21st Biennial ACMS Conference

Charleston Southern University
Charleston, SC
May 31 - June 3, 2017

Tuesday, May 30

6:00-7:00 pm	Dinner for early arrivals

Wednesday, May 31

7:00-8:00 am	Breakfast
8:30 am - 12:00 pm	Pre-Conference Workshops I
12:00 - 1:00 pm	Lunch
1:00 - 4:30 pm	Pre-Conference Workshops II
5:30 - 6:30 pm	Dinner
7:00 - 7:15 pm	Welcome
7:15 - 8:15 pm	*Shaping a Digital World: Connecting Bytes and Beliefs* Derek Schuurman
8:30 - 9:30 pm	Reception

Thursday, June 1

7:15 - 7:45 am	Morning Prayer
7:45 - 8:45 am	Breakfast (board meeting in a side room)
9:00 - 9:30 am	Devotions and announcements
9:30 am - 2:45 pm	Excursion to Downtown Charleston (including box lunch)
3:00-4:00 pm	*The Mathematics of Faith: Euler's anonymous work on the limits of mathematics, science, and faith* Dominic Klyve
4:00-6:00 pm	Parallel Sessions I
6:15-7:15 pm	Dinner
7:30 - 8:30 pm	Parallel Sessions II
8:30 -9:15 pm	Discussion of the role of CS/IS in ACMS

*Note: All meals (except Friday's banquet) will be in the Cafeteria. The locations for parallel sessions can be found on the parallel session schedule. All other activities will be held in WCCL room 102-3.

Friday, June 2

7:15 - 7:45 am	Morning Prayer
7:45 - 8:45 am	Breakfast
9:00 - 9:30 am	Welcome and Devotional
9:30 - 10:30 am	*De Morgan's Budget of Paradoxes*
	Sloan Despeaux
10:30 - 11:00 am	Break
11:00 - 12:00 pm	*Responsible Automation: Faith and Work in an Age of Intelligent Machines*
	Derek Schuurman
11:45 - 12:45 pm	Lunch (board meeting in a side room)
1:00-3:00	Parallel Sessions III
3:00-3:30 pm	Break
3:30-6:00 pm	Parallel Sessions IV
6:15 - 7:30 pm	Banquet
7:30 - 8:30 pm	*Translation and Betrayal: "Euler's Letters to a German Princess"*
	Dominic Klyve
8:30 - 9:15 pm	Discussion of the Role of Statistics in ACMS

Saturday, June 3

7:45 - 8:45 am	Breakfast
9:00 - 10:00 am	*Fit to print? Referee's Reports of Mathematics in Nineteenth-Century London*
	Sloan Despeaux
10:30 - 11:00 am	ACMS business meeting
11:00 - 12:00 pm	Worship Service

Schedule of Parallel Sessions

Parallel Sessions I - Thursday, June 1

	WCCL 201	WCCL 115	WCCL 116
4:00-4:15	*Models, Values, and Disasters* Michael Veatch	*Some Silly Analogies and Mnemonic Devices for Upper-Level Math Topics* Aaron Allen	*Gaudi's Geometry of Nature* Donna Pierce
4:20-4:35	*P-values Considered Harmful* Michael Stob	*Warm-up Problems in Linear Algebra* Kristin A. Camenga	*Portuguese Mathematical History* Maria Zack
4:40-4:55	*The Daily Question: Building Student Trust and Interest in Undergraduate Intro to Probability and Statistics Courses* Matthew A. Hawks	*Inquiry-Oriented Instruction in an Abstract Algebra Course* Jill Jordan	*Algebra without Signed Numbers: Mr. Frend's Universal Arithmetic* Richard Stout
5:00-5:15	*Mentoring as a Statistical Educator Within the Context of a Christian College* L. Marlin Eby	*Reading Journals: Promoting Student Engagement and Success in Undergraduate Mathematics Courses* Sarah A. Nelson	*The Resolved and Unresolved Conjectures of R.D. Stout* Brian D. Beasley
5:20-5:35	*Future Medical Professionals and the Statistics Classroom* Paul Lewis	*Revitalizing Complex Analysis* Russell W. Howell	*Ten Mathematicians Who Recognized God in Their Work* Dale McIntyre
5:40-5:55	*Conceptual Understanding of Inference via Simulation* Justin Grieves	*The Complex Moduli Project and Mathematica-Based Modules in Complex Analysis* Bill Kinney	*Mathematics and an Epistemology of Love* Chris Micklewright

Parallel Sessions II - Thursday, June 1

	WCCL 201	WCCL 115	WCCL 116
7:30-7:45	*Hybrid Courses Across the Curriculum: What Works and What Doesn't* Catherine Crockett	*Influence on Students' Dispositions Toward Mathematics* Patrick Eggleton	*The Topology of Harry Potter: Exploring Higher Dimensions in Young Adult Literature* Alexa Schut, Sarah Klanderman, Dave Klanderman, William Boerman-Cornell
7:50-8:05	*Teaching Math and Computer Science Using Graphic Novels* Eric Gossett	*Poster Projects in Math for Liberal Arts* Brandon Bate	*Book Review: Redeeming Mathematics - A God-centered Approach by Vern Poythress* Kevin Vander Meulen
8:10-8:25	*Including a Writing Project in a Service Learning Course for Mathematics and Computer Science Students is a Win for Both Students and Professor* Lori Carter	*Finding Meaning in Calculus (and Life)* Doug Phillippy	*God: One, Part Two* Daniel Kiteck

Parallel Sessions III - Friday, June 2

	WCCL 201	WCCL 115	WCCL 116
1:00-1:15	*Using Machine Learning and Data Mining to Analyze Retention Rates at Bethel University* Deborah Thomas	*Precalculus and Calculus Students' Understanding of the Concept of Function* Lauren Sager	*An Overview of Specifications Grading* Mike Janssen
1:20-1:35	*An Analysis of SNU Chapel Attendance Data* Nicholas Zoller	*A Pre-Calculus Controversy: Infinitesimals and why they really matter* Karl-Dieter Crisman	*A "Big Ideas" Reflection Assignment Inspires Students to Make Valuable Connections* Jeremy Case and Mark Colgan
1:40-1:55	*Mathematics and Statistics Service Learning: Beyond the Project* Alana Unfried	*Using Inertial Navigation to Demonstrate Basic Calculus Concepts* Ron DeLap	*Mathematics/STEM Study Abroad across Europe* Nicholas J. Willis
2:00-2:15	*The Heart of Mathematics Through the Eyes of Faith* Matt D. Lunsford	*Why You Should Move Your Infinitesimals to the Top Drawer* Troy Riggs	*Axioms: Mathematical and Spiritual* Melvin Royer
2:20-2:35	*Classical Mathematics: An Attempt to Integrate Mathematics and Christian Worldview in a General Education Mathematics Course* Jamie K. Fugitt	*Variations on the Calculus Sequence* Chris Micklewright	*Integrating Faith and Discipline - Beyond the Classroom* Kevin Hopkins
2:40-2:55	*Teaching by Not Teaching: The Power of Collaboration* Audrey DeVries	*A Pre-Lab Style Approach to Calculus III* Michael Martinez	*Living at Work: My First Year as a Faculty-in-Residence* Rachel Grotheer

Parallel Sessions IV - Friday, June 2

	WCCL 201	WCCL 115	WCCL 116
3:30-3:45	*Logical Axioms and Computational Complexity: A Correspondence* Danny Rorabaugh	*Creating a Natural Progression Through a College Algebra Course* Denise K. Dawson	*The Role of Informal Learning in Supporting Mathematics Teacher Education* Alice Petillo
3:50-4:05	*Techniques for Integrating Faith Into the Computer Science Classroom* CSU computer science department	*The Corset Theorem* Owen Byer	*Math Teacher Circles: How and Why to Start Yours* Amanda Harsy, Tom Clark, Dave Klanderman
4:10-4:25	*Using Real-World Team Projects: A Pedagogical Framework* Michael Leih	*The Set of Zero Divisiors of Factor Rings* Jesús Jiménez	*Math Teacher Circle Problems: This Year's Brightest and Best* Mike Janssen, Mandi Maxwell, Sharon Robbert
4:30-4:45	*ScratchFoot: A Tool for Transitioning Students From Scratch to Greenfoot* Victor Norman	*Bicycle Routes and Euler Double-paths* C. Ray Rosentrater	*A Framework for Integrating Faith and Learning in the K-12 Mathematics Classroom* Ryan and Valorie Zonnefeld
4:50-5:05	*Teaching Introductory Computer Programming with "Processing"* Jeff Nyhoff	*Tightened Relaxations of the Traveling Salesman Problem* Audrey DeVries	*Cultivating Mathematical Affections through Engagement in Service-Learning* Joshua Wilkerson
5:10-5:25	*A Practical Mechanism to Perform Secure Computation* Benjamin Mood	*Sculpting Seifert Surfaces: Shepherding a Student Through a Mathematical Art Project* Lisa Hernández	*Revamping the Path Through High School Mathematics - The Impossible Dream?* Clayton R. Hall II
5:30-5:45	*Brokering Trust in Knowledge Management with the use of Data Visualizations* Kari Sandouka	*Manifold Methods for Averaging Subspaces* Justin Marks	*On Beyond Calculus: A Day for Community Outreach* Rebekah Yates

Abstracts for Invited Talks

De Morgan's *Budget of Paradoxes*

Sloan Despeaux

De Morgan's often-quoted and highly entertaining work, *A Budget of Paradoxes*, was a natural outgrowth of his anonymous book reviews for the weekly London-based literary magazine, *The Athenaeum*. This talk will give a sample some of the Budget's most enjoyable excerpts, discuss De Morgan's motivations for writing them, and consider why the work enjoyed such wide-ranging appeal. It will also consider De Morgan's treatment of mathematical "cranks," that is, people who tried to convince the general public that they done mathematically impossible feats such as doubling the cube, squaring the circle, or trisecting the angle. Exposing these "paradoxers" was part of De Morgan's program of a responsible and truthful presentation of mathematics to the public at large.

Fit To Print? Referee's Reports of Mathematics in Nineteenth-century London

Sloan Despeaux

The Royal Society represents one of the first British scientific societies to establish a peer review process for papers submitted to its journals. While peer review procedures were initially at best informal, by the 1830s, they became a formal, required gateway for all Royal Society submissions. This talk focuses on the refereeing of mathematical papers submitted to the Society from 1832 to 1902, the years covered in the first fifteen volumes of referee's reports archived at the Royal Society Library. Besides judging the mathematical content of papers, these reports give us sometimes tantalizing glimpses into the politics, relationships, and personalities of 19th-century mathematicians.

The Mathematics of Faith: Euler's anonymous work on the limits of mathematics, science, and faith

Dominic Klyve

In 1747, Euler wrote (and anonymously published) his Rettung der gottlichen Offenbahrung (E92), defending the validity of divine revelation as a valid source of knowledge, while considering perceived inconsistencies in mathematics and science. Drawing on a new translation of the Rettung, we shall attempt to elucidate some of Euler's religious views, and draw connections between this work and the work he was doing at the time in astronomy and mathematics. A close familiarity with Euler's mathematical works of the 1740's is necessary to understand Euler's religious document, and we thus demonstrate some of the mathematical theorems and problems besetting Euler at this time.

Translation and Betrayal: "Euler's Letters to a German Princess"

Dominic Klyve

Perhaps no work of popular science was more widely read, and more widely mistranslated, than Leonhard Euler's Lettres à une Princesse d'Allemagne. In this talk, we shall examine Euler's book, trying to understand why it was so popular and influential in its time. We shall then look at its dissemination and translation into eight languages over the first century following its publication. We shall discover that much of Euler's book, including almost all of his writing on God and faith, was systematically eliminated or edited by Condorcet in an attempt to make the book "more appropriate" for the modern reader. We will conclude by using this one example as a meditation on the problem of translation in general.

Shaping a Digital World: Connecting Bytes and Beliefs

Derek Schuurman

What does the Bible have to say about technology? What do bytes have to do with Christian beliefs? This talk will present some ideas from the book "Shaping a Digital World" (InterVarsity Press, 2013) in which a Christian perspective of technology will be sketched based on the Biblical themes of creation, fall, redemption, and restoration. It will be argued that computer technology is not neutral, but value-laden with substantial legal, ethical, social, cultural and faith implications. A discussion of norms for computing will be presented as guidelines for working towards more responsible technology. The talk will conclude by sketching common technological visions of the future and contrasting them with what is described in the biblical story.

Responsible Automation: Faith and Work in an Age of Intelligent Machines

Derek Schuurman

Ever since the Luddites revolted in opposition to the industrial revolution in the early 19th century, concerns over automation have persisted. Throughout the Industrial Revolution, the introduction of new technology did displace certain jobs, but it simultaneously created new jobs. And so it went for much of the 20th century. However, the digital revolution and the increasing pace of automation are now rapidly transforming the economy and employment. With recent developments in robotics and artificial intelligence, many have begun to warn of the "end of work" in what has been called "the second machine age." If pursuing absolute efficiency through automation leads to undesirable consequences, what normative guidelines can help us responsibly harness the possibilities of new technologies while simultaneously ensuring flourishing for humans and the rest of the creation? A set of norms informed by a Christian perspective for responsible technology will be presented to provide a helpful framework as we face the second machine age.

Abstracts for Parallel Session Presentations

Some Silly Analogies and Mnemonic Devices for Upper-Level Math Topics

Aaron Allen

There exist a number of topics, particularly in upper-level math courses, that are difficult to explain. Moreover, even when the professor explains an abstract topic clearly, there's the question of whether or not the student is able to grasp what the professor is communicating. The aim of this talk is to simply provide some examples of analogies and memory devices that help with student understanding of certain difficult topics. Examples include cooking (or baking) as an analogy for explaining vector spaces and archery as an analogy for explaining functions. Also included are memory devices such as pirate integrals and a spherical coordinate dance.

Poster Projects in Math for Liberal Arts

Brandon Bate

Over the past few years, I have been assigning poster projects to my Math for Liberal Arts class. For these projects, students identify an area of mathematics that they would like to learn independently and then present what they've learned to their peers in a poster session. In this talk, I will share about my experience using this assignment, including ideas for how to help students find appropriate topics, advice for how to encourage independent learning, and some thoughts on what I feel students gain through completing this assignment.

The Resolved and Unresolved Conjectures of R. D. Carmichael

Brian D. Beasley

Even before heading to Princeton University to work on his doctoral degree, Robert Daniel Carmichael started influencing the path of number theory in the 20th century. From his study of Euler's totient function to his discovery of the first absolute pseudoprime, he set the stage for years of productive research. This talk will present a brief overview of Carmichael's life, including his breadth of mathematical interests and his service on behalf of the Mathematical Association of America. It will focus mainly on his two most famous conjectures - which one has been settled, and which one remains open to this day?

The Corset Theorem

Owen Byer

In this presentation, we explore how to interpret the base and altitude of a triangle relative to a coordinate system in order to generalize the standard formula for the area of a triangle. This generalization will lead to an elementary proof of a formula for the area of a general polygon in terms of the coordinates of its vertices. A surprising corollary is that if every other vertex of a polygon is translated by a fixed vector, the area of the polygon is unchanged.

Warm-up problems in Linear Algebra

Kristin A. Camenga

Inspired by Ryan Higginbottom's article in the February/March 2016 MAA Focus, I used warm-up problems as the only homework in my linear algebra class of 31 students in Spring 2017. After every class I assigned several homework problems and at the beginning of the next class, I (mostly) randomly selected students to present some of these problems to their peers. Goals included increasing student responsibility, focusing attention on the communication of mathematics, giving students detailed and quick feedback, and limiting my time commitment to grading homework. I will share specifics of how I used warm-up problems, challenges faced, and how these goals were achieved (or not).

Including a Writing Project in a Service Learning Course for Mathematics and Computer Science Students is a Win for Both Students and Professor

Lori Carter

At Point Loma Nazarene University, we faced 2 dilemmas with our Mathematics and Computer Science graduating seniors. One issue became apparent in the capstone course taken the last semester before graduation. A major component of the course is a research paper. Each year we saw many seniors who still could not write well about concepts from their disciplines. The second issue was with the Service Learning course taken by students in our department. In this class, students use the skills they have acquired from their coursework and work in groups to complete a project as a service for a non-profit client. There are times when progress is not made on a project either because the client has not had time to get the data or resources required to move forward, or the students just lack motivation for this credit/no credit course. The addition of a project-based research paper, written with instruction and over the course of the semester-long Service Learning course has appeared to improve the experience in both Service Learning and Capstone for the students and professors alike. The presentation will focus on the instructive methods used to help students progressively write the paper in a way that motivated them to make progress on their projects and increased their confidence in writing without huge additional burden on the professor.

A "Big Ideas" Reflection Assignment Inspires Students to Make Valuable Connections

Jeremy Case and Mark Colgan

While participating in a Faculty Learning Community, we explored the "big questions" we wanted our students to take away from our mathematics courses. We called these questions the Big Ideas of the course and developed a Big Ideas Reflection Assignment, which we continue to assign at the end of each of our courses. Students are able to demonstrate understanding and application of their learning as well as their values and appreciation of mathematics. The assignment encourages students to move beyond a focus on technique and symbolic manipulations towards a broader and more holistic approach, including making connections between their learning and the Christian faith. We also noticed that the assignment changed the way we approach our teaching and designed our courses, so that our students are beginning to see our courses not as a collection of neatly packaged isolated chunks of material but as a unified collection of important mathematical ideas.

A Pre-Calculus Controversy: Infinitesimals and why they really matter

Karl-Dieter Crisman

In teaching calculus, it is not uncommon to mention the controversy over the role of infinitesimals with Newton's and Leibniz' calculus, including Berkeley's objections. In a history of mathematics course, it is a required topic! But rancor over infinitesimals and their role in mathematics predates calculus - so much so that a popular new book is dedicated to this topic.

In this talk, I will discuss not just the relevant controversies between Cavalieri and the Jesuits, between Thomas Hobbes and John Wallis, but also why they matter to us today, both as mathematicians and as Christians. Perhaps most importantly, I will present the modern life of the controversy as an example of overreach in the history of science, along with suggestions for how to bring the whole story into the mathematics classroom.

Hybrid courses across the curriculum: what works and what doesn't

Ryan Botts, Lori Carter and Catherine Crockett (presenter)

Recent hype around online and blended courses touts the benefits of immediate student feedback, flexible pace, adaptive learning, and better utility of classroom space. Here we aim to summarize the results of a 3-year pilot study using blended courses across the quantitative science curriculum (Mathematics, Statistics and Computer Science), in both upper and lower division, major and GE courses. We present findings on student attitudes towards this format, most helpful course components, time on task, progress on learning outcomes and faculty perspectives. This summary can be used to inform best practices in hybrid design, implementation and faculty expectations in the quantitative sciences.

Creating a Natural Progression Through a College Algebra Course

Denise K. Dawson

By approaching College Algebra as a study of functions and their graphs we are able to present the material in a way where each new topic builds on previous topics and naturally adds a level of complexity. The hope is that students will be able to see the connections and common themes running through the course. This presentation will compare this graphical approach to a more classical presentation of the material and will discuss a general map through the course.

Using Inertial Navigation to Demonstrate Basic Calculus Concepts

Ron DeLap

Students often absorb concepts more fully when they see concrete demonstrations of how the concepts can be applied. One such example is the relationships between acceleration, velocity and position. A lesson on inertial navigation provides a creative and interesting way to demonstrate these basic physics and calculus concepts in the classroom. "Smart cars" or autonomous driving vehicles are just one example of a known technology that uses inertial navigation. In this talk I will discuss several ways to illustrate the concepts of acceleration, velocity and position via theory and demonstrations of how inertial navigation works.

Teaching by Not Teaching: The Power of Collaboration

Audrey DeVries

The first ten minutes of class can either be the most wasted time or the most valuable time. A "Problem of the Day", completed in groups and given at the start of each class, can serve to review the prior day's material, encourage discussion and interactive learning, assess the students' understanding, provide the opportunity for instant feedback, and altogether result in learning by means other than teaching âĂŞ by means that extend beyond the classroom walls âĂŞ by means of collaboration. We all learn a great deal from what others know, and every student brings a unique perspective to the table. Collaboration allows students to see and understand concepts in a new light. Furthermore, a daily warm-up exercise frees up the teacher to answer questions, interact with students individually, observe and assess student understanding, critique student work, and build rapport with the class. It's well worth the sacrifice of ten fewer minutes of lecturing! Moreover, promoting collaboration within the classroom paves the way for collaboration amongst students outside the classroom. All in all, collaboration is a means of teaching by not teaching and leads to continued learning far beyond the scope of the teacher.

Tightened Relaxations of the Traveling Salesman Problem

Audrey DeVries

This paper derives new mixed 0-1 linear representations of the asymmetric quadratic traveling salesman problem (AQTSP). The AQTSP is a variant of the classical ATSP which allows for "quadratic" objective coefficients to record costs associated with travel along pairs of consecutive arcs. Emphasis is given to exploiting the problem structure so as to obtain representations with tight linear programming relaxations. In the process, different subtour elimination constraints are tightened, including the Miller-Tucker-Zemlin restrictions, and the restrictions invoking precedence-constrained variables. A consequence is improved valid inequalities for the (linear) ATSP. Computational results are provided to compare the relative merits of the different approaches.

Mentoring as a Statistical Educator Within the Context of a Christian College

L. Martin Eby

In this paper, I present principles based on more than thirty years of intentional mentoring as a statistical educator in a Christian college. I believe this mentoring has been enhanced due to the setting âĂŞ a Christian college, and the discipline âĂŞ statistics. I discuss distinctives of the Christian college setting that positively impact mentoring in any discipline with respect to the mentor, the mentee, and the pervading campus atmosphere. I focus on mentoring as a statistical educator by specifically considering the following: attracting students to the discipline of statistics, preparing students for careers using statistics, and preparing students for graduate study in a statistics related field. For each, I consider principles of successful mentoring in statistics at the undergraduate level regardless of the type of institution and how these principles can be expanded within the context of a Christian college.

Influences on Students' Dispositions toward Mathematics

Patrick Eggleton

This session is intended for presenting the findings from a Spring 2017 research study conducted at Taylor University regarding influences that contribute to a student's disposition toward mathematics. In the foundation level mathematics course taught for non-majors at Taylor, students are asked to share a reflection on their past mathematical experiences. Analysis of these reflections shows general themes regarding the influences, both good and bad, that have contributed to how these students approach mathematics. We would like to use this information as well as related studies to help instructors of mathematics develop positive dispositions toward mathematics in their students.

Classical Mathematics: An Attempt to Integrate Mathematics and Christian Worldview in a General Education Mathematics Course

Jamie K. Fugitt

As part of the faculty review process, Classical Mathematics, a freshman-level, general education mathematics course designed for students who wish to take a broad look at the history and structure of mathematics was developed. In this course students explore mathematical topics related to numeration, geometry, number theory, symbolic logic, and statistics through processes such as reasoning, proof, the axiomatic method, and application. Throughout the course, related philosophical and theological ideas are explored. At this point the course has not been taught and is still in the developmental stage.

In this session the journey that led to the development of this course curriculum and the major components of this curriculum will be presented. Participants will be encouraged to share similar efforts so that participants can learn from each other.

Teaching Math and Computer Science Using Graphic Novels

Eric Gossett

Find out how graphic novels can supplement textbooks in a math or computer science class. The presentation will also demonstrate how to produce your own graphic novel supplement at a reasonable cost. Here are a few advantages that graphic novel supplements can provide:

- They are fun to read.
- They provide easy to read overviews of many standard topics. Students can read the appropriate section of the graphic novel, then read, in more depth, the material in the textbook.
- They can be a useful part of an exam review. Repeatedly rereading a textbook does not aid learning. The graphic novel provides a quick reminder of the topics. The student can then look at some key sections of the main textbook to deepen that review.
- A graphic novel provides more opportunity to explore some common errors in student thinking.
- The story can model the kinds of questions that a successful student would ask.
- Many helpful research-based study tips can be included throughout the novel.

Conceptual Understanding of Inference via Simulation

Justin Grieves

In this talk we will look at an example in which hypothesis testing about a proportion is motivated and discovered. A story about a woman claiming to smell Parkinson's Disease motivates this lesson in which a simulation based randomization test is conducted. The lesson has been presented to 7th grade students, AP Statistics students, and college level introduction to statistics students and emphasizes the concept of testing and p-values.

Living at Work: My First Year as a Faculty-in-Residence

Rachel Grotheer

Research has shown that increased interaction between faculty and students outside of the classroom improves student achievement and the students perception of their educational experience. In an effort to increase this interaction and bridge the gap between a student's academic and residential life, Goucher College has adopted a Faculty-in-Residence program in its new first-year dorm. In this talk I will share the challenges and successes of developing this program and determining just how to create that bridge. I will also share challenging issues such as the blurred boundaries between life and work, maintaining a welcoming but still personal space, deciding how to bring mathematics into a dorm, and the unique perspective faith brings to it all.

Revamping the Path Through High School Mathematics - The Impossible Dream?

Clayton R. Hall II

In high school, most college-bound students follow the same general path of courses in mathematics and take Algebra 1, Geometry, Algebra 2, Trigonometry, Pre-Calculus, and Calculus. However, a significant number of students fall off this path at some point, ending their mathematical experience with negative feelings and possibly failure. For those students who survive, and even for those that have good mathematical ability, it is often the case that one of the two semesters of Calculus is for them a terminal course. The purpose of this talk is to look at the narrow view of mathematics held by most students and to ask if it is possible to broaden their perspective. Or is this really the impossible dream?

Math Teacher Circles: How and Why to Start Yours

Amanda Harsy, Tom Clark, Dave Klanderman

Many K-12 math teachers are not ready to teach from a conceptual and inquiry-oriented perspective because they have an algorithmic understanding of mathematics. One solution is to create a math teacher circle (MTC), which provides conceptual and inquiry-based learning activities and builds professionalism among the teachers. With the support of grants from the American Institute of Mathematics (AIM), over 100 math teacher circles (MTCs) have been formed over the last decade. Each circle is a partnership among faculty members at colleges and universities along with local elementary, middle, and high school math teachers. In this session, we describe the origins of two such MTCs, highlighting the process of identifying leadership team members, submitting the grant proposal for seed money, and hosting launch events, intensive summer workshops, and monthly meetings during the academic year. We will also share opportunities for professional development for college and university faculty, including research linked to shifts in in-service teacher attitudes and impact on student learning. Join us for a clear path to starting your own circle!

The Daily Question: Building Student Trust and Interest in Undergraduate Introductory Probability and Statistics Courses

Matthew A. Hawks

Introducing probability or statistics to disinterested undergraduate students is challenging. Adding faith in such a classroom at a secular institution only increases the complexity. We share an unobtrusive way to build trust with students, creating a medium to both naturally share your faith and have your students look forward to attending each class. The context is the United States Naval Academy, a four-year undergraduate institution with an emphasis on leader development. In addition to a calculus sequence, Humanities majors enroll in Probability with Naval Applications or Introductory Statistics. These sophomores or juniors are split between those who have no intention of enrolling in subsequent statistics courses (English, History, Language majors), and those who will take a follow-on course as part of their major (Economics, Political Science). Based on a technique of daily questions suggested by Penn State University Lecturer Dr. Heather Hollerman (2015), we integrate daily questions with the course content. The daily question offers opportunities for expressions of faith and invitations to further conversations. Anonymous midterm assessments and end of term student opinion forms demonstrate initial success of this method.

Sculpting Seifert Surfaces: Shepherding a Student Through a Mathematical Art Project

Elliott Best and Lisa Hernández (presenter)

A Seifert surface is a surface whose boundary is a particular knot or link. This talk will give a brief introduction to knot theory and Seifert surfaces followed by an exposition on guiding a student through a mathematical art project involving making physical models of Seifert surfaces.

Integrating Faith and Discipline - Beyond the Classroom

Kevin Hopkins

For those teaching at a Christian College, the idea of integrating faith and discipline is not a new one and is probably an expectation of the job. We hopefully have ideas on how to do that in the classroom. In the past couple of years I have been challenged to think of ways to integrate my faith and discipline beyond the classroom. This talk will share how I have attempted to integrate faith and discipline in some opportunities God has blessed me with outside the classroom. I hope the ideas shared will encourage others in their integration of faith and discipline both inside and beyond the classroom.

Revitalizing Complex Analysis

Russell W. Howell

Complex Analysis, despite its beauty and power, seems to have lost some of the prominence it once enjoyed in undergraduate STEM fields. Thanks to a grant from NSF a team of scholars convened in the summer of 2014 at Westmont College to discuss what might be done to rectify that situation. As a result, there have been contributed paper sessions for the past three years at the winter joint mathematics meetings, and just recently a theme issue of *PRIMUS* was dedicated to the revitalization effort. This talk will focus on some of the interesting pedagogical and research ideas that have grown out of this movement, and discuss a tip or two for applying for an NSF grant.

Math Teacher Circle Problems: This Year's Brightest and Best

Mike Janssen, Mandi Maxwell, Sharon Robbert

The key to a good Math Teacher Circle (MTC) is have a great collection of problems that are both deep and engaging but also approachable. We present several of the year's best activities that were used at our MTC meetings. We will describe activities such as fair division, extensions and generalizations of numerical and algebraic patterns, and applications in cryptography. In each case, feedback from the MTC meeting will include reactions from teachers at all grade levels, potential implications for classroom teaching, and possible extensions for future meetings. Come to learn more about these important partnerships among math teachers at elementary, middle, and high school levels as well as college and university mathematics and mathematics education faculty members.

The set of zero divisors of factor rings

Jesús Jiménez

Let A be a ring and $\mathfrak{a}$ an ideal of A. In this paper we show how to construct factor rings $A/\mathfrak{a}$ and a finite set of ideals $\mathfrak{a}_1, \mathfrak{a}_2, \ldots, \mathfrak{a}_k$, of $A/\mathfrak{a}$, such that: each ideal $\mathfrak{a}_j$ is contained in the set of zero divisors of $A/\mathfrak{a}$, the factor ring $A/\mathfrak{a}$ is a direct sum of these ideals, and each ideal $\mathfrak{a}_j$ is a ring with unity when endowed with addition and multiplication modulo $\mathfrak{a}$. Explicit examples are given when A is the ring of integers, Gaussian integers or the ring of polynomials over a field.

Inquiry-Oriented Instruction in an Abstract Algebra Course

Jill Jordan

I will briefly discuss why some mathematics instructors are choosing to move away from lecture and toward classes that emphasize inquiry-based learning, and explain what specifically is meant by the phrase "inquiry-oriented instruction." The focus of the talk will be my own experience in teaching Abstract Algebra I using an inquiry-oriented approach. I will discuss the primary curriculum I have used, give examples of specific activities from the curriculum, and share suggestions for adapting the curriculum as necessary to fit individual situations. Comments from end-of-course evaluations will be shared to give insight into students' perspectives on the course.

God: One, Part Two

Daniel Kiteck

At the last ACMS Biennial conference in 2015, I gave a talk titled: God: One, where I explored the relationship between the ontology of the number one and God. I have continued to be fascinated with this theme, and, thus, I have continued looking into this. This talk is my continued explorations.

Near the end of my last talk, God: One, I asked "What if God had chosen not to create anything? Is [the concept of the number one] necessary then?" I wasn't sure where to go with the question, as it had just occurred to me the week I gave the talk. After further reflection, I have more to say on that now. This lead me to explore the concept of the Simplicity of God, a traditional aspect of God that is not as prominent in modern theology compared to ancient theology, including Christian greats such as Basil of Caesarea and Gregory of Nyssa who were influential in the final version of the Nicene Creed, a universally accepted creed for Christianity. I read Basil of Caesarea, Gregory of Nyssa, and the Transformation of Divine Simplicity by Andrew Radde-Gallwitz. This has helped shape my concept of God and one. If God is Simple in a sense that nothing else could be, perhaps anything meaningful to us when we say "one" would not necessarily have any truly equivalent concept to if there was God alone and no creation.

Using Real-World Team Projects: A Pedagogical Framework

Michael Leih

The use of team projects in a program capstone course for computer science or information systems majors has been a popular method for reinforcing and assessing program learning objectives for students in their final semester. Using real-world group projects as a learning activity is an excellent pedagogical approach in helping students develop critical thinking, team work, real-world problem solving, and communication skills. However, real-world group projects also provide many challenges to both the instructor and students alike. Instructors or students must find real-world projects appropriate for the learning objectives in the course. Instructors must determine how to provide teams with appropriate learning activities and provide effective feedback to reinforce learning objectives while fairly assessing project deliverables to individual team members. Students must find a common time to work together and learn to appropriately delegate project activities so each student fairly participates in the project. Finally, real-world projects have the real risk of failing due to circumstances outside the control of the instructor and students.

There have been papers presented in the past describing methods to address these challenges and successfully use real-world team projects. This presentation gives a summary of these methods and presents a successful and practical approach that has been used for the past seven years in an information technology program capstone course. This framework is based on traditional project management methodologies which allow students the opportunity to successfully meet learning objectives even if the project success factors are not met.

Future Medical Professionals and the Statistics Classroom

Paul Lewis

Students seeking admission to Texas medical and dental schools are required to take a course in statistics. In fall of 2014, I began teaching a statistics course offered specifically to meet the needs of pre-health students. In this talk, I will present a few medical applications that could be explored in most probability and statistics courses. I will then share some of the benefits of offering a course intended primarily for pre-health students and how my interactions with students through this course have shaped my perspective on teaching statistics.

The Heart of Mathematics Through the Eyes of Faith

Matt D. Lunsford

Over the past several years, I have developed and taught a freshman-level mathematics course for non-math/science majors, which fulfills the general core requirement in mathematics. The primary text for the course is *The Heart of Mathematics* by Burger & Starbird. The senior capstone course in mathematics, which lies at the opposite end of the undergraduate experience, requires mathematics majors to read and respond to *Mathematics Through the Eyes of Faith* by Bradley & Howell. Upon noticing the many similarities in mathematical content presented in the two texts, I have worked to synthesize portions of these two texts into a coherent framework that could be used in the lower-level course. The ultimate goal of this endeavor is to demonstrate a mutually beneficial relationship between the discipline of mathematics and the Christian faith. This talk will focus on how the course and the integration project have evolved.

Manifold Methods for Averaging Subspaces

Justin Marks

Applications of geometric data analysis often involve producing collections of subspaces, such as illumination spaces for digital imagery. For a given collection of subspaces, a natural task is to find the mean of the collection. A robust suite of algorithms has been developed to generate mean representatives for a collection of subspaces of fixed dimension, or equivalently, a collection of points on a particular Grassmann manifold. These representatives include the flag mean, the normal mean, the projection mean, and the Karcher mean. In this talk, we catalogue the types of means and present comparative heuristics for the suite of mean representatives. We respond to, and at times, challenge the conclusions of a recent paper outlining various means built via tangent-bundle maps on the Grassmann manifold.

A Pre-Lab Style Approach to Calculus III

Michael Martinez

The Calculus sequence plays a foundational role for math and science majors of all stripes and is usually taken either concurrently with or immediately preceding the core upper-division math courses. At the same time, the traditional third course in the calculus sequence can be characterized as revisiting the concepts of the first two in higher dimensions and so much of the material is familiar to the students. As such, Calculus III is positioned wonderfully to more intently teach students many of the "soft skills" of mathematics. In this talk I will present some lessons learned after a year of restructuring the Calculus III course and discuss ideas for further implementation in the context of a liberal arts university

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Ten Mathematicians Who Recognized God's Hand in their Work (part 2)

Dale McIntyre

Scottish philosopher David Hume (1711-1776) once observed that

> "Whoever is moved by faith to assent to [the Christian religion], is conscious of a continued miracle in his own person, which subverts all the principles of his understanding, and gives him a determination to believe what is most contrary to custom and experience."

Evidently Hume's cynical pronouncement did not apply to Descartes, Newton, Riemann, and other profound thinkers who believed God had commissioned and equipped them to glorify Him in their pursuit of truth through mathematics âĂŞ And based on their extraordinary achievements the principles of their understanding do not appear to have been subverted too badly!

Leading mathematicians of the past commonly affirmed that God created and sovereignly rules the universe and that He providentially sustains and nurtures His creatures. Despite Hume's assertion, history teaches us that faith often informs rational inquiry and vice versa. In many cases Christian commitment stimulated intellectual activity; sometimes mathematical understanding led to spiritual insight.

In my former paper, ten of history's most influential mathematicians expressed the role faith in God and religious conviction played in their work in their own words. This paper explores the same for mathematicians numbered eleven through twenty.

Book Review: Redeeming Mathematics - A God-centered Approach by Vern Poythress

Kevin Vander Meulen

The title of the book by Vern Poythress should peak the interest of members of the ACMS. I will review what the book has to offer, and give a critique of the approach given in the book.

Mathematics and an Epistemology of Love

Chris Micklewright

N.T. Wright often describes the resurrection as ushering in a new paradigm for understanding and inhabiting the world, calling on scholars to explore how an "epistemology of love" transforms their discipline. This talk will engage in such an exploration, beginning with our understanding of mathematical objects. In particular, we will consider how both platonist and formalist views of mathematics have the potential to draw our imagination and our love toward abstract ideas and certainty, but away from God's good creation – and, perhaps, away from the Creator as well. One response, articulated by Boyer and Huddell in a recent Christian Scholar's Review article, is to follow Augustine in locating all of mathematics in the very nature of God; such an approach accounts well for the value and beauty of mathematics, but still has the potential to leave the mathematician adrift from creation. It can also be argued that the Augustinian approach improperly elevates mathematics above other disciplines, privileging an epistemology that falls short of Wright's ideal. As such, we will consider a Christian Humanist perspective on mathematics, recognizing mathematics as a part of human culture that seeks to "make something of the world" (to borrow from Andy Crouch). Such a perspective has the potential to fulfill much of what Wright calls for, and has significant implications for the ways in which we practice and teach mathematics.

Variations on the Calculus Sequence

Chris Micklewright

Many institutions have embraced a standard format for the Calculus sequence, comprising three four-credit courses covering a fairly consistent set of topics. While there is much to recommend this approach, it still leaves some fantastic concepts rushed or untouched, and it can be argued that it demands too much of students with weaker backgrounds. As such, some schools have experimented with variations on the standard format. In this talk, I will present the model that my institution currently uses, exploring the strengths and weaknesses of our particular approach. I will also suggest ideas, developed in conversation with other ACMS members at the 2015 meeting, for how different approaches might be explored in a comparative study. It is my hope that this talk will open productive conversation on the most effective ways of structuring the Calculus sequence, and that it will help to guide and inform the development of the comparative study.

A Practical Mechanism to Perform Secure Computation

Benjamin Mood

Secure computation allows multiple parties to compute on secret input and receive secret output without revealing sensitive information to any other party. For instance, two or more parties are able to find out which contacts they share on their mobile phones without revealing any information about the contacts they don't share by using a secure computation. Two health care companies could perform statistical queries on their data to find out new correlations between diseases without revealing the highly confidential data to each other. Unfortunately, the computational cost to perform secure computation by using cryptography is orders of magnitude slower than performing that same computation without any security. This work will discuss a new set of instructions for Intel processors, the software guard extensions, and how they can be used to perform secure computation efficiently.

Reading Journals: Promoting Student Engagement and Success in Undergraduate Mathematics Courses

Sarah A. Nelson

We spend lots of time searching for the *best* textbook for students. We want our students to have a reliable and useful resource to reference, as needed. We even ask them to read over certain material before classes. Often, however, we fail to guide our students in how to read the text productively.

Incorporating reading journals into your classes is an excellent way to simultaneously develop your students' ability to read mathematical text and capitalize on what the students already have to offer. In this presentation, we will look at how reading journals motivate students in a variety of mathematics courses across the undergraduate curriculum. As time permits, we will share important lessons learned and how to develop different types of prompts for journals.

ScratchFoot: a tool for transitioning students from Scratch to Greenfoot

Victor Norman

Students in middle school and high school are often introduced to computer programming with the online blocks-based programming environment, Scratch. Scratch is an ideal tool because students can learn computational thinking, while working in an environment in which little keyboard typing is required and it is difficult to make syntax errors. However, students do become frustrated with some of the limitations of Scratch. They also learn that "real" computer programming uses text-based languages, like Java, Python, or C++.

Another Computer Science educational tool is Greenfoot. Like Scratch, Greenfoot has a large user base and many online resources, including curriculum, lesson plans, tests, etc. However, Greenfoot helps students learn introductory programming using Java, a text-based language.

For years, educators have been seeking ways to gently help students make the transition from blocks-based program to text-based programming. In fact, a recent conference was convened to discuss, among other things, exactly this problem.

Over the last 3 summers students and I have been developing a tool to transition Scratch users to Greenfoot. The similarities between Scratch and Greenfoot are notable: 1) both offer a 2-dimensional canvas on which programmers place images (or *sprites*); 2) both offer an API to allow the programmer to move the image, to changes the direction it is facing, to detect collisions between images, to detect collisions with the edges, to change their images, and to react to user events - keyboard presses, mouse movement, etc.; and 3) both allow students to post their creations online easily, to be shared with others.

The tool, ScratchFoot, consists of 2 parts. First, the tool includes a Greenfoot library that provides a Scratch-like API, so that students who are familiar with Scratch "calls" can easily recognize the ScratchFoot equivalents. Second, the tool can automatically convert a Scratch project into a Greenfoot scenario.

My presentation will demonstrate the tool and discuss the challenges in making Greenfoot's execution model act like Scratch's. It will also discuss my first round of testing with middle-school and high-school students during the summer of 2017. The presentation will include a live demo of the tool.

Teaching Introductory Computer Programming with "Processing"

Jeff Nyhoff

"Processing" is a free, open source, and multiplatform computer programming language that was originally created 16 years ago at MIT Media Lab to make it easier for digital artists to create works involving graphics, animations, and interactivity. Since then, Processing has evolved into a stable, powerful, and versatile programming environment with a worldwide popularity. However, Processing remains relatively unknown in academic computer science. This presentation will describe and demonstrate how, at Trinity, Processing has continued to prove to be an enjoyable and highly effective way for college students from a variety of majors to learn the basics of computer programming and acquire a solid basis for further learning. Because Processing is a considerably simplified version of Java, using Processing in Trinity's "CS1" course has been found to prepare students well for the "CS2" course that uses Java. Processing can be used to write graphical programs as well as numerical programs. Processing has also proven to be suitable for instruction of high school students: this past fall, 8 students from Chicago Christian High School enrolled in the introductory computer programming course taught at Trinity using Processing and continued on to the second programming course in Java, performing strongly in both courses. Trinity students have also used Processing in more advanced courses to create Android smartphone apps and interactive body-tracking games that incorporate the Microsoft Xbox Kinect camera.

The Role of Informal Learning in Supporting Mathematics Teacher Education

Alice E. Petillo

Informal learning in mathematics opens a door for pre-service teachers to experience mathematics in a constructive and interconnected way. This research addresses a gap in research and practice in that many future teachers are not currently exposed to informal learning opportunities. Data from undergraduate students was collected as part of IRB-approved studies over the last three years at the National Math Festival 2015 and 2017, and the USA Science & Engineering Festival 2016 in Washington DC.

The purposeful implementation of these community-based informal learning experiences supports pre-service teachers' mathematical development while still undergraduate students. These experiences may promote a positive shift in beliefs and feelings towards mathematics as a subject they will one day teach. Implications include recommendations for teacher educators to facilitate pre-service experiences in informal and service-based learning. Since many informal learning events are free and open to the public, these events provide opportunities for students from all types of backgrounds and have the potential to support educational equity.

Professional education associations like the American Educational Research Association (AERA), National Council of Teachers of Mathematics (NCTM) and National Science Teachers Association (NSTA) recognize that informal education should be a part of a core STEM strategy and be supported by professional development of in-service teachers and pre-service teachers. Educational research describing how informal learning environments in mathematics can create interest and connections with mathematics is needed. In addition, mathematics teacher educators can benefit from support in designing these kinds of experiences for their pre-service teachers.

Finding Meaning in Calculus (and Life)

Doug Phillippy

A 2015 publication of the Mathematical Association of America (*Insights and Recommendations from the MAA National Study of College Calculus*) noted that "students taking college calculus exhibited a reduction in positive attitude toward mathematics, which can affect their career aspirations and desire to take more mathematics". The study pointed out that students' confidence to do mathematics, enjoyment of mathematics, and desire to persist in their study of mathematics had all dropped by the end of their college calculus experience. The study also suggested possible reasons for the negative drop in student attitude and made several recommendations to mathematics departments on how to address this problem. The focus of this talk will be on a uniquely Christian approach to addressing this problem, one that the presenter believes is the only long-term solution to find meaning in the calculus classroom.

Gaudi's Geometry of Nature

Donna Pierce

Antoni Gaudi (1852-1926) was a Catalan architect whose distinctive style was characterized by its range of forms, textures, polychromy and sense of unity with the natural world. His architecture, inspired by the Christian message and nature, broke from the established order both in form as for the constructive solutions employed in his buildings. Gaudi took his inspiration from the Christian message and nature. He saw creation as being the supreme work of the Creator and the model from which he should take inspiration for his buildings. Employing complex geometries such as ruled surfaces, hyperboloids, paraboloids, double twisted columns, caternary arches, his architectural structures give the appearance of being a natural object in complete conformity with nature's laws. In this talk we will look at his most famous building, La Sagrada Familia in Barcelona, and learn how he employed his geometry of nature to create a place of worship resembling a wood that invites prayer and is fitting for celebrating the Eucharist. We will see how Gaudi took his observations of nature and passed them through the sieve of his enormous personal creativity and ingenious methodologies to create the structures and forms which give his buildings their organic unity of nature, faith and many arts.

Why you should move your infinitesimals to the top drawer

Troy Riggs

Anyone who has taught applications of calculus has used infinitesimal arguments, even if only heuristically. I will argue that based on A. Robinson's foundations, B. Dawson's approximation relation and a very positive response from students; we should all formalize this process and use it as an alternative to limits from the very beginning of calculus.

Logical Axioms and Computational Complexity: A Correspondence

Danny Rorabaugh

Relational structure $\mathbb{A}$ is compact provided for any structure $\mathbb{B}$ of the same signature, if every finite substructure of $\mathbb{B}$ has a homomorphism to $\mathbb{A}$ then so does $\mathbb{B}$. The Constraint Satisfaction Problem (CSP) for $\mathbb{A}$ is the computational problem of determining whether finite structures have homomorphisms into $\mathbb{A}$. We explore a connection between the hierarchy of logical axioms and the complexity hierarchy of CSPs: It appears that the complexity of CSP for $\mathbb{A}$ corresponds to the strength of the axiom "$\mathbb{A}$ is compact". At the top, the statement "K_3 is compacts" is logically equivalent to the compactness theorem. Thus the compactness of K_3 implies the compactness of all finite relational structures. Moreover, the CSP for K_3 is NP-complete. At the bottom are width-one structures; these are provably complete from ZF and their corresponding CPSs are polynomial-time solvable.
This is joint work with Claude Tardif and David Wehlau, arXiv:1609.05221 [math.LO].

Bicycle Routes and Euler Double-paths

C. Ray Rosentrater

What configurations of roads are amenable to creating a bicycle route that traverses each segment exactly once in each direction? As stated, every configuration of roads can be so traversed. However, the question becomes much more interesting when U-turns are not allowed. This talk investigates the conditions under which a connected graph has a non-reversing, Euler double-path.

Axioms: Mathematical and Spiritual

Melvin Royer

Pastors such as A.W. Tozer have described their preaching as an attempt to extract from scripture axioms that are universal across circumstances. Similarly, academicians in various disciplines have tried to characterize the foundational principles of their field. For example, the social psychologist Gerard Hofstede proposed an onion model for comparing cultures in which core values of a nation help explain its rituals, feelings, and artifacts. On a personal level, many of us have likely tried to identify root causes of our beliefs and feelings.

These attempts to "find bedrock" are somewhat analogous to the axiomatization of mathematics attempted by Euclid, Hilbert, Frege, Russell and Whitehead, and others. As is well known, the success of these efforts ranges from that of Euclid (whose book arguably guided western mathematical reasoning for two millennia) to that of Russell and Whitehead (whose book was essentially defeated by Gödel's Incompleteness Theorem within two decades).

In this talk, we will propose insight that mathematical axiomatization (considered as a parable) may have for our efforts to understand God and explain our core spiritual beliefs. Is it really possible to identify our personal spiritual axioms? Is it possible to classify spiritual axioms as consistent and complete? Are there things that God does and does not want us to know? How should Christians respond when deductive reasoning fails to explain a situation?

Precalculus and Calculus Students' Understanding of the Concept of Function

Lauren Sager

Function is a central topic to the precalculus course, and many researchers have suggested the importance of a strong conception of function to students' mathematical development. Following a framework of understanding suggested by Anna Sfard (1991), I developed a questionnaire on functions for precalculus and calculus students. This talk will focus on interesting trends found in the solutions, and the differences between precalculus and calculus students' solutions.

Brokering Trust in Knowledge Management with the use of Data Visualizations

Kari Sandouka

Discussion of a research proposal that I developed to measure and broker trust within knowledge management using data visualizations. A conceptualized view is provided to show how the four modalities of knowledge creation are intertwined with creating and maintaining trust in an organization with data visualizations. In addition to the conceptual model, a measurement scheme to identify how effective the data visualizations are in building trust between the hierarchical levels of employees. Overall, I am proposing a research model to identify if, and if so how effectively, data visualizations are brokering trust by providing transparency into the data used for decisions at the administrative and/or executive levels of an organization.

The Topology of Harry Potter: Exploring Higher Dimensions in Young Adult Fantasy

Alexa Schut, Sarah Klanderman, Dave Klanderman, William Boerman-Cornell

As one of the most beloved series in childrenâĂŹs literature today, the Harry Potter books excite students of all ages with the adventures of living in a magical world. Magical objects (e.g., bottomless handbags, the Knight Bus, time turners, and moving portraits) can inspire generalizations to mathematical concepts that would be relevant in an undergraduate geometry or topology course. Intuitive explanations for some of the magical objects connect to abstract mathematical ideas. We offer a typology with a total of five categories, including Three Dimensions in Two Dimensions, Higher Dimensions in Three Dimensions, Two and Three Dimensional Movement, Higher Dimensional Movement, and Higher Dimensional Traces. These categories attempt to explain supernatural events from the wizarding world using mathematical reasoning in order to increase engagement in topics from topology to differential geometry. Our pedagogical goal is to pique student interest by linking these abstract concepts to familiar examples from the world of Harry Potter. Put on your Ravenclaw robe or Gryffindor scarf and join us!

Techniques for integrating Faith into the Computer Science Classroom

Valerie Sessions, Yu-Ju Lin, Paul West, Sean Hayes, Fred Worthy, Jim Roberts

The computer science department at Charleston Southern University uses a variety of methods to integrate faith into the classroom. The department strives to integrate faith in the general education course, Freshman Seminar, all the way up to our masters level courses in computer architecture, user interface, and distributed data mining. Mapping Bloom's taxonomy to a series of courses, we show a few of our methods and how they map with the type of skills we wish to see in our students. Over the course of the majors' time at CSU we strive to grow the student from knowledge of the Christian faith, to how our faith can illuminate the type of work we do in computer science, to how CS (particularly Artificial Intelligence) could inform our very faith. We will also give some specific examples of class discussion topics, ethics papers and out of classroom club activities. This will be a very practical look at faith integration by the entire department.

P-values considered harmful

Michael Stob

In 2016, the American Statistical Association adopted a statement on null hypothesis statistical testing. This unprecedented statement was motivated by increasing criticism of both the contemporary practice and theoretical foundations of this method which is taught in every introductory statistics class as an important method for gaining scientific knowledge from data. In this talk, we look at just one strand of that criticism, the replicability crisis, to see what all the fuss is about.

Algebra without Signed Numbers: Mr. Frend's Universal Arithmetic

Richard Stout

Toward the end of eighteenth century negative numbers had gained wide acceptance yet, there were still pockets of resistance, especially in England. One particularly vocal and irritating opponent of the use of negative numbers was the British mathematician William Frend (1757-1841). Frend adamantly maintained that signed quantities are meaningless, that they have no place in rigorous mathematics, and that their use was essentially why students struggled with algebra, which at the time was thought of as a universal arithmetic.

Frend was educated at Cambridge and held a position as a tutor at Jesus College until he became disenchanted with the Church of England and was forced to leave. Nevertheless, he continued to be active in London intellectual circles and maintained a connection with the British mathematical community. Some historians believe that his campaign against the negatives was a factor in PeacockâĂŹs developing a formal system of algebra.

Convinced that the use of negative quantities was a major cause of confusion among algebra students, Frend wrote a text devoid of signed quantities, *The Principles of Algebra*, published in 1796. Because he eschews the use of negative quantities, Frend must resort to clever arguments to obtain basic algebraic identities. In this talk we will introduce Frend and his text, considering several illustrative examples of his reasoning. Our goal is to appreciate the methods he uses and critique his claim that deleting negative quantities simplifies the subject and facilitates understanding.

Using Machine Learning and Data mining to analyze retention rates at Bethel University

Deborah Thomas

Academic institutions, such as ours, are always looking for ways to increase retention rates by increasing our percentage of successful students. Two indications of success at Bethel are the percentage of returning students between freshman and sophomore year as well as the graduation rate for a particular class after four years. Since we have acquired information about our students

over the past many years, we can use it to describe students who are successful and those who aren't. Often, the underlying patterns may not be obvious with simple analysis techniques, making it a challenging problem. Once we identify them, it will help us better assist our students so that we can increase our success rates. This is where data mining can be used to analyze the data and look at relationships, across student types and across years. The presentation will include a discussion of such techniques as well as our results so far, including summative descriptions of students who tend to succeed at Bethel and return the following year. We will also do similar analysis on the graduation rates of Bethel students.

Mathematics and Statistics Service Learning: Beyond the Project

Alana Unfried

"What is service?" "Is mathematical consulting a form of service?" "How do I consult effectively?" "Why does it even matter?" A Service Learning course or project is a powerful tool for helping mathematics and statistics students realize the impact that their field of study has on the world, as well as the role that they themselves might play in bettering society. This type of course or project can often be a student's first exposure to using their mathematical and statistical skills to work with a real client. This talk will discuss not only the implementation of consulting projects, but also the logistics of creating a reflective, engaging learning environment for our students at secular and religious universities alike. I will share resources and ideas for reading assignments, presentations, journals, in-class activities, and more. Service learning is more than just a project; it is a way for students to realize the deep need for their skill sets in society today and to explore how these skills can be used in service to others.

Models, Values, and Disasters

Michael Veatch

Response to a major disaster involves rapid movement of people and supplies in a challenging environment. Mathematical planning models have been proposed, analogous to those used in commercial logistics. Part of the model building challenge is to capture the decision-maker's objective, which is multifaceted and not simply monetary. How is equity balanced with efficiency? How is cost and donor interest considered? How should uncertainty be modeled? The objective functions of several models are described. Like any decision tool, the models have values embedded in them. For the decisions to reflect the right values, the model must align with the organization's values. I will report on a study of how the values and priorities of Christian relief organizations differ in ways that can - or should - be reflected in their logistics procedures and these models. The study used interviews with World Vision and secular organizations and a survey of logisticians. I will also describe plans to assess these decision-maker's values.

Cultivating Mathematical Affections through Engagement in Service-Learning

Joshua Wilkerson

Why should students value mathematics? While extensive research exists on developing the cognitive ability of students, very little research has examined how to cultivate the affections of students for mathematics. The phrase "mathematical affections" is a play on the affective domain of learning as well as on the general notion of care towards something. Mathematical affections are more than a respect for the utility of the subject; the term is much broader and includes aesthetic features as well as habits of mind and attitude.

This paper will analyze the findings from a research project exploring the impact of service-learning on the cultivation of mathematical affections in students. This was a qualitative case study of high school students who recently completed a service-learning project in their mathematics course. Data was gathered from student interviews, reflection journals, and field observations. The framework for the analysis follows the definition of "productive disposition" offered by the National Research Council (2001) as well as the concept of formative "cultural liturgies" offered by the philosopher James K.A. Smith (2009).

The major themes that emerge from the data indicate that through service-learning students see math as sensible, useful, and worthwhile. This supports the potential of service-learning as a pedagogical tool that can be utilized to develop a productive disposition in students; addressing at a practical level how the affective objectives of national policy documents can be achieved.

Mathematics/STEM Study Abroad across Europe

Nicholas J. Willis

Are you interested in taking your Math majors/STEM students on a trip to Europe? Nick Willis has lead 21-day study abroad trips to Europe four times and is ready to share his experiences with you. In this talk Nick will give ideas about places that you might take your Math students in Europe and some of the lessons he has learned about leading STEM trips. Countries Nick has lead trips to include Spain, France, England, Switzerland, Germany, Austria and Italy.

On Beyond Calculus: A Day for Community Outreach

Rebekah Yates

Each February, around 100 high school students descend on Houghton's small campus in western New York to take the American Mathematics Competition and participate in several sessions designed to inspire them in math or science. Our department's goal is always to show them that there is more to math than the march to calculus. We have offered sessions on a variety of topics from voting to game theory to spherical geometry. In this talk, I will share some of the materials I've used to introduce high school students to binary, non-standard metrics, and infinity.

Portuguese Mathematical History

Maria Zack

Portuguese mathematical history is quite different from that in the rest of western Europe. In the 1500's Portugal was a world power with a large shipping fleet that navigated the globe and took trade and settlers to new colonies. The Portuguese also built significant fortresses in their far-flung colonies. However by the 1700's, the mathematics taught at the universities in Portugal was significantly less advanced than what was being taught in neighboring countries. This talk will discuss Portuguese history and trace the unique role that the military academies played in modernizing Portuguese mathematics in the late 1700's.

An Analysis of SNU Chapel Attendance Data

Nicholas Zoller

Southern Nazarene University (SNU) requires its traditional undergraduate students to attend chapel services as an expression of its commitment to faithful living in Christian community. Chapel services are held regularly on Tuesday and Thursday mornings for the entire SNU community. Other chapel opportunities are available throughout the week. Traditional undergraduate students must attend at least 27 chapels each semester in order to pass the chapel requirement. Failure to meet the requirement results in a fine or suspension from SNU.

We present a descriptive analysis of SNU chapel attendance data for the Fall 2014, Spring 2015, and Fall 2015 semesters. We find that female students have better chapel attendance completion rates than male students, and student athletes have better chapel attendance completion rates than non student athletes. We also examine chapel attendance trends over the course of each semester by day of the week (e.g. Tuesday or Thursday) and by type of chapel (e.g. regular chapel or alternative chapel service).

This work was completed during the summer of 2016 by an SNU math major. We con- clude by noting some of the lessons learned from using institutional data for an undergraduate statistics research project.

A Framework for Integrating Faith and Learning in the K-12 Mathematics Classroom

Ryan Zonnefeld and Valorie Zonnefeld

As middle school and high school mathematics teachers, we were challenged by the desire to integrate our faith in the mathematics classroom. Over the past year, in consultation with kindergarten through college-level mathematics educators, we have co-authored a document to give K-12 teachers ideas for teaching mathematics faithfully organized by grade level at the elementary level and domain at the secondary level. The document is intended to be a springboard for teachers and

is organized around the Teaching For Transformation Through lines while using the structure of the Common Core State Standards for mathematics. As educators continue to speak into the document it expands and morphs. This talk will briefly share the development process, give an overview of the design, and present the current version of the framework for you to use. There will also be time for questions and feedback allowing you to "speak into" the document.
