum Renewal Across the First Two Years (CRAFTY)

TCPS #19. Wavelets in Undergraduate Education
Monday afternoon, January 12
Description: Wavelets are functions that satisfy certain mathematical properties and are used to represent data or other functions. They work extremely well in analyzing data with finite domains having different scales or resolutions. Interesting applications include digital image processing, FBI fingerprint compression, the design of medical equipment, and the detection of potholes. Wavelets have typically

been studied at the graduate level, but are making their way into the undergraduate curriculum. We are interested in presentations that effectively incorporate wavelets in an innovative way at the undergraduate level. This may include an undergraduate course in wavelets; a topic on wavelets in some other course using, but not limited to, hands-on demonstrations, projects, labs that utilize technology such as Matlab, Mathematica, Maple, Java applets, etc.; or research opportunities for undergraduates.
Organizers: Caroline Haddad, SUNY Geneseo; John Merkel, Oglethorpe University; and Edward Aboufadel, Grand Valley State University

TCPS #20. Teaching Proof Writing Techniques within a Content-Based Mathematics Course
Tuesday morning, January 13
Description: At many smaller undergraduate institutions, it is not possible to offer a dedicated introductory proofs course. Therefore, a content-based course is often used to introduce proof writing techniques. Depending on the course chosen and the method of instruction used, student success can vary widely from course to course. In this session, we seek to gain insight from those who have successfully implemented proof writing techniques in a content-based course. Papers focusing on methods of instruction, including in-class activities, methods of assessment – both formative and summative – and overall course design are welcome. Discussion of the interaction between content-based instruction and proof writing techniques is particularly encouraged.
Organizers: Kristi Meyer, Wisconsin Lutheran College, and Jessie Lenarz, St. Catherine University

TCPS #21. Original Sources and Archives in the Classroom
Tuesday morning, January 13
Description: In the last few years, the number of resources in the history of mathematics available on the internet has skyrocketed. This makes it very easy for the math educator to include original and historical sources and materials into their mathematics classroom. This session invites talks that show how to use online materials such as original sources, archives, museum pieces, correspondence and much more to supplement and enhance mathematics courses.
Organizers: Amy Shell-Gellasch, Montgomery College, and Dominic Klyve, Central Washington University

TCPS #22. Revitalizing Complex Analysis at the Undergraduate Level
Saturday afternoon, January 10
Description: Complex analysis, despite its beauty and power, seems to have has lost some of the prominence it once enjoyed in undergraduate mathematics, science, and engineering. Thanks to funding from NSF a national dialog has begun with the

intention of remedying this situation. A team of people will convene for the purpose of giving some initial recommendations, but input from the broader mathematical community is solicited.

Papers at this session should be scholarly in nature, but collectively address a wide-range of questions: What are the essential components of an undergraduate complex analysis class from mathematical and scientific standpoints? What technologies seem to be promising? What pedagogical ideas have borne fruit? In general, what innovative approaches might be suggested in teaching the subject?
Organizers: Russell Howell, Westmont College; Paul Zorn, St Olaf College; and Alan Noell, Oklahoma State University

TCPS #23. First-Year Calculus: Fresh Approaches for Jaded Students
Tuesday afternoon, January 13
Description: The majority of first-year college students signing up for calculus had a previous encounter with the subject during high school. These new college students start out in calculus 1 (or even calculus 2) having seen much of the material of the course, but with weakness or lack of (or perhaps an unwarranted) confidence in some areas. As such, this audience poses special challenges to the college instructor. This session seeks presenters that will share innovative approaches to engage this audience in first or second semester calculus. Such responses may be curricular, say through a reorganization or approach to the material, or structural, such as innovative approaches to placement. The session is in part inspired by and seeks to complement the MAA's NSF-sponsored project on Characteristics of Successful Programs in College Calculus.
Organizers: Bob Sachs, George Mason University, and Caren Diefenderfer, Hollins University
Sponsor: SIGMAA TAHSM

TCPS #24. Humor and Teaching Mathematics
Saturday morning, January 10
Description: Humor is a powerful teaching tool. It can be used to make a course more interesting, to introduce a topic or a concept, to emphasize a misconception, or to help recall learned material. Furthermore, it can help build relationships and classroom communities by easing stressful situations, reducing anxiety levels, enhancing communication, and making the classroom a place where students want to be. This session will showcase presentations on how humor and math can be combined and how humor can be used in the classroom to enhance learning. We particularly encourage submissions about ideas and techniques that have been tested in the classroom and have had a demonstrated effect on student learning and attitudes, though more theoretical or tentative approaches are also welcome. This session specifically emphasizes the place of humor in the mathematics classroom, but outstanding submissions about other facets of the relationship of mathematics and humor will also be considered.

Organizers: Semra Kilic-Bahi, Colby-Sawyer College; Gizem Karaali, Pomona College; and Debra Borkovitz, Wheelock College

TCPS #25. Incorporating Formal Symbolic Reasoning into Mathematics Courses
Sunday morning, January 11
Description: Techniques from symbolic logic enrich the undergraduate curriculum at all levels. Courses in quantitative reasoning or liberal arts mathematics often include units on symbolic logic or basic concepts of set theory: for example, one representative text includes a section that begins with basic truth tables, and concludes with a study on the validity of syllogisms. Geometry courses use formal rules of inference; proof by contradiction drives inference in statistics courses; computer science classes depend on logic for control flow; Venn diagrams appear in many areas. Finally, more advanced courses often include a primer on the logical foundations of proof techniques. However, it can be challenging to develop coherent curricula that help students make direct connections between formal symbolic reasoning and the other areas of mathematics they are studying. Another challenge is that formal logic is not universally taught in secondary schools, creating a wide disparity among students' preparation.

   Speakers in this session should discuss creative ways of incorporating the study of formal symbolic logic into mathematics courses, the benefits of doing so, or ways to address challenges. The organizers particularly welcome presentations from practitioners that include specific activities or interesting problems that could be used in the classroom.
Organizers: Christopher Shaw and Daniel Jordan, Columbia College Chicago

TCPS #26. Statistics Education beyond the Introductory Statistics Course
Sunday afternoon, January 11
Description: The introductory noncalculus-based statistics course ("Intro Stats") is one of the most commonly taught courses on university campuses, and much attention has been focused on improving student learning in this course. This session is focused on the rest of the undergraduate statistics curriculum. We invite submissions that provide details about learning activities, technologies, resources, or teaching methods that have been used to teach statistics outside the Intro Stats course. In addition to discussions related to calculus-based first-courses in statistics, "Stat 2," "MathStat," and other courses in the statistics curriculum, we encourage submissions related to teaching statistics through internships, undergraduate research experiences, and capstone courses, as well as efforts to partner with other disciplines to ensure that the statistics learned in Intro Stats (and other courses) is affecting the data analyses done in these disciplines. Presentations should address the objectives and effectiveness of the described activities. Presenters will be considered for the Dex Whittinghill Award for Best Contributed Paper.
Organizers: Randall Pruim, Calvin College; Scott Alberts, Truman State University; and Patti Frazer Lock, St. Lawrence University

TCPS #27. The Times They are a Changin' – Successful Innovations in Developmental Mathematics Curricula and Pedagogy
Monday morning, January 12
Description: Developmental mathematics education has captured the nation's attention as critical to student success in college and life. The mathematics community is working vigorously to redress high failure rates, low student preparation for subsequent courses, and routine requirements for multiple-semester sequences for reasonably prepared students. Increasing pressures to help students better prepare for college mathematics in less time and/or with dwindling resources calls for new, creative solutions. For example, there are emerging curricula tailored for different student major/career pathways; novel uses of online student-learning tools; and interesting co-programs that support student learning and persistence.

This session invites speakers who have implemented successful innovative curricula, pedagogy, or student support programs for developmental mathematics. Talks should briefly summarize the key changes made, provide specific evidence of student success, and highlight information or advice that would be helpful for other departments who might implement the changes. Talks examining what research on mathematics education tells us about developmental mathematics education are also appropriate. This session welcomes speakers from two-year colleges, speakers implementing solutions in a four-year college context, or partnerships between two-year and four-year colleges.
Organizers: Suzanne Dorée, Augsburg College; Joanne Peeples, El Paso Community College; Donald Small, USMA; Bruce Yoshiwara, Los Angeles Pierce College; and Chris Oehrlein, Oklahoma City Community College
Sponsors: Committee on Two-Year Colleges (CTYC) and the Curriculum Renewal Across the First Two Years (CRAFTY)

TCPS #28. Well-Designed Online Assessment: Well-formed Questions, Discovery-based Explorations, and their Success in Improving Student Learning
Monday afternoon, January 12
Description: Online delivery of homework and other assessments in mathematics courses has become standard. Many problems have been taken from textbooks and recreated in the context of a variety of online learning systems. Unfortunately, there is often something lost in this process, reducing once open-ended questions expecting a series of clearly written steps to a single answer blank, or sometimes just a multiple-choice response.

It would be arguably more effective to develop online questions and explorations that are pedagogically well-formed, and which take full advantage of the online environment. These would not only more accurately assess student

knowledge, but also help students to develop proper understanding and clear procedures.

We invite papers describing online questions or activities that have been successful in helping students learn particular learning objectives. We specifically solicit (and will prefer in selection) papers that assess the impact of these online activities on student learning. Both qualitative and quantitative results are welcome.

Preference will also be given to papers with problems, explorations, or activities that can be easily adopted in a broad range of institutions, or accessed by a wide range of devices (mobile phones, tablets, laptops, desktops, etc.).

Organizers: Paul Seeburger, Monroe Community College, and Matthew Leingang, New York University

Sponsor: WEB SIGMAA

TCPS #29. Infusing Quantitative Literacy into Mathematics and Non-Mathematics Courses

Tuesday afternoon, January 13

Description: Quantitative literacy (QL) can be described as the ability to adequately use elementary mathematical tools to interpret and manipulate quantitative data and ideas that arise in an individual's private, civic, and work life. Like reading and writing literacy, quantitative literacy is a habit of mind that is best formed by exposure in many contexts. Many institutions have entire courses devoted to QL, while others embed QL learning objectives into traditional mathematics courses or non-mathematics courses. We invite talks that describe projects, applications, modules, or entire courses that help students achieve quantitative literacy. Since QL is inherently interdisciplinary, we encourage discussion of material that may appear in or be linked to non-mathematics courses. Also, since QL goals are often neglected in advanced mathematics courses, we welcome material that appears in mathematics courses at the calculus level and above. Preference will be given to talks that present innovative content or courses, novel contexts, well-developed assessment of objectives, or otherwise advance the national dialogue on QL.

Organizers: Andrew Miller, Belmont University; Aaron Montgomery, Central Washington University; and Gary Franchy, Mott Community College

Sponsor: SIGMAA QL

TCPS #30. Perspectives and Experiences on Mentoring Undergraduate Students in Research

Saturday morning, January 10

Description: In recent years, mathematics faculty members have become increasingly interested in mentoring undergraduate research. This paper session will provide an opportunity for faculty mentors to 1) discuss and exchange ideas on current trends and best practices in mentoring undergraduate research; and 2) share their experiences in directing undergraduate level research activities. We

invite talks addressing any issue about mentoring undergraduate research. We especially encourage talks that address the following topics:

1. how to get started;
2. challenges and benefits of mentoring undergraduate research;
3. how to choose a good topic for undergraduate research;
4. managing student work and expectations (from recruitment to final reports);
5. writing and publishing with undergraduates;
6. potential pitfalls and how to overcome them during the mentoring journey;
7. how to help students develop independence in doing research.

We welcome undergraduate research mentors to share with other participants their experiences, ideas, stories of successful or unsuccessful attempts, and effective approaches to working with undergraduate students. The presentations are expected to be scholarly in nature and present evidence supporting the success of the described approaches.

      This session serves as a follow-up event for the Regional Faculty Workshop on REU Issues (RFWREU) held in New Jersey in May 2013. Participants from RFWREU are especially encouraged to present in this session. This session is also sponsored by the journal **PRIMUS.** Papers arising from this session, along with papers from RFWREU participants, may be considered for a special issue of **PRIMUS** on mentoring undergraduate research.

Organizers: Aihua Li, Montclair State University; Thomas Hagedorn, College of New Jersey; and Jan Rychtar, The University of North Carolina at Greensboro

TCPS #31. What Makes a Successful Math Circle: Organization and Problems
Sunday morning, January 11
Description: A mathematics circle is an enrichment activity for K-12 students or their teachers, which brings them into direct contact with mathematics professionals, fostering a passion and excitement for deep mathematics in the participants. It is usually a weekly or monthly activity, but it can also be an intensive summer experience. There are many factors that lead to a successful math circle for either students or teachers. Talks are invited which address either the successful organization of a math circle or a problem or topic that was successful at your math circle.

Organizers: Philip Yasskin, Texas A&M University; Tatiana Shubin, San Jose State University; Paul Zeitz, University of San Francisco; and Katherine Morrison, University of Northern Colorado
Sponsor: SIGMAA MCST

TCPS #32. Cartography and Mathematics: Imaging the World Around Us
Monday morning, January 12
Description: Cartography has used and inspired different kinds of mathematics for centuries, including but not limited to questions in Real Analysis, Complex Analysis, Differential Geometry, and Riemannian Geometry. Modern incarnations of these

phenomena make use of exciting topics, too, such as imaging, mirror design, spatial statistics, and optics. We welcome talks from a variety of fields that involve, generalize, or are inspired by cartographic projections and our quest to visualize the world around us.
Organizers: Emek Kose and Casey Douglas, St. Mary's College of Maryland

TCPS #33. Technology, the Next Generation: Integrating Tablets into the Mathematics Classroom
Saturday afternoon, January 10
Description: Presenters will describe effective and ineffective classroom integration of electronic tablets into university mathematics courses. The presentations will include specific classroom examples of efforts to harness the dramatic power of an electronic tablet. Presentations will describe mathematical objectives to have been achieved, evidence of levels of success among students, and a rationale for the decision to integrate technology into the learning experiences.
Organizers: Kevin Charlwood and Janet Sharp, Washburn University

TCPS #34. Best Practices for Teaching the Introductory Statistics Course
Saturday afternoon, January 10
Description. Much attention has been focused in recent years on improving student learning in the introductory statistics course. We invite submissions that provide details about learning activities, technologies, resources, or teaching methods that have been used to successfully improve student learning in Intro Stats. We particularly encourage submissions related to teaching introductory statistics using non-conventional data, models, and computing (e.g., 'big' data, web scraping, etc.). We also welcome presentations about overcoming the challenges faced by mathematicians, often with little formal training in statistics, who find themselves teaching statistics. Presenters will be considered for the Dex Whittinghill Award for Best Contributed Paper.
Organizers: Randall Pruim, Calvin College; Scott Alberts, Truman State University; and Patti Frazer Lock, St. Lawrence University
Sponsor: SIGMAA Stat Ed

GENERAL CONTRIBUTED PAPER SESSIONS
Saturday, Sunday, Monday, and Tuesday, morning and afternoon
Organizers: Kristen Meyer, Wisconsin Lutheran College; Bem Cayco, San Jose State University; and Kimberly Presser, Shippensburg University of Pennsylvania

Description: The MAA's General Contributed Paper Session accepts contributions in all areas of mathematics, curriculum, and pedagogy. When you submit your abstract you will be asked to classify it according to the following scheme.

- Assessment
- History or Philosophy of Mathematics
- Interdisciplinary Topics in Mathematics
- Mathematics and Technology
- Mentoring
- Modeling or Applications
- Outreach
- Probability or Statistics
- Research in Algebra
- Research in Analysis
- Research in Applied Mathematics
- Research in Geometry
- Research in Graph Theory
- Research in Linear Algebra
- Research in Logic or Foundations
- Research in Number Theory
- Research in Topology
- Teaching or Learning Advanced Mathematics
- Teaching or Learning Calculus
- Teaching or Learning Developmental Mathematics
- Teaching or Learning Introductory Mathematics
- Assorted Topics