



2019 MISF STEM Education Conference Breakout Sessions

*Recommended grades listed in left column.
Additional grades for which sessions may be relevant are indicated in parentheses.*

Morning Double Sessions: 9:30-11:50am

3-12	<p>Hands-on Learning Through The Minnesota 4-H Engineering Design Challenge Are you looking for a way to engage youth in STEM learning in a highly engaging way? In this session, you will learn how to use the eight practices of science and engineering and the experiential learning model through the 4-H Engineering Design Challenge. The challenge empowers and inspires youth to develop 21st Century Skills and brings math and science standards to life. The session will introduce attendees to Engineering Design Challenge Level 1 and Level 2.</p> <p><i>Michael Compton, University of Minnesota Extension Center for Youth Development & Melissa Huppert, Minnesota State Engineering Center of Excellence</i></p>
6-12	<p>Digital Electronics Demystified: From 0 to 1 in a Single Session We know that digital technology drives our modern world, but how do those ones and zeros actually facilitate the technology we use every day? Participants will learn how digital electronics use this binary concept to control systems, store data, and communicate information—and then build a functional digital circuit to practice this new knowledge. This session will be beneficial to anyone working with electronics, robotics, and microprocessors such as Arduino, Raspberry Pi, Beagle Bone, and others.</p> <p><i>Andrew Tubesing, University of St. Thomas</i></p>

One-Hour Breakout Sessions: 9:30-10:30am

K-5	<p>STEM Tales: Integrating Literacy and STEM for K-5 Students It's a literacy-STEM mash-up as fairy tale characters use STEM to solve their problems! Join in on the fun as we do a bit of hands-on engineering with recycled and household objects to help our favorite fairy tale friends escape danger and improve their lives. View the entire <i>The STEM Tales</i> series created by Meredith Anderson, and enter a drawing for a chance to win one of five \$10 gift cards for Teachers Pay Teachers to purchase your favorite STEM Tales downloads.</p> <p><i>Kelly Stanton-Nutt, St. Dominic School</i></p>
K-5	<p>Compelling Stories and Creative Engineering Challenges Reading a book can engage elementary students with ideas such as creativity and problem solving, thus setting the tone for an engineering challenge that they then complete. This session will focus on teaching engineering habits of mind, such as collaboration, persistence, creativity and conscientiousness. Included will be examples of books that appeal to grades K to 5, and hands-on engineering challenges and necessary materials to accompany the books.</p> <p><i>Kit Wilhite, The Works Museum</i></p>
K-8	<p>Makerspace Mashup II Back by popular demand! Does your school have a Makerspace, or are you thinking about starting one? Join us to explore the myriad of ways Making can happen in schools. Learn how teachers are bridging the gap between hand tools and high tech and from woodworking to coding. In this session you will have the chance to explore favorite resources and sample lessons from schools with established Makerspaces, ideas for designing learning experiences for students, as well as tips and lessons learned.</p> <p><i>Evan Handrick, Maranatha Christian Academy Ellen Schafer, St. Joseph's School Ruth Thom, Helicher Minneapolis Jewish Day School Beth Murphy, Minnesota Independent School Forum</i></p>
K-12	<p>Online STEM Teaching Resources The STEM Teachers Center is both a repository of Minnesota academic standards in math and science and also a teacher-built resource for implementing engaging and rigorous lessons in your classroom. The Teachers Center includes guidance for adapting lessons for English Language Learners, Special Education students, and gifted students. Come and explore the site and see how its resources can be implemented in your classroom.</p> <p><i>Jim Davnie, SciMathMN</i></p>

3-8	<p>Building a 5E Student-Centered STEM Lesson Delve into the 5E Instructional Model, a research-based framework for effectively integrating hands-on and discovery-focused STEM activities into the classroom. Engage as students would in an exciting STEM lesson, and then discuss and reflect on the learning experience as teachers. Leave with ideas and tools to help incorporate this student-centered approach into your existing curricula. <i>Renee Piersa & TBA, Science from Scientists</i></p>
3-12 (K-2)	<p>Three-dimensional Teaching and Learning in Science Learn about teaching strategies that are promoted by the Next Generation Science Standards. You will engage in a model-developing activity and analyze the teaching moves. The research behind these strategies is being incorporated into most of the new curriculum materials that are being published and is the basis for Minnesota's 2019 science standards. <i>John Olson, Minnesota Department of Education</i></p>
6-8 (3-5)	<p>Engineering a Rocket This session will focus on an engineering design challenge that uses low cost, easily accessible materials. Attendees will create a rocket and explore the mathematics connected to the rocket launch as well as use this data to redesign and re-launch the rockets. <i>Debbie Monson & Deb Besser, University of St. Thomas</i></p>
9-12	<p>Mission to the Galaxy! Calculating the Launch Date You are mission control! You need to save Mark Whatney and send a rocket to Mars (or maybe Neptune, or...). But you need the correct launch date so that your rocket arrives when the planet is actually there. You'll need to learn about the Hohmann Transfer, heliocentric angles, Kepler's Laws of Planetary Motion, and elliptical orbits. Sounds daunting, but it's actually really fun. This project was adapted from a Jet Propulsion Laboratories module in response to the movie Hidden Figures for use as an interdisciplinary project for Physics and Calculus students, but it is appropriate for Pre-calculus as well. <i>Daniel Bowler & Tanner Stevens, Benilde-St. Margaret's</i></p>
Session 2: 10:50-11:50am	
K-5	<p>Compelling Stories and Creative Engineering Challenges Reading a book can engage elementary students with ideas such as creativity and problem solving, thus setting the tone for an engineering challenge that they then complete. This session will focus on teaching engineering habits of mind, such as collaboration, persistence, creativity and conscientiousness. Included will be examples of books that appeal to grades K to 5, and hands-on engineering challenges and necessary materials to accompany the books. <i>Kit Wilhite, The Works Museum</i></p>
K-5 (6-12)	<p>Educator Resource Center: Hands-on Science! Find out how your MISF membership can give you access to half a million dollars' worth of classroom materials, education experts, a place to network with colleagues, inspire your teaching and more—all at the Educator Resource Center at the Science Museum of Minnesota. Explore crosscutting concepts such as systems/system models, energy, and matter through hands-on learning. Enter a giveaway to win tickets to the Science Museum of Minnesota so you can find out for yourself how many of these concepts can be applied to our larger-than-life galleries and exhibits. <i>Kalia Vue, Karla Ollanketo & Sam Glick, Science Museum of Minnesota</i></p>
K-8	<p>Seesaw: An App to Show Student Learning in the Classroom Attendees will learn about Seesaw—a free app for teachers--and how they can use it in their classrooms. Real examples of how students can use Seesaw to document their learning via online portfolio and how teachers can use it to communicate with parents will be shared. Please bring an iPad or tablet and download the free app called <i>Seesaw: The Learning Journal</i> in advance to maximize exploration during the session. <i>Jackie Eyberg, Christian Heritage Academy</i></p>

K-12	<p>Bringing Technology into the Classroom: A Look at Tech in the Real World Technology is everywhere and 21st skills—such as technical literacy—are required in a modern society. This workshop will explore hands-on approaches to learning about the technology that we use every day. Participants will interact with different educational platforms from circuit components to sensors to programming—and everything in between! Teachers can take on the role of students and learn new approaches to using electricity and circuits, robotics, and programming in the classroom.</p> <p><i>Rachel Fees, STEM Supplies-Gopher Sport</i></p>
3-12 (K-2)	<p>Three-dimensional Teaching and Learning in Science Learn about teaching strategies that are promoted by the Next Generation Science Standards. You will engage in a model-developing activity and analyze the teaching moves. The research behind these strategies is being incorporated into most of the new curriculum materials that are being published and is the basis for Minnesota’s 2019 science standards.</p> <p><i>John Olson, Minnesota Department of Education</i></p>
6-8 (3-5)	<p>Engineering a Rocket This session will focus on an engineering design challenge that uses low cost, easily accessible materials. Attendees will create a rocket and explore the mathematics connected to the rocket launch as well as use this data to redesign and re-launch the rockets.</p> <p><i>Debbie Monson & Deb Besser, University of St. Thomas</i></p>
6-12	<p>STEMinist: Engaging Girls in Engineering In a student led panel, we'll discuss strategies around encouraging girls in STEM. We will look at data collected from our students over time, review current research around engaging girls in STEM, and hear from students themselves about why they are excited about engineering.</p> <p><i>Anne Dougherty, Benilde-St. Margaret's</i></p>
9-12 (6-8)	<p>How do we see? The Physics of How Your Eye Works Ever wonder about how your eye allows you to see light and colors? In this session we will discuss the geometric optics of the lens of your eye, how your brain interprets colors and images, and discuss the safety when using lasers or LEDs.</p> <p><i>Jason Hall, Academy of Holy Angels</i></p>
Afternoon Double Session: 1:00-3:15pm	
3-8	<p>LEGO Mindstorms Robotics 101 Experience the thrill of making a LEGO robot move! During this hands-on session—designed for beginners—we will explore robotics using basic programming to make the robot drive. Using the LEGO Mindstorms EV3 icon-based software, we will also integrate sensor feedback into the programming. Participants will work in teams on a laptop and robot provided by the presenter. No experience necessary!</p> <p><i>Jeannie Badger, Cheryl Moeller & Vicki Coaty, High Tech Kids</i></p>

Session 3: 1:00-2:00pm	
K-2	<p>The Buzz About Coding These days, it seems everyone is talking about teaching students to code, but it can be hard to get started if you aren't familiar with the concepts or don't have the tools. Come learn some ways to introduce coding concepts to young students using basic materials as well as more sophisticated equipment (Bee Bots). In this session you will learn both about coding and the science of bees, and briefly discuss how easy it is to embed coding in other science topics.</p> <p><i>Anika Taylor, The Bakken Museum</i></p>
K-12	<p>MISF STEM Grant Program Bring your questions about the MISF STEM Grant Program and your ideas for STEM Grant projects to discuss with MISF's STEM program manager and the people who review Grant applications. MISF's STEM Advisory Committee includes engineers, scientists and educators from the community who are eager to talk with you about developing a strong project and writing a winning proposal.</p> <p><i>Beth Murphy & representatives from the STEM Advisory Committee, Minnesota Independent School Forum</i></p>
K-12	<p>Navigating the Sky Learn to use both technology-based and paper-based tools to identify more objects in the sky. This will introduce 'motion in the sky' lessons that use apps to make observations. Gain familiarity with what is in the sky on any given night and ideas for engaging your students. Please bring a device to use.</p> <p><i>Sarah Weaver, Como Planetarium</i></p>
K-12	<p>Bringing Technology into the Classroom: A Look at Tech in the Real World Technology is everywhere and 21st skills—such as technical literacy—are required in a modern society. This workshop will explore hands-on approaches to learning about the technology that we use every day. Participants will interact with different educational platforms from circuit components to sensors to programming—and everything in between! Teachers can take on the role of students and learn new approaches to using electricity and circuits, robotics, and programming in the classroom.</p> <p><i>Rachel Fees, STEM Supplies-Gopher Sport</i></p>
3-5 (K-2)	<p>ALL MORPHED UP! The STEAM of Anamorphic Cylinder Art Mirror Anamorphosis is an art distortion technique developed several hundred years ago in order to hide secret messages and information in paintings. This clever and visually surprising illusion draws on the science and mathematics of light and optics. In this hands-on workshop, you'll uncover the secrets of mirror anamorphosis and learn to create your own "morphed up" drawings with a simple grid transfer technique. All materials provided.</p> <p><i>Colette DeHarpporte, Laser Classroom, LLC</i></p>
3-12	<p>More Hidden Figures: Storytelling Projects that Teach Content and Inspire Students Behind every STEM concept, principle, or law lays the complex and very human story of its creation. Learn how to use a "mantle of the expert" performing arts integration strategy to explore possibilities in project-based learning. Work in small groups to identify opportunities for your classroom that could range from small shifts in the ways that students engage in the daily classroom to large-scale, multi-class projects integrating science, arts, and humanities curriculum. Leave with a list of possible projects ideas based on the Next Generation Science Standards and a framework for experimentation with STEAM at your school.</p> <p><i>Cassandra Cutler Proball, Powered by Play</i></p>
4-12	<p>STEM Outdoors: Minnesota Trout in the Classroom Minnesota Trout Unlimited's <i>Trout in the Classroom</i> program provides participating schools an opportunity to raise rainbow trout from egg to fingerling in the classroom. With both field and classroom components, students learn about Minnesota ecosystems and environmental threats through the context of these sensitive fish. The program provides excellent real-world opportunities for students to collect and analyze their own data and communicate their findings. Attendees will learn about the program's overarching goals, methodology, and applications.</p> <p><i>Lauren Reuss, Benilde-St. Margaret's & Amber Taylor, Trout Unlimited</i></p>

6-8 (3-5, 9-12)	<p>Climate Change, STEM, and Humanities! The causes, impacts, and solutions to climate change lie in both human dimensions and science. Join Climate Generation as we discuss and practice how climate change is the perfect interdisciplinary topic for your students. With the release of a new humanities module earlier this year, participants will learn how climate change can be taught in STEM classes, social studies, and English Language Arts using a unifying theme. Participants will walk away with resources for their STEM classes, and also for their colleagues' humanities classes.</p> <p><i>Jenna Totz, Climate Generation: A Will Steger Legacy</i></p>
9-12	<p>Fundamentals of Engineering: A Year Long Hands-On Survey of Careers in Engineering The presentation will provide an overview of the curriculum used at Saint Agnes School for a yearlong science elective in engineering. The curriculum includes exposure to the engineering process plus 10 fields within engineering and an associated project in many. During the second half hour we will take a deeper dive into a hands-on project in Electrical and Computer Engineering during which attendees will have the opportunity to use Arduino boards.</p> <p><i>David Crompton, St. Agnes School</i></p>
Session 4: 2:15-3:15pm	
K-2	<p>The Buzz About Coding These days, it seems everyone is talking about teaching students to code, but it can be hard to get started if you aren't familiar with the concepts or don't have the tools. Come learn some ways to introduce coding concepts to young students using basic materials as well as more sophisticated equipment (Bee Bots). In this session you will learn both about coding and the science of bees, and briefly discuss how easy it is to embed coding in other science topics.</p> <p><i>Anika Taylor, The Bakken Museum</i></p>
K-8	<p>STEMtastic!™ Learn how to weave science, technology, engineering and math (STEM) together with nature and your existing curriculum. Soil, land, air and water systems are the foundation as we explore many examples of projects and experience STEM process. Work with Growing Green Hearts and teacher teams to design, build, and test. Together participants will move and morph great science lessons into fantastically fun, inexpensive, standards-based and student-centered STEM.</p> <p><i>Heidi Ferris, Growing Green Hearts</i></p>
K-12	<p>Journey Toward Exploratory and Experiential Learning Understand the Zone of Predictability vs. the Zone of Possibility and how one can reframe learning experiences, utilize mindsets, and implement innovation design thinking to invite learners and leaders into exploratory and experiential learning. Implement and navigate the innovation design thinking process within your sphere of influence utilizing the ChangeMaker Innovation Process™.</p> <p><i>Amanda Kopischke & Angela Anderson, Incubate to Innovate</i></p>
3-5 (K-2)	<p>ALL MORPHED UP! The STEAM of Anamorphic Cylinder Art Mirror Anamorphosis is an art distortion technique developed several hundred years ago in order to hide secret messages and information in paintings. This clever and visually surprising illusion draws on the science and mathematics of light and optics. In this hands-on workshop, you'll uncover the secrets of mirror anamorphosis and learn to create your own "morphed up" drawings with a simple grid transfer technique. All materials provided.</p> <p><i>Colette DeHarpporte, Laser Classroom, LLC</i></p>
3-12	<p>More Hidden Figures: Storytelling Projects that Teach Content and Inspire Students Behind every STEM concept, principle, or law lays the complex and very human story of its creation. Learn how to use a "mantle of the expert" performing arts integration strategy to explore possibilities in project-based learning. Work in small groups to identify opportunities for your classroom that could range from small shifts in the ways that students engage in the daily classroom to large-scale, multi-class projects integrating science, arts, and humanities curriculum. Leave with a list of possible projects ideas based on the Next Generation Science Standards and a framework for experimentation with STEAM at your school.</p> <p><i>Cassandra Cutler Proball, Powered by Play</i></p>

3-12	<p>ZOOMS Design Challenge: Engineering for Animals and Conservation Looking for ways to engage your students in integrated STEM in an environmental context? The ZOOMS Design Challenge presented by Flint Hills Resources offers students in grades 3-12 a chance to use the engineering design process to develop a solution to a 'real' problem faced by zookeepers and staff at the Minnesota Zoo. From designing an animal enrichment to renovating a zoo exhibit, students are challenged to use STEM skills to solve the problem and present solutions.</p> <p><i>Liz Gilles, Minnesota Zoo</i></p>
6-8 (3-5, 9-12)	<p>Climate Change, STEM, and Humanities! The causes, impacts, and solutions to climate change lie in both human dimensions and science. Join Climate Generation as we discuss and practice how climate change is the perfect interdisciplinary topic for your students. With the release of a new humanities module earlier this year, participants will learn how climate change can be taught in STEM classes, social studies, and English Language Arts using a unifying theme. Participants will walk away with resources for their STEM classes, and also for their colleagues' humanities classes.</p> <p><i>Jenna Totz, Climate Generation: A Will Steger Legacy</i></p>
9-12 (6-8)	<p>Flying High with STEM projects Join us to learn about student STEM projects that are part of a new aviation program at Bethany Academy. These hands-on projects introduce students to topics such as rocket propulsion, hot air balloons, and fundamentals of flight. Attendees will have the chance to explore a balloon launch activity that teaches the fundamental design challenges in a heavy rockets project, a hot air balloon project, and an airfoil design project that includes the use of DESMOS to turn actual online wind foil data into a 2D model, 3D printing and a student-built wind tunnel.</p> <p><i>Eugene Poole, Bethany Academy</i></p>
9-12 (6-8)	<p>Construction, Robots, Space balloons, Cortisol, & Bees: STEM Ideas Exchange Finding STEM projects that interest students, fit the school budget, and don't take up all your time is a challenge. At this panel discussion you will hear about some STEM projects at Southwest Christian High School followed by an open discussion about what is going on at other schools (like yours!). You will leave excited to promote STEM at your school, with a few ideas (big and small), and some good networking contacts to support you through the year. STEM is better together!</p> <p><i>Dan Ehresmann, Gary Shelton & Pete Flint, Southwest Christian High School</i></p>