# 27<sup>th</sup> Annual Kansas City MATHEMATICS TECHNOLOGY EXPO

# Schedule of Events and Abstracts

University of Missouri – Kansas City, Kansas City, MO Friday and Saturday, October 6 and 7, 2017

> Online MAA Store: https://store.maa.org/site/

Login Account Names and Passwords for EXPO 2017, valid October 6 – 7, 2017

Wireless Access Anywhere for EXPO participants and speakers:

- For help on Friday only: UMKC Call Center at (816) 235-2000
- Username: umkc-mathexpo
- Password: R00mathEx [the 00 are zeroes, not capital letters]

ILE (Ideal Learning Environment) Station Access in talk rooms, for EXPO speakers only:

- Username: umkc-mathexpo
- Password: R00mathEx [the 00 are zeroes, not capital letters]

## 27<sup>th</sup> Annual Kansas City MATHEMATICS TECHNOLOGY EXPO

#### Thank you!

We thank **UMKC** for their generous hospitality in providing the facilities for the EXPO. They provided the lecture hall, classrooms, and exhibitor areas, as well as computers, Internet connections, and audiovisual equipment. We thank the UMKC students and faculty, who have given up their classrooms!

We thank the following individuals at UMKC for making the EXPO possible:

- Jeremy Schliesman, Manager, UMKC IS Call Center, UMKC IS, for wireless and ILE access accounts, and ILE room technical help.
- Marcia Roberts, UMKC Room Scheduling, for all the room reservations.
- Tonya Crawford, Senior Manuscript Specialist, UMKC Archives, for information on the Haag Hall murals.
- All the UMKC undergraduate and graduate students who are volunteering their time on the two days of the EXPO.

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We thank **Johnson County Community College** for funding paper and printing for EXPO mailings, the program booklet, EXPO packet information, and evaluations.

#### Registration in the 3<sup>rd</sup> floor lobby of Haag Hall

Friday, 8:00 am - 2:00 pm, and Saturday, 8:00 am - 11:00 am

#### **Complimentary Continental Breakfasts**

Continental breakfasts are available Friday and Saturday mornings in the registration area, compliments of Cerner.

#### Lunches

The lunches are included as part of your registration fee. UMKC's FaCET (Faculty Center for Excellence in Teaching) provided a generous donation toward the lunches.

#### Handouts

Extra handouts from sessions should be placed at the Handout table on the 3<sup>rd</sup> floor lobby of Haag Hall, and will be available to EXPO participants at that location.

#### Textbook, Hardware, and Software Exhibitors

Friday, 8:00 am – 2:45 pm; Saturday, 8:00 am – 1:00 pm EverFi, Cengage, and MAA Books (Not all exhibitors will be present on Saturday.)

#### Door Prizes

We thank the following companies that have donated door prizes to be given away following the Keynote Address and the Invited Address: Cengage, Design Science, and Macmillan

## FRIDAY, October 6, 2017

#### Welcome and Introductions

Friday, 8:30 am Haag **301** 

**Chad Wiley**, 2017 EXPO Group Chair, Emporia State University, Emporia, KS **Jennifer Lundgren**, Associate Dean, College of Arts and Sciences, Professor of Psychology, UMKC

#### **SESSION 1 – Keynote Address**

Friday, 8:30 am – 9:50 am Haag **301** 

#### Does Technology Actually Aid Explanation? Grant Sanderson

3blue1brown.com

With the abundance of classroom tools, online videos, animations, and interactives available to math teachers, choosing which ones to incorporate into a lesson demands a set of principles around what genuinely accelerates learning, and what is fluff. The focus in my own work is on finding the right pairing between explanations and animations, which includes writing the software to create those animations. Here I will share a few principles I hold in doing so.

Door prizes will be awarded directly following this address.

#### SESSION 2 - Friday, 10:00 am

2A. **Haag 301** 10:00 – 10:45 am

#### A Beginner's Guide to Using R in the Probability & Statistics Classroom Brian Hollenbeck, Emporia State University, Emporia, KS

In the past, I have allowed students to use distribution tables and graphing calculators to solve problems in Probability and Statistics. Due to the expense and limitations of a calculator, I was curious if students would be able to use the sophisticated statistical package, R, in an introductory course. In this talk, I will discuss the advantages and disadvantages of this approach, including student feedback. I will introduce RStudio and the Mosaic package which softened the potentially steep learning curve for students and myself. I will demonstrate the key commands needed for an introductory course and the accompanying lab activities we used in the classroom.

\*\*Participants are welcome to bring their own laptops and play in the RStudio environment themselves. It will be beneficial to download R and RStudio in advance.

Presider: Brian Hollenbeck, Emporia State University, Emporia, KS

2B. Haag 312 10:00 - 10:45 am

#### Using Photography and GeoGebra to Facilitate the Teaching of Mathematics Nora Strasser, Friends University, Wichita, KS

Mathematics has many connections to art. These connections can be exploited through the use of photographs and photography. Using photographs in the teaching of mathematics serves two purposes. First it makes connections from the abstract world of mathematics to the real physical world. Second, it allows students who enjoy art to discover a relationship between art and Mathematics. Photographs will be imported into GeoGebra. These photographs will include both those provided to the class and those taken by students. Once the photograph has been imported into GeoGebra, the geometric and algebraic aspects can be studied. These ideas can also be expanded to include Calculus concepts as well. Examples of the activities used in class along with the assignments and questions that students are required to complete will be discussed. GeoGebra will be demonstrated both through the importation of photos and how to use them to bring mathematical concepts to life.

Presider: Tom Mahoney, Emporia State University, Emporia, KS

#### Teaching Mathematics with Technology through Lecture and Student Activities Kimberly Kinder, Missouri University of Science and Technology, Rolla, MO 10:00 - 10:45 am

I have used technology since my first year of teaching though with caution. I believe that the technology should support the learning of mathematical concepts. I use Powerpoints and Smart Notebook in my large lectures and we use My Math Lab Software for online homework. I want to focus on using graphing to reveal mathematical concepts. I will discuss how I have used Winplot graphing software to demonstrate in class on the fly and how I incorporate graphs in my Powerpoints and exams. Students can now download free or low cost apps on the devices in their hand and transform them into graphing calculators. I will discuss how I had my students in college algebra use smartphones and tablets to explore transformations during an in class activity. I will discuss other more or less successful activities using smartphone apps in college algebra. Apps discussed include Desmos, Good Grapher and others.

Presider: Lauren Jacobs, Johnson County Community College, Overland Park, KS

2D. Haag 201 10:00 - 10:45 am

2C.

Haag 313

#### Using Overleaf to Build Students' Proof Writing Skills Chad Wiley, Emporia State University, Emporia, KS

Last fall, I made several major revisions to my Mathematical Proofs course (an online course for new graduate students). This included a strong focus on frequently revising written work, and so I decided to require students to type their proofs using LaTeX. The cloud-based LaTeX platform Overleaf has turned out to be a great way of implementing this requirement, since it requires little setup on the part of students. In this talk, I will discuss the structure of my course, how Overleaf was implemented as part of it, and how student reacted to it. I will also give recommendations for others who want to implement LaTeX in their own classes. Presider: Ian Young, Grandview High School, Grandview, MO

#### SESSION $\mathbf{3}$ – Friday, 10:45 am

Haag 2<sup>nd</sup> and 3<sup>rd</sup> This time is provided especially for EXPO participants to visit the Exhibitors and the MAA book floor Lobbies sale. The Exhibitors Area will also be open at other times during the EXPO. 10:45 - 11:30 am

#### SESSION 4 - Friday, 11:30 am

12:15 pm

#### 4A. Rare and Historical Mathematics Books at Linda Hall Library Linda Hall Library 11:30 am – This is one of two separate expertupities for bands on viewing of over

This is one of two separate opportunities for hands-on viewing of over a dozen books. It is not a tour. Examples: the 1482 first printed copy of Euclid's *Elements*, a 1637 copy of Descartes' *Discours*, the 1696 first calculus textbook of L'Hopital, books by Newton, Agnesi, Galileo, and more. This session will be repeated at 3:30 this afternoon.

4B.	<i>Lightning Talks</i> (short 5 – 7 minute talks)
Haag 301	Presider: Nick Haverhals, Avila University, Kansas City, MO
11:30 am –	
12:15 pm	Plickers – Collecting Instantaneous Assessment Data in the Classroom with (

#### Plickers – Collecting Instantaneous Assessment Data in the Classroom with Only One Mobile Device

#### Kristi Karber, University of Central Oklahoma, Edmond, OK

The Plickers app allows the instructor to engage students in the classroom by obtaining formative assessment data without the need for student devices. The presenter will discuss the use of Plickers in a beginning proof-writing course; although, the app can easily be used in a variety of courses. Lessons learned by the presenter when using this app will also be addressed.

#### *Individual assessments via Microsoft Office* Nick Haverhals, Avila University, Kansas City, MO

In this talk, I will share how I have used the Mail Merge feature in Microsoft Word to create randomized assignments. I will provide a few examples of assessments I have given and a trick that might just save you some frustration.

#### BusGrapher -- Students Use a Distance/Time Graph to Play a Game, and It's Fun! Lisa Erickson, MidAmerica Nazarene University, Olathe, KS

BusGrapher is a free online applet where students control the movement of a bus by manipulating the graph of the bus's location. As students progress through the game, the meaning of the coordinates of the distance/time graph become second-nature to them. And when the police pull them over for exceeding the posted speed limit, slope takes on a new significance! Students can get quite animated as they work to conquer each of the challenges. The last levels require a good bit of strategy. I've found that most all of my algebra students -- from "A-students" to those who are barely-passing -- really get into the game. http://plaza.ufl.edu/youngdj/applets/busgrapher.html

#### My Favorite GeoGebra Feature

#### Chad Wiley, Emporia State University, Emporia, KS

GeoGebra is a freely-available software package with a variety of tools which can be used in geometry, algebra, statistics, and more. In this talk, I will briefly discuss a little-known feature of GeoGebra and how I use it in my Calculus II classes to test student understanding of Riemann sums.

4C. Haag 312 11:30 am -12:15 pm

#### **Exploring Mathematics in Virtual Reality**

#### Tom Mahoney, Emporia State University, Emporia, KS

Many areas of mathematics involve studying objects in three or more dimensions. Using virtual reality is one way to help students visualize these challenging concepts. I have been experimenting with the HTC Vive virtual reality headset. Using CalcFlow, students explore concepts in full 3D, including parameterized functions, vector addition and cross products, surface integrals, spherical coordinates, and even the fourth dimension. Going beyond 3D, students can experience 4-dimensional shapes in the program 4D Toys. We will see how VR was implemented to help students understand concepts, as well as share some of their creations. Presider: Tom Mahoney, Emporia State University, Emporia, KS

#### The Right Software for Your Data Analysis Haag 313

Steve Klassen, Missouri Western State University, Saint Joseph, MO

11:30 am -12:15 pm

4D.

Whether teaching introductory statistics for freshmen or a statistical methods course for graduate students, the choice of a suitable statistical software package is always an important decision. Available features, ease of use, and cost are all important considerations. As a service course, it is also important to consider the needs of other academic departments. This presentation considers the advantages and disadvantages of some typical choices for data analysis, including Minitab, SPSS, StatCrunch and Excel, as well as the freely available R and JASP software. Always in search of the best option, Dr. Klassen will discuss his recent experiences, as well as his current software selection.

Presider: Lauren Jacobs, Johnson County Community College, Overland Park, KS

#### 4E. Engaging Online Students Through Technology Haag 201 Glenn Rice, Missouri Western State University, St. Joseph, MO 11:30 am -I have utilized many different technologies to create materials that provide an experience for 12:15 pm online students that is similar to the experience of students in the traditional classroom. However, many of the students do not even look at most of these materials. These unmotivated students then proceed to fail. How do you stop this? Presider: Ian Young, Grandview High School, Grandview, MO

Friday, 12:15 pm – 1:30 pm **LUNCH** – Swinney Gym North Lobby

#### SESSION 5 - Friday, 1:30 pm

5A.	Which One Doesn't Belong? and Other Ambiguous Math Questions
Hadg SUI	Christopher Danielson, Normandale Community College, Bloomington, MN, and Desmos
1:30 – 2:15 pm	Certainty is the end product of mathematical activity, not its starting point.
	When mathematicians ask questions such as How are these the same? What is this like? and
	<i>What if</i> ? these questions have unknown answers. The same can be true of questions we ask in instructional settings. <i>Which one doesn't belong</i> ? <i>How many</i> ? <i>What comes next</i> ? can all be questions where <i>It depends</i> is a very good answer, and that open up mathematical possibilities. This session offers opportunities to experience the power of ambiguity for sparking
	mathematical conversations, and classroom-ready tasks for all levels of learners.
	Presider: Chad Wiley, Emporia State University, Emporia, KS

## 5B.Teaching a Course on Mathematics in Computer Graphics using Ray-Tracing SoftwareHaag 312Cynthia Huffman, Pittsburg State University, Pittsburg, KS

1:30 – 2:15 pm In this talk, we will take a look at a course the presenter taught called the Mathematics of Computer Graphics. Mathematics is used in many ways in making images and movies. Most students are familiar with computer-generated imagery (CGI) in video games and movies. Even high school mathematics topics from algebra and geometry such as functions, polygons, solids, and matrices are useful tools in CGI. Also, information will be included on free ray-tracing software available for creating images and animations.

Presider: Steve Klassen, Missouri Western State University, Saint Joseph, MO

## 5C/6C.WORKSHOP: Down and Dirty with Bayesian Statistics and Python (1:30 pm - 3:15 pm)Haag 313Gavin Waters, Missouri Western State University, St. Joseph, MO

1:30 – 3:15 pm

#### Gavin Waters, Missouri Western State University, St. Joseph, MO An introduction via Jupiter notebooks of how to create a your own Markov Chain Monte Carlo examples for students interested in Bayesian Statistics. We will create and explore the basic Metropolis Hastings algorithm and illustrate its geometry before using more complicated packages. Examples will range from the classic coin flip, to Stockmarket financial predictions, to

\*\*Please install Anaconda 64 bit python 3+ on your laptop if you want to play along.

Presider: Ian Young, Grandview High School, Grandview, MO

predict tumor growths.

5D.

Haag 201 1:30 – 2:15 pm

#### *Soaring Through Developmental Math Using Hawkes Learning and Peer Tutoring* Shawnda Bradshaw and Haleigh Collier, College of the Ozarks, Point Lookout, MO

College of the Ozarks offers one developmental math course. Topics include real numbers, linear equations in one or more variables, polynomial and rational functions, quadratic equations, radicals, factoring, and inequalities. This presentation will focus on the success rate of this course using peer tutors, who are majoring in math-related fields, to assist developmental math students while using the Hawkes Learning System. The discussion will include benefits to both the developmental students and the peer tutors.

#### SESSION 6 - Friday, 2:30 pm

6A.	Using Innovative Online Teaching Resources to Enhance Inquiry-based Mathematics
Haag 301	Lessons
2:30 – 3:15 pm	Steve Obenhaus & Carrie La Voy, University of Kansas, Lawrence, KS

Are you interested in teaching mathematics through inquiry? Would you like to use technology to increase your students' curiosity about mathematics? This session will explore these topics as we look at lessons that have been taught in high school mathematics classrooms, and in collegelevel mathematics content courses taken by pre-service teachers. Participants will view online resources, such as Youcubed.org, to explore innovative, research-based teaching methods, math tasks, and other teaching ideas. Audience members will have the opportunity to participate in a mini-lesson, discuss applications for their own classroom, and explore resources for teaching mathematics

Presider: Brian Hollenbeck, Emporia State University, Emporia, KS

#### 6B. Desmos: Advanced Tips & Tricks

#### Tom Mahoney, Emporia State University, Emporia, KS

Desmos is a free, popular online graphing tool. Beyond just graphing functions and derivatives, Desmos includes tools that create advanced animated visualizations. In this talk, I will share my techniques for creating instructive animations. Some of the example applications include studying epsilon-delta continuity by turning it into a game, verifying the conclusion of the Mean Value Theorem, animating linear transformations, and setting up related rates problems from calculus. I will then show you how to use lists, piecewise functions, colors, and variable restrictions to build your own Desmos demos.

\*\*Participants are encouraged to bring a laptop or tablet.

Presider: Steve Klassen, Missouri Western State University, Saint Joseph, MO

#### Resources to Help You Gamify Your Math Class Haag 201

#### Heather Miller and Erica Hart, EverFi

Attendees will gain access to a web-based resources that is available at NO COST. Hockey Scholar is a course that brings STEM concepts to life using the exciting, fast-paced game of hockey. Through immersive simulations, each module enables students to explore real-life applications of STEM concepts. Radius covers topics ranging from the real-world application of algebra to basic computer science and STEM career exploration. Students will learn and apply skills to solve real world challenges, such as repairing a bridge using linear equations. Summer Slugger is a math and literacy program to help students avoid the summer slump by providing them with interactive baseball-themed challenges throughout the course. This resource focuses on sentence structure/correction, synonyms/antonyms, factors, multiples, and fractions. These resources are student-driven and have assessments embedded, enabling students to go at their own pace as the teacher facilitates the classroom and see measurable outcomes from student work.

Haag 312

6D.

2:30 - 3:15 pm

#### 2:30 - 3:15 pm

#### POST-SESSIONS (A, B, C, and D) Friday, 3:30 pm

P-S A. Linda Hall Library 3:30 pm	Rare and Historical Mathematics Books at Linda Hall Library Benjamin Gross, Associate Vice President for Collections, Linda Hall Library, and Cindy Rogers, Assistant Librarian for the History of Science, Linda Hall Library This is one of two separate opportunities for hands-on viewing of over a dozen books. It is not a tour. Examples: the 1482 first printed copy of Euclid's <i>Elements</i> , a 1637 copy of Descartes' <i>Discours</i> , the 1696 first calculus textbook of L'Hopital, books by Newton, Agnesi, Galileo, and more. This session will be repeated at 3:30 this afternoon.
P-S B. Haag <b>301</b> 3:30 pm	MAA-MO Project NExT Fall Meeting Samuel Chamberlin, Park University, Parkville, MO, and Azadeh Rafizadeh, William Jewell College, Liberty, MO Project NExT (New Experiences in Teaching) is a professional development program for new and recent Ph.D.s in the mathematical sciences, and is sponsored by the Mathematical Association of America. This meeting is for Project NExT Fellows from Missouri.
P-S C. Haag <b>312</b> 3:30 pm	<i>KAMATYC Meeting</i> (Interested KAMATYC and MOMATYC participants will go to supper together after the meetings.)
P-S D. Haag <b>313</b> 3:30 pm	<i>MOMATYC Meeting</i> (Interested KAMATYC and MOMATYC participants will go to supper together after the meetings.)

## SATURDAY, October 7, 2017

#### Welcome and Introductions

Saturday, 8:30 am Haag 301 Chad Wiley, 2017 EXPO Group Chair, Emporia State University, Emporia, KS

#### **SESSION 7 – Invited Address**

Saturday, 8:30 am – 9:50 am Haag **301** 

#### The New Basics: Arithmetic and Algebra with 21st Century Tools Christopher Danielson

Normandale Community College, Bloomington, MN, and Desmos

It's easy to get digital tools to drill students on their facts, at the very same time that they make fact memorization less valuable. What do students need to know about arithmetic and algebra, and how can digital tools support them learning it? This session provides some answers and classroom-ready examples.

Door prizes will be awarded directly following this address.

#### SESSION 8 – Saturday, 10:00 am

Saturday, 10:00 am - 10:45 am

8A. <b>Haag 301</b> 10:00 – 10:45 am	Useful tools in making a class more visual Grant Sanderson, 3blue1brown.com If a picture is worth a thousand words, how much is it worth to have one you can manipulate easily in front of a classroom? In this seminar, I will go through a few useful tools for quickly
	creating mathematical animations.
	**Participants are encouraged to bring laptops.
	Presider: Ian Young, Grandview High School, Grandview, MO
8B.	Getting Familiar with Open Educational Resources (OER) in Mathematics
Haag 306 10:00 – 10:45 am	Scott Curtis, University of Missouri - Kansas City, Miller Nichols Library, Kansas City, MO
	You may be familiar with Open Educational Resources (OER) from using Khan Academy videos or reading an open textbook from OpenStax, However, OER embraces a broader range of
	learning objects, as well as a collaborative ethic of re-use, re-mixing, and re-creation. This
	presentation will help you with tools to better find, evaluate, and select OER for your classes.
	Presider: Lauren Jacobs, Johnson County Community College, Overland Park, KS

#### SESSION 9 - Saturday, 11:00 am

9A.

9B.

Haag 306

Haag 301

#### Eliminate Video Post-Production with Open Broadcaster Software Tom Mahoney, Emporia State University, Emporia, KS 11:00 - 11:45 am

How long does it take to make a 5-minute video? While the recording may only take 5 minutes, editing the video afterwards can be even longer than the video itself. I will show you how to use Open Broadcaster Software (OBS) to cut down on the editing time by recording more in real-time. We will walk through how to add screen capture, overlays, slideshows, browser windows, and picture-in-picture video while recording. OBS is free, open source, and crossplatform (Windows/Mac/Linux).

\*\*Participants are encouraged to bring their laptops. Open Broadcaster Software may be downloaded from obsproject.org.

Presider: Tom Mahoney, Emporia State University, Emporia, KS

#### Teaching Math Through the Digital Collections, On-line Catalogues, and Search **Engines of Fine Arts Museums** 11:00 - 11:45 am

#### Natasha Rozhkovskaya, Kansas State University, Manhattan, KS

In this talk we will describe the arts and math project that is a result of several years of collaboration between Math Circle Seminar at Kansas State University and the Marianna Kistler Beach Museum of Art. Math Circle seminar is an enrichment program for school students with a strong interest in mathematics. The traditional part of the program is an art and math workshop, which is based on the art works in the collection of the museum. The crucial component in preparation of these workshops, that allowed us to develop successfully this direction of the instructions and to extend it to the to other groups of students and educators, is the usage of the digital collection of the local museum, combined with the online catalogues of prominent world art museums (The Louvre, MoMA, Metropolitan, Chicago Art Institute, etc.). In the presentation we will share examples of the math topics covered during the workshops and the information on the further resources originated from our programs' materials.

Presider: Ian Young, Grandview High School, Grandview, MO

9C.
Haag 307
11:00 – 11:45 am

#### Using (Free) Web Tools to Engage the Flipped Classroom and Online Learning Chris Imm, Johnson County Community College, Overland Park, KS

Software can help with visualization and exploration of topics in math. I will demonstrate how incorporating active tools such as Desmos, GeoGebra and Wolfram Demonstrations Project can help students explore topics prior to and inside of a flipped classroom. Presider: Brian Hollenbeck, Emporia State University, Emporia, KS

### Saturday, 11:45 am – 1:00 pm

#### LUNCH and Brainstorming – Swinney Gym North Lobby.

#### Implementing effective technology

One of the challenges in implementing technology is making sure that it is beneficial to the instructor and to the students. So often, technology winds up being more of a gimmick than a useful tool. Grant Sanderson's keynote posed the question, "Does technology actually aid explanation?"

How do you identify when technology is serving itself rather than the students? Have you experienced technology that appeared to be beneficial, but ended up not being useful? What techniques do you use to ensure that students are reaping the benefit of the technology?

We hope that you enjoyed the EXPO. If you have comments that you would like to share, please e-mail any of the committee members as listed below.

## www.kcmathtechexpo.org

#### The 2017 EXPO Group

- Chad Wiley (EXPO Chair 2016-- ), Emporia State University, Emporia, KS
- Pam Cox (Presiders, Mailing List), Paragould High School, Paragould, AR
- Richard Delaware (Financial Secretary and Site Coordinator; EXPO Chair 1993 1994), University of Missouri Kansas City, Kansas City, MO
- Lisa Erickson (Publications, Mailing List), MidAmerica Nazarene University, Olathe, KS
- David Ewing (Special Speaker Contact), University of Central Missouri, Warrensburg, MO
- Rob Grondahl (Webmaster and Registration), Johnson County Community College, Overland Park, KS
- Nick Haverhals (Exhibitors), Avila University, Kansas City, MO
- Mark Hunter (Social Media, Publications), McPherson College, McPherson, KS
- Tom Mahoney (Recording Secretary, Local Transportation), Emporia State University, Emporia, KS
- Nora Strasser (Mailing List), Friends University, Wichita, KS
- Ian Young (Presiders, Mailing List), Grandview High School, Grandview, MO

#### Events/Activities in Kansas City: www.visitkc.com/visitors/events