

On-site Brochure

ADVANCING THE STEM AGENDA

3rd Annual Conference

June 3 – 4, 2013 | Grand Rapids, MI
On the Grand Valley State University Pew Campus

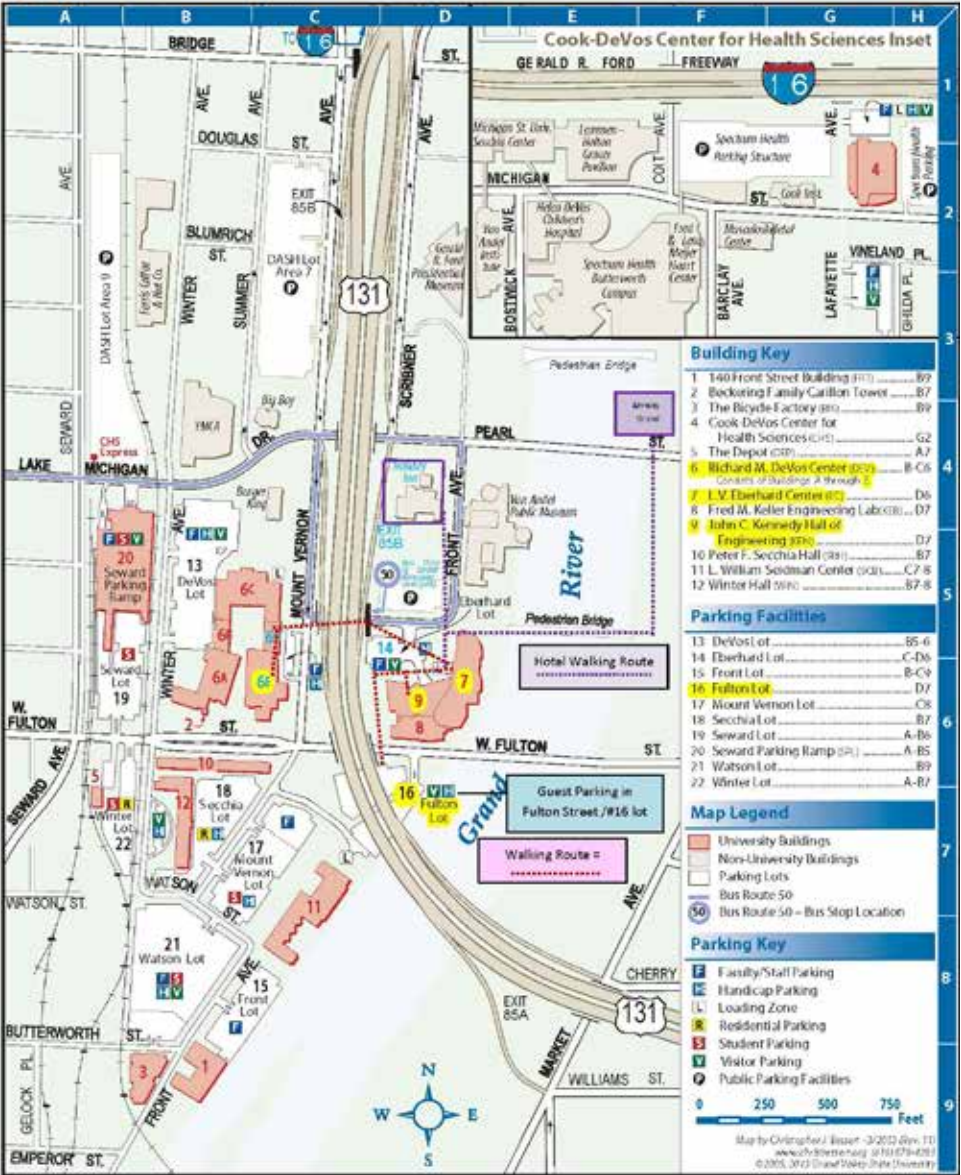
Visit asq.org/conferences/stem-agenda/index.html



CAMPUS MAP ON CONFERENCE LOCATION



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LETTER TO CONFERENCE PARTICIPANTS

Dear Conference Participants,

The Seymour and Esther Padnos College of Engineering and Computing at Grand Valley State University and the ASQ Education Division welcome you to the third annual conference addressing STEM education. The **ASQ Advancing the STEM Agenda Conference** will bring to the fore the importance of quality STEM education through the pipeline from K–12 education to professional, with a conference theme of Collaboration With Industry on STEM Education.

We are preparing the next generation of STEM professionals. Success in the scientific and engineering ventures of today and in building tomorrow's industry is reliant upon innovative and strong partnerships between education and industry on STEM and engineering education, which this conference seeks to engage and sustain.

With the urgent need for more STEM professionals, the economic, social, and cultural value of the four fields of STEM—science, technology, engineering, and mathematics—cannot be understated in today's evolving landscape. We hope you find the educators and STEM leaders from industry that we have gathered for each preconference workshop, break-out session, and keynote address informative and inspiring for your journey in improving STEM education and collaborative STEM partnerships. We also hope you take advantage of opportunities to network with other professionals and educators to gain real-world knowledge about best practices and lessons learned.

We thank you for your participation, knowledge, and experience that you bring to this conference in support of advancing the STEM agenda.

Sincerely,

Cindy P. Veenstra
Conference Co-Chair
ASQ Education Division

Charles R. Standridge
Conference Co-Chair
Grand Valley State University



SCHEDULE AT A GLANCE

(subject to change)

Monday June 3, 2013

Noon

Registration and Check-in Open

L. V. Eberhard Center, 2nd Floor
Exhibits in Kennedy Hall of Engineering
Room 330

1:00 p.m. – 3:00 p.m.

Preconference Workshops

Kennedy Hall of Engineering
2nd and 3rd floors

3:15 p.m. – 4:15 p.m.

Welcome by President Thomas (Tom) Haas, Grand Valley State University

L. V. Eberhard Center, 2nd Floor

Welcome Keynote by Reginald McGregor *A Journey in Continuous Improvement: Preparing the Next Generation of STEM Professionals*

L. V. Eberhard Center, 2nd Floor

4:15 p.m. – 5:00 p.m.

Welcome Reception

Tuesday, June 4, 2013

Start Day at Richard M. DeVos Center
Building E

7:00 a.m.

Registration and Check-in Open

Richard M. DeVos Center
Hager-Lubbers Exhibition Hall

8:00 a.m. – 8:45 a.m.

Light Continental Breakfast and Networking

8:45 a.m. – 9:40 a.m.

Morning Keynote Panel Discussion Led by Carrie Houtman

*Industry Initiatives to Develop
STEM Professionals*

Loosemore Auditorium

Walk to Kennedy Hall of Engineering for
Breakout Sessions on 2nd and 3rd floors

10:10 a.m. – 11:00 a.m.

First Breakout Session

Kennedy Hall of Engineering

11:10 a.m. – Noon

Second Breakout Session

Kennedy Hall of Engineering

12:15 p.m. – 1:20 p.m.

Luncheon

L. V. Eberhard Center
(adjoining building 2nd floor)

Luncheon Keynote Panel Discussion Led by Dean Paul D. Plotkowski *University Response to Industry's Requirements*

1:35 p.m. – 2:25 p.m.

Third Breakout Session

Kennedy Hall of Engineering

2:40 p.m. – 3:30 p.m.

Fourth Breakout Session

Kennedy Hall of Engineering

3:45 p.m. – 4:30 p.m.

Closing Keynote by Glenn Walters *Creating a Globally Competitive Workforce*

L. V. Eberhard Center, 2nd floor

4:30 p.m. – 5:00 p.m.

Closing Reception and Networking

ABOUT THE CONFERENCE SPONSORS

Grand Valley State University's Seymour and Esther Padnos College of Engineering and Computing

Grand Valley State University educates students to shape their lives, their professions, and their societies. Teaching in the liberal tradition, whether in general arts and sciences or the professional degree programs, remains at the heart of Grand Valley's educational mission. The university is also dedicated to educating students to become competent professionals, able scholars, and responsible citizens. GVSU is characterized by and known for its superior student-centered teaching and learning, as well as for its development and support of world-class scholars and artists, its investments in meaningful community service, and its actions in partnership with the West Michigan community.

The mission of [The Seymour and Esther Padnos College of Engineering and Computing](#) is to prepare undergraduate and graduate students in engineering and computing to become accomplished professionals; to contribute to our professions through active scholarship in all of its forms; and to support the university and society with expertise, leadership, and service. Fulfilling this mission includes preparing students to compete in today's global economy by emphasizing experiential learning in a contemporary technical environment. All degree programs require a cooperative education or internship experience.

The mission of the School of Engineering is to prepare students to assume engineering positions in industry with the potential to advance to leadership positions. Students develop technical competency through classroom/laboratory work and through the supervised on-site co-op work experience. The continual improvement of the curriculum is informed by close contact with current engineering practice and a commitment to a general education program required for a well-balanced education.

Due to this approach, in 2012, the National Academy of Engineering recognized the School of Engineering at GVSU as one of 29 "Exemplar Programs of Real World Engineering Education." [View this video](#) for GVSU's perspective on collaboration with industry.

ASQ Education Division

The ASQ Education Division informs, inspires, and networks on developing knowledge, best practices, and research on quality in education in K-12, higher education, and the workplace. The division's vision is to "shape the future through quality in education and professional development."

This is the third consecutive year that the Education Division has sponsored the Advancing the STEM Agenda Conference with a university partner. It also supports the 2013 ASQ National Quality Education Conference (NQEC) and the ASQ World Conference on Quality and Improvement (WCQI).

The Education Division continues to grow with more than 1,300 members. The division publishes two periodicals: the online, peer-reviewed [Quality Approaches in Higher Education](#) and the [Workforce Development Brief](#). It also publishes [QEDNews](#), its bi-annual newsletter, which highlights the activities of the *Advancing the STEM Agenda* conferences. The division celebrates engineers' week with the co-sponsorship of the annual STEM joint issue of the [ASQ Higher Education Brief/ASQ Primary Secondary Education Brief](#).

In May 2012, the ASQ Education Division published its book on improving STEM education based on a selection of conference papers and workshops from its 2011 *Advancing the STEM Agenda* conference. [Advancing the STEM Agenda: Quality Improvement Supports STEM](#) presents high-impact ideas that improve STEM education. Throughout the book are examples of collaboration to improve STEM education. In May 2013, the division published the special issue of [Quality Approaches in Higher Education](#) on STEM education and collaboration.

With this conference, its publications, and its events, the ASQ Education Division expects to continue to drive the conversation for collaborative stakeholder models of continuous improvement that will make a difference in the STEM education of our students.

GENERAL INFORMATION

No Smoking in Buildings

Smoking is not allowed in campus buildings or within 25 feet of buildings.

Recertification Units

The ASQ Education Division recommends that ASQ members claim 0.1 recertification units (RUs) for each hour in attendance at this conference. Your conference nametag, the program cover page, and the conference schedule in this program are evidence needed to claim these RUs for your ASQ recertifications.

Conference Proceedings

The conference proceedings are accessible on the conference program page. After the conference, all the papers will be accessible in the ASQ Education Division library. <http://tinyurl.com/nzm7ox2>.

All conference papers were peer-reviewed. Recommended referencing for conference papers/presentations from the conference proceedings:

Proceedings of the 2013 ASQ Advancing the STEM Agenda Conference, Grand Rapids, MI.

Accessibility

If you feel you need disability-related accommodations while on-site, please notify the registration desk.

Program Changes and Cancellations

The conference sponsors reserve the right to make changes in programs and speakers or to cancel programs if enrollment criteria are not met, or when conditions beyond its control prevail. Changes and cancellations will be posted at the registration desk.



Education
Division
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Join the ASQ Education Division

Continue networking on improving STEM education and the workforce after the conference. Find out the benefits and join the division. Visit us online at asq.org/join/addforum-edu.html.

KEYNOTE SPEAKERS

Welcome Keynote: A Journey in Continuous Improvement: Preparing the Next Generation of STEM Professionals

June 3, 3:15 p.m.

Reginald McGregor Manager of Engineering Employee Development R&T Strategy Rolls-Royce Corporation



Reginald McGregor is the manager of engineering employee development, R&T Strategy, at Rolls-Royce Corporation (RRC) in Indianapolis, IN. In this role McGregor manages the RRC engineering pipeline, overseeing the K-12 STEM Initiatives, Co-op Program, and Early Career Development Engineering Programs. He is also the chair of the RRC Engineering Education Council. He has more than 10 years' experience in the aerospace industry in roles as project engineer, and process improvement and lean specialist. In 2006, he received the Black Engineer of the Year Award. He serves on the board of trustees for Martin University; Engineering Education Industrial Advisory Council, Purdue University; board of directors for the American Society Engineering Education (ASEE) Cooperative and Experiential Education Division; and the ASEE College Industry Partnership Board.

At our 2012 Advancing the STEM Agenda Conference, McGregor participated as a panelist for the keynote panel discussion on STEM Education-Industry Partnerships.

Closing Keynote: Creating a Globally Competitive Workforce

June 4, 3:45 p.m.

Glenn Walters Deputy Cabinet Secretary for the New Mexico Higher Education Department



Glenn Walters is the deputy cabinet secretary for the New Mexico Higher Education Department and is also serving his second four-year term as an elected county commissioner. Prior to his current position he had a successful management consulting company for 10 years and continues to be a sought-after professional speaker for his engaging presentations. He has the rare distinction of twice being a keynote speaker for the ASQ World Conference on Quality and Improvement as well as the European Quality Conference, and for many years has been a keynote speaker at an annual productivity conference in Singapore.

Walters is a retired U.S. Air Force officer with more than 40 years' experience in leadership and quality-related roles. He brings to this conference knowledge about the ASQ Education Division and systems thinking common with quality award programs in education. He was a multiyear examiner with the Malcolm Baldrige National Quality Award, the President's Quality Award, and four other quality award programs. He also co-lead the team that created the three-tiered New Mexico Quality Awards. He has served as the lead judge for ASQ's NQEC Education Team Excellence Recognition Program since its inception five years ago. Walters has served as ASQ Education Division's Workforce Development chair and as the chair for the ASQ Team and Workplace Excellence Forum. He has also served as an adjunct professor for quality-related courses at the undergraduate and graduate level for the University of New Mexico and the National Graduate School.

KEYNOTE SPEAKERS AND PANELISTS

Morning Keynote: Speaker and Panel Panel Discussion — Industry Initiatives to Develop STEM Professionals

June 4, 8:45 a.m.

Panel Leader

Carrie Houtman is the regulatory services leader for Michigan and Minnesota at The Dow Chemical Company. Houtman began her career at Dow in 1996 with technical service and development for emulsion polymers and Dow microbial control, and spent 10 years in environmental health and safety, including various roles in the toxicology organization and in product stewardship. In 2010, she joined Public Policy at Dow, where she led Dow's STEM education initiatives and represented Dow at think-tanks, trade associations, and most notably as part of President Obama's Advanced Manufacturing Partnership. She most recently served on the Global Remediation Team as the primary community interface for the Michigan Dioxin Initiative and other remediation projects. A graduate of Pennsylvania State University, Houtman is also a certified Six Sigma Black Belt.



Panelists

Bryan Dansberry is an education specialist at Johnson Space Center (JSC), where he serves as NASA internships operations manager, overseeing business processes generating more than 1,700 internships at 13 NASA facilities since 2007. Prior to JSC, Dansberry served as assistant professor in the Division of Professional Practice at the University of Cincinnati, where he was responsible for the mandatory undergraduate aerospace, biomedical, and computer engineering co-op programs. Dansberry has a BS in aerospace engineering, an M. Ed., 10 years' experience as a NASA research engineer and 11 years' experience designing, implementing, and evaluating higher education experiential programs. From 2007 to 2013 he served on the board of the Cooperative & Experiential Education Division (CEED) of ASEE.



Scot Lindemann is the vice president of JR Automation and has been working in the automation business for more than 25 years. He grew up in West Michigan and went to Lake Superior State University for his BSEE.



In his positions of engineering management for several companies, he has implemented internship programs and high school work study programs. For the past 12 years, Lindemann has worked at JR Automation in Holland, MI. JR has won the GVSU Co-Op of the Year Award, has supported three **FIRST** robotics teams, and has several employees on high school and college advisory boards. "STEM education is the future of our state and our company!"

KEYNOTE SPEAKERS AND PANELISTS

Wendy Ljungren is an avionics and mechanical systems chief consulting engineer with GE Aviation Systems in Grand Rapids, MI. In 2004, after 20 years in engineering and management roles with Honeywell in Glendale, AZ, Ljungren was hired as vice president of engineering and program management at L-3 Communication's Avionics Systems division in Grand Rapids, MI. Ljungren joined General Electric Aviation Systems in 2007 as director of systems integration, and then vice president of software and is in her current role as the chief consulting engineer. She co-leads the GE Grand Rapids Women In Technology (WIT) affinity group, which was begun in 2010 using the **FIRST** program. Each year more than 40 GE engineers support more than 200 students on robotics-related challenges and 600 students through the introduction to engineering sessions.



Natalia Powers joined The Right Place in 2008 as the organization's event director. Since that time, she has also assumed the role as facilitator for The Right Place/MMTC-West Manufacturers Council. As a facilitator, Powers works alongside 38 West Michigan manufacturers and organizations to strengthen the West Michigan region as an international center for business innovation and manufacturing excellence. She also helps facilitate several working groups on the council, including: University Partnerships, Lean and Green, and Workforce Development.



KEYNOTE SPEAKERS AND PANELISTS

Luncheon Keynote: Speaker and Panel Panel Discussion — University Response to Industry's Requirements

June 4, 12:15 p.m.

Panel Leader

Paul Plotkowski, Ph.D., is the founding dean of The Seymour and Esther Padnos College of Engineering and Computing at Grand Valley State University. The Padnos College enrolls more than 1,600 students in a variety of BS and MS degree programs in engineering, computer science, information systems, and medical and bio-informatics. The programs in the Padnos College were established in response to regional industry needs and all function as partnerships between the university, students, and industry. All academic programs include work experience through either the co-op or internship experience integrated into each. Plotkowski is a Fellow of ASME, and has received numerous awards including the Dedicated Service Award from ASME, the Outstanding Young Manufacturing Engineer of the Year award from SME, and the Outstanding Educator award from Pi Tau Sigma. He has BS and MS degrees in mechanical engineering, and a Ph.D. in systems engineering from Oakland University.



Panelists

Gayle Elliott, MS, is an associate professor in the Division of Professional Practice. She is responsible for the University of Cincinnati's International Co-op Program, and for placing mechanical engineering students in co-op jobs in the United States. Elliott has worked with the International Engineering Co-op Program since 1993. She has extensive experience developing international exchange programs and is an active member in several international engineering education organizations and projects. In 2013, Elliott



received the Alvah K. Borman Award for the practice of cooperative education in engineering. She is a member of the ASEE International Division and will serve as program chair for the International Division at the ASEE annual conference in 2014.

Joy Watson, Ph.D., is an assistant professor in the University of Cincinnati's Division of Professional Practice and Experiential Learning, where she is the co-op advisor for chemical, electrical, and environmental engineering students. Her doctoral work at the University of South Carolina focused on preparing engineering Ph.D. students for careers in industry. She also has collaborated with private industry, academia, and the U.S. Navy to develop a logistics/IT course for low-income, high-potential middle and high school students. Some of her other experiences include working as a processing engineer in the pulp and paper industry, a patent examiner at the U.S. Patent and Trademark Office, and an NSF GK-12 Fellow at the University of South Carolina.



Chris Plouff, Ed.D., P.E., is the assistant director of the School of Engineering and the James R. Sebastian Chair of Engineering Cooperative Education and Educational Development at Grand Valley State University. He is an assistant professor and coordinates assessment efforts for the School of Engineering, including for the mandatory cooperative education program. His research interests include effective assessment of engineering education, cooperative education, transition to and from the engineering educational environment, and first-year engineering program development. Plouff is a registered Professional Engineer in Michigan.



PRECONFERENCE WORKSHOPS

June 3

1:00 p.m. – 3:00 p.m.

Improving Graduation Rates at a Comprehensive University: A Case Study of Institutional Alignment and Process Improvement in Higher Education

Workshop leaders include:

Paul Plotkowski, Ph.D., Dean, The Seymour and Esther Padnos College of Engineering and Computing at Grand Valley State University

Nancy Giardina, Ed.D., Vice Provost for Student Success at Grand Valley State University

Shaily Menon, Ph.D., Associate Dean, College of Liberal Arts and Sciences at Grand Valley State University

This workshop will engage participants in using the ideas of process improvement and the continuous improvement cycle often used in manufacturing for improving student success, quality of education, and retention and graduation rates in higher education. We will discuss the challenges of applying process improvement thinking to educational processes in two ways:

1) Using process improvement to improve quality in education:

Participants will learn the elements of the educational process and managerial concepts for improving the quality and quantity of graduating students through the discussion of the efforts made at Grand Valley State University (GVSU), a rapidly growing “Master’s Large” university with a strong dedication to undergraduate education.

2) Using process improvement to improve retention and graduation rates:

In addition, Grand Valley State University has been very successful in substantially

and rapidly increasing the university-wide graduation rate by more than 15 percentage points between 2002 and 2012. The efforts to make this possible reflect a process-improvement mindset. Workshop participants will also learn about GVSU’s efforts to improve its graduation rates.

How to Make Your Entrepreneurial Dreams a Reality

STEM and Entrepreneurship: Problems, Discovery, Inventions, Opportunity!

Workshop leaders include:

Thomas H. Zurbuchen, Ph.D., Professor of Aerospace Engineering and Space Science and the Associate Dean of Entrepreneurial Programs in the College of Engineering at the University of Michigan

Kevin McCurren, MPH, Executive Director of the Center for Entrepreneurship and Innovation at Grand Valley State University, Seidman College of Business

Richard Sheridan, MS, Entrepreneur and CEO of Menlo Innovations

This interactive workshop will focus on four discussion questions:

1. Where is the intersection between entrepreneurship and invention and what role does science, technology, engineering, and math play in either or both?
2. How does entrepreneurial and invention teaching enable and support a STEM agenda?
3. What are good examples for educational models through which entrepreneurial projects are enabled toward successful outcomes?
4. How can these educational models mutually benefit the local entrepreneurship community?

PRECONFERENCE WORKSHOPS

Developing Highly Effective Industry Partnerships: Co-op to Capstone Courses

Workshop leader:

Chris Plouff, Ed.D., Assistant Professor and the James R. Sebastian Chair of Engineering Cooperative Education and Education Development at Grand Valley State University

This workshop will engage participants in the processes that generate effective partnerships between education and the workplace, resulting in STEM talent development that is highly desirable by students and employers alike. The workshop will address:

- Developing an effective internship/co-op program from both the education institution and employer perspectives
- Identifying and recruiting the right partners
- Assessing the effectiveness of the internship/co-op experience
- Enhancing the learning experience through distance learning components
- Generating industry-based course projects for a win-win experience for schools and employers
- Developing a robust industry-partnered capstone project process that integrates employer needs with real-world, interdisciplinary student experiences

Implementing and Assessing STEM Learning Communities

Carefully designed and implemented learning communities can lead to increases in student achievement and retention in STEM fields

Workshop leaders include:

Ryan Sweeder, Ph.D., Associate Professor of Chemistry in the Lyman Briggs College at Michigan State University

Laurie Witucki, Ph.D., Faculty Director of the WISE (Woman in Science and Engineering) Living Center and an Associate Professor of Chemistry at Grand Valley State University

During the workshop, participants will undertake a needs assessment—helping them to begin to create a learning community that is customized to meet their own teaching and learning goals as well as develop a plan of assessment for either new or proposed learning communities. Participants also will help determine the vital role that on-campus student service groups can play in helping to develop communities. This will include:

- Considering the different ways an effective STEM-themed learning community might be structured on your own campus
- Identifying the key ingredients necessary for creating a learning community that targets student success in the STEM fields
- Identifying key criteria for assessing learning communities
- Using a needs assessment to understand the next steps to creating, improving, and/or assessing STEM learning communities on the participant's own home campus

CONFERENCE BREAKOUT SESSIONS

SESSIONS

Session 1: 10:10 a.m. – 11:00 a.m.

Session 2: 11:10 a.m. – Noon

Session 3: 1:35 p.m. – 2:25 p.m.

Session 4: 2:40 p.m. – 3:30 p.m.



TRACKS

Track 1: STEM Partnerships and Collaboration

Kennedy Hall of Engineering Room 350

STEM partnerships between industry and schools, community colleges and four-year universities, including K–12 outreach, industry-sponsored projects, and collaboration in the classroom.

Track 2: Teacher Preparation/Preparing Students to Be College-ready in STEM

Kennedy Hall of Engineering Room 322

Latest research and practice on preparing teachers to teach math, science, and engineering in school systems; discussions of the Next Generation Science Standards and pedagogy for teaching science; research on improving the teaching of math; building STEM teaching efficacy; and the importance of teaching creativity for future STEM innovators. This will lead to students who are college-ready for STEM majors.

Track 3: Higher Education STEM—Improving Learning Through Quality Teaching

Kennedy Hall of Engineering Room 222

Project-based learning, undergraduate research, undergraduate practice programs; teaching statistics and Six Sigma; encouraging women to succeed in STEM fields; models for teaching engineering and STEM.

Track 4: Decreasing the STEM Gap Through Outreach and Systems Thinking

Kennedy Hall of Engineering Room 344

Programs that encourage girls and under-represented minorities to succeed in STEM fields, K–12 outreach programs, Michigan STEM partnerships, STEM intervention and mentoring programs; using a museum as a base for innovative learning through additive manufacturing.

BREAKOUT SESSIONS SCHEDULE

Track 1: STEM Partnerships and Collaboration	Track 2: Teacher Preparation/ Preparing Students to Be College-ready in STEM	Track 3: Higher Education STEM— Improving Learning Through Quality Teaching	Track 4: Decreasing the STEM Gap Through Outreach and Systems Thinking
Break-out Session 1: First Presentation at 10:10 a.m.; Second Presentation at 10:35 a.m.			
<p>Filling the Gaps: Building and Sustaining a Scientific Workforce <i>Darcie Wallace-Duckworth and Cheryl R. Hild, Aegis Sciences Corporation</i></p>	<p>Next Generation Science: Bridge to the Future <i>Karen Meyers, Regional Math and Science Center, Grand Valley State University</i></p>	<p>Improvement in Teaching Quality Concepts to Engineers: Measurement, Data Analysis, Experiments and Modeling <i>Chris Plouff, Paul Stephenson, and Shabbir Choudhuri, Grand Valley State University</i></p>	<p>The Michigan STEM Partnership in Action: A Collaboration Between Business, Education, and Government <i>Michael Tanoff, Kalamazoo Area Mathematics and Science Center, and Kathy Grosso, Battle Creek Public Schools</i></p>
<p>Integration of STEM Community College Curricula and Industry Partnerships Through National Certifications <i>Susan Ely, Ivy Tech Community College-Lafayette</i></p>	<p>The Pedagogy of Science Teaching Test <i>William W. Cobern and colleagues, Western Michigan University</i></p>	<p>Teaching Lean Six Sigma With Service Learning <i>Janet Braun, Western Washington University</i></p>	<p>An Aviation-themed STEPS Camp for Engaging 7th Grade Girls: Assessment Summary <i>Sara L. Maas, Charles R. Standridge, and Paul D. Plotkowski, Grand Valley State University</i></p>

BREAKOUT SESSIONS SCHEDULE

Track 1: STEM Partnerships and Collaboration	Track 2: Teacher Preparation/ Preparing Students to Be College-ready in STEM	Track 3: Higher Education STEM— Improving Learning Through Quality Teaching	Track 4: Decreasing the STEM Gap Through Outreach and Systems Thinking
Break-out Session 2: First Presentation at 11:10 a.m.; Second Presentation at 11:35 a.m.			
<p>LASER: Leadership And Science Ensures Results— Evolution of a STEM Partnership Between Industry and Education <i>Jill Brooks, Raytheon</i></p>	<p>Synthesizing the Literature Concerning Math Anxiety to Inform a Project on Preservice Teacher Retention Rates <i>Nicholas Flegg, Kamariah Mohamed, and Karen Trimmer, University of Southern Queensland, AU</i></p>	<p>An Overview of MIT’s Undergraduate Practice Opportunities (UPOP) <i>Susann Luperfoy, MIT</i></p>	<p>What Works in STEM Intervention Programs (SIPs) for URM Undergraduates <i>Raina Dyer-Barr, University of Illinois–Urbana-Champaign</i></p>
<p>Promoting STEM Education Through the Ford High School Science and Technology Program <i>Imad H. Makki, Ford Motor Company</i></p>	<p>Intel Math Connections: A Three-year Study of the Impact of a Math-based Program on Elementary Teachers <i>Matt Feldmann, Goshen Education Consulting Inc.; Adam Weyhaupt, SIUE; and Mary Ann Quivey, Monroe/Randolph Regional Office of Education #45</i></p>	<p>Pedagogical Environments in Chemistry: Effects on Women’s Self-efficacy Beliefs <i>Megan L. Grunert, Western Michigan University, and George M. Bodner, Purdue University</i></p>	<p>The Hispanic Health Workforce Gap: Creating Fellowship Programs <i>Michelle Quinteros de Czifra, HSHPS, and Suzanne M. Randolph, MayaTech Corp.</i></p>

BREAKOUT SESSIONS SCHEDULE

Track 1: STEM Partnerships and Collaboration	Track 2: Teacher Preparation/ Preparing Students to Be College-ready in STEM	Track 3: Higher Education STEM— Improving Learning Through Quality Teaching	Track 4: Decreasing the STEM Gap Through Outreach and Systems Thinking
Break-out Session 3: First Presentation at 1:35 p.m.; Second Presentation at 2:00 p.m.			
<p>Invited Session: Industry Sponsored Projects: Balancing Academic and Industrial Needs Discussion (entire session) <i>Chris Pung, GVSU; Jason Howe, SAF Holland; Tony Slabaugh, Attwood Marine; Jerry Barofsky, L3 Communications; and Todd DeBruyne, Cameron</i></p>	<p>Teachers in Training: Building Formal STEM Teaching Efficacy Through Informal Science Teaching Experience <i>Georgia Bracey, Molly Brooks, Stephen Marlette, and Sharon Locke, Southern Illinois University Edwardsville</i></p>	<p>Enhancing STEM Education Through Project-based Learning: Barriers vs. Benefits <i>Susan Mendoza and Robert M. Smart, Grand Valley State University</i></p>	<p>Eliminating Confounding Variables to STEM Implementation in a Rural School District Using Mobile 1:1 <i>Diane Brissette, Greenville Public Schools, and James Anderson, Ventra</i></p>
	<p>Creating a Foundation for Engineering Education in Five K-12 Rural School Districts <i>Stephen Marlette, Allison Fahsl, Gary Mayer, and Georgia Bracey, Southern Illinois University Edwardsville</i></p>	<p>A Contract Research Organization as a Model for Engaged Learning in STEM <i>Mary Nelson (presenter) and Craig Caldwell, Salt Lake Community College</i></p>	<p>sHaPe: Camp for Middle School Students <i>Kathryn Agee, Regional Math and Science Center, GVSU</i></p>

BREAKOUT SESSIONS SCHEDULE

Track 1: STEM Partnerships and Collaboration	Track 2: Teacher Preparation/ Preparing Students to Be College-ready in STEM	Track 3: Higher Education STEM— Improving Learning Through Quality Teaching	Track 4: Decreasing the STEM Gap Through Outreach and Systems Thinking
Break-out Session 4: First Presentation at 2:40 p.m.; Second Presentation at 3:05 p.m.			
<p>Developing an Advanced Manufacturing Certificate Program for High School Students <i>Christopher Reis, Kettle Moraine School District (WI), and Donald Patnode, Second Chance Partners for Education</i></p>	<p>Learning by Doing: A Case Study of a Clinical Model for STEM Teacher Preparation <i>Caryn M. King, Grand Valley, State University</i></p>	<p>How Do We Know? Inquiry-based Front Ends for Conventional Topic Treatments in STEM Textbooks <i>David Schuster, Western Michigan University</i></p>	<p>Blending Innovation, Student Co-Learning, Entrepreneurship, and Informal Education – Innovation 5 <i>Thomas Deits, Michigan State University, and Katherine LaCommare, Lansing Community College</i></p>
<p>Pre-Engineering STEM Capstone Project to Design an Oil Cap Remover Tool to Help General Aviation Cessna Pilots <i>Sandy Feola, NCME and Sinclair Community College</i></p>	<p>Bridging the Creativity and STEM Crisis <i>Daniel Katanski, Eastern Michigan University</i></p>	<p>Using Models to Teach and Learn Engineering <i>Slobodan Urdarevik, Western Michigan University</i></p>	<p>An Integrative STEM Experience Onboard a Research Vessel <i>Janet H. Vail and Michele H. Smith, Grand Valley State University</i></p>

DESCRIPTIONS OF BREAKOUT SESSIONS

Session 1

June 4, 10:10 a.m. – 11:00 a.m.

Breakout Session 1-1

Filling the Gaps: Building and Sustaining a Scientific Workforce

Darcie Wallace-Duckworth and Cheryl R. Hild, Aegis Sciences Corporation

Filling gaps in scientific, technology, engineering, and mathematical fields (STEM) with experienced employees has become increasingly difficult. Filling these gaps becomes critical as employment in STEM-related fields is projected to grow 17 percent over the next decade. In order to fill 236 new STEM positions over the past two years, Aegis Sciences Corporation has responded through key elements, such as development of partnerships, internal training programs, and career progression paths, and establishing diversity across scientific areas and technologies.

Integration of STEM Community College Curricula and Industry Partnerships Through National Certifications

Susan Ely, Ivy Tech Community College–Lafayette

This presentation reviews the best practices for embedding national certifications within STEM curricula, making skills transferable at K–12, community college, four-year institution, and industry levels. Participants will learn how a successful model was developed, implemented, and proliferated within an entire economic region, focusing on the advanced manufacturing skills gap. An experiment to determine delivery method effectiveness for the curriculum was used and results will be presented.

Breakout Session 1-2

Next Generation Science: Bridge to the Future

Karen Meyers, Regional Math and Science Center, Grand Valley State University

This presentation focuses on the newly released Next Generation Science Standards (NGSS) for Today's Students and Tomorrow's Workforce, developed over the past year through a collaborative, state-led process. Included will be a brief overview of the history and structure of the new standards. Attention will be given as to how the NGSS differ from previous standards and the implications of these differences for classroom instruction.

The Pedagogy of Science Teaching Test

William W. Cobern, David Schuster, Betty Adams, and Brandy Skjold, The Mallinson Institute for Science Education, Western Michigan University; Ebru Muğaloğlu, Bögaziçi University, Istanbul, Turkey; Amy Bentz and Kelly Sparks, The Mallinson Institute for Science Education, Western Michigan University

This presentation describes the development and testing of formative assessment items pertaining to the pedagogical knowledge of science content instruction as typically taught in science teaching methods courses. Example items of different types are provided and illustrative results discussed. The presentation also includes comments on applications for instruction and future research.

DESCRIPTIONS OF BREAKOUT SESSIONS

Breakout Session 1-3

Improvement in Teaching Quality Concepts to Engineers: Measurement, Data Analysis, Experiments, and Modeling

Chris Plouff, Paul Stephenson, and Shabbir Choudhuri, Grand Valley State University

This presentation discusses a pair of courses that have been developed to teach engineering students about measurement, data analysis, and statistical modeling concepts used in quality control and quality systems in technical environments. One course introduces students to statistical tools that can be used to aid in the design of engineering experiments and in the analysis of data generated from these studies, and the other course provides hands-on lab experiences that reinforce the material and introduces students to many of the physical tools used in the engineering sciences. Topics covered will include how the two courses were developed, the content of the courses, and learning outcomes realized.

Teaching Lean Six Sigma With Service Learning

Janet M. Braun, Western Washington University

This presentation describes incorporation of a problem-based service-learning project in an industrial quality assurance course in order to improve student learning of Lean Six Sigma tools and methodology. Student teams were paired with community partners in need of problem-solving and process-improvement support. Preliminary assessment includes student surveys, which seem to indicate an improvement in learning; however, a longer-term assessment is currently in progress to determine the full extent of that improvement.

Breakout Session 1-4

The Michigan STEM Partnership in Action: A Collaboration Between Business, Education, and Government

Michael Tanoff, Kalamazoo Area Mathematics and Science Center, and Kathy Grosso, Battle Creek Public Schools

This presentation describes the evolution and ongoing development of the Michigan STEM Partnership and its Lake Michigan Hub, part of a statewide collaboration of leaders from pre-K–20 education, business and industry, philanthropy, economic development, government, military, and other organizations dedicated to elevating STEM literacy and proficiencies in a way that increases Michigan's economic strength to retain and attract desirable jobs. The presentation will describe statewide needs that dictated the formation of the partnership, the structure of the partnership, and activity within the Hub through its second year of existence, including asset and expertise mapping, teacher professional development, and student outreach activities.

An Aviation-themed STEPS Camp for Engaging 7th Grade Girls: Assessment Summary

Sara L. Maas, Charles R. Standridge, and Paul D. Plotkowski, Grand Valley State University

This presentation describes the STEPS program for seventh-grade girls at Grand Valley State University. A 10-year tracking study on the impact of the camp showed that 47 percent of camp participants claim an interest in a science-related career versus 18 percent of a comparable peer group.

DESCRIPTIONS OF BREAKOUT SESSIONS

Session 2

June 4, 11:10 a.m. – Noon

Breakout Session 2-1

LASER: Leadership And Science Ensures Results—Evolution of a STEM Partnership Between Industry and Education

Jill Brooks, Raytheon

This presentation will describe Leadership And Science Ensures Results (LASER), the collaborative STEM project of Raytheon and the McKinney Independent School District, which has impacted more than 6,700 high school and middle school students over a three-year period. This presentation highlights the evolution of LASER, which addresses the gap in the STEM pipeline by combining project-based learning, technical skills, and leadership skills to pull students from an observer role into a participatory role.

Promoting STEM Education Through the Ford High School Science and Technology Program

Imad H. Makki, Ford Motor Company

The Ford High School Science and Technology Program (HSSTP) was created to increase student interest in engineering, science, mathematics, and related careers. This is achieved through a variety of sessions designed to relate the “classroom” science and mathematics learned in school to different kinds of experiments, operations, and technologies used within industry in general and specifically those at Ford. Participating students often carry this newly found interest with them to college. The program is also open to high school teachers, who take ideas from the program back to their classrooms to be used as examples of “real-life” applications.

Breakout Session 2-2

Synthesizing the Literature Concerning Math Anxiety to Inform a Project on Preservice Teacher Retention Rates

Nicholas Flegg, Kamariah Mohamed, and Karen Trimmer

This presentation reviews literature on preservice teacher math-anxiety issues in order to inform discussion of a project looking to improve student retention rates. A significant number of students exhibit math-related problems and the project offers targeted assistance to at-risk students. While restricted to students from one Australian university, the majority are online students from Australia and overseas; this makes it of wide relevance.

Intel Math Connections: A Three-year Study of the Impact of a Math-based Program on Elementary Teachers

M.L. Feldmann, Goshen Education Consulting, Inc.; Adam Weyhaupt, Southern Illinois University Edwardsville; and Mary Ann Quivey, Monroe/Randolph Regional Office of Education #45

The quasi-experimental study considers the impact of a math professional development program for elementary school teachers. The project used Intel Math materials combined with mathematical learning communities vertically aligned by school district. The study found that the project teachers had significant increases in (1) math content understanding and (2) their use of good math teaching practices when compared with a control group of similar elementary school teachers.

DESCRIPTIONS OF BREAKOUT SESSIONS

Breakout Session 2-3

An Overview of MIT's Undergraduate Practice Opportunities Program (UPOP)

Susann Luperfoy, MIT

This presentation will discuss MIT's Undergraduate Practice Opportunities Program (UPOP), a full-year, co-curricular program that prepares sophomores for a summer internship in what is in many cases the student's first job experience, provides coaching and mentoring during the summer internship, and then upon return to campus in the fall, guides the student through a process of reflection to help connect their internship experiences and observations to the learning objectives of the learning exercises.

Pedagogical Environments in Chemistry: Effects on Women's Self-efficacy Beliefs

Megan L. Grunert, Western Michigan University, and George M. Bodner, Purdue University

This presentation investigates the effect of common college chemistry pedagogical practices on the self-efficacy beliefs of women in chemistry degree programs. Through qualitative interview techniques, six women discussed their experiences pursuing chemistry degrees and how their self-efficacy beliefs were affected by pedagogical environments. As self-efficacy beliefs are potent predictors of persistence and success, understanding how educational experiences affect self-efficacy beliefs yields important information about better supporting students and developing more effective learning experiences.

Breakout Session 2-4

What Works in STEM Intervention Programs (SIPs) for URM Undergraduates

Raina Dyer-Barr, University of Illinois at Urbana-Champaign

This project explores the perspectives of STEM intervention program administrators with respect to practices that work in successfully and effectively administering SIPs targeted toward underrepresented minority undergraduates. The administrators in this work indicated that student-centeredness, community building, and collaboration were three components of SIPs that are integral to their success in recruiting and retaining underrepresented minority undergraduates in STEM fields.

The Hispanic Health Workforce Gap: Creating Fellowship Programs

Michelle Quinteros de Czifra, HSHPS, and Suzanne M. Randolph, MayaTech Corp.

The nation faces a shortage of Hispanic health professionals who can provide quality and culturally competent healthcare to their community—the largest ethnic group in the United States. To meet the challenge of providing access and better care to Hispanics, Hispanic-Serving Health Professions Schools (HSHPS) developed and implemented a Graduate Fellowship Training Program (GFTP) to increase the number of Hispanic health professionals, enhance research and professional development skills, increase knowledge about Hispanic and other minority health issues, and provide networking opportunities. This presentation provides an overview of the importance of increasing the Hispanic health professionals' workforce; lessons learned and best practices in student recruitment, retention, and supportive services of the GFTP; and the role that other national STEM organizations like HSHPS can play to diversify the health professionals' workforce.

DESCRIPTIONS OF BREAKOUT SESSIONS

Session 3

June 4, 1:35 p.m. – 2:25 p.m.

Breakout Session 3-1

Invited Session—Industry-sponsored Projects: Balancing Academic and Industrial Needs

Chris Pung, GVSU; Jason Howe, SAF Holland; Tony Slabaugh, Attwood Marine; Jerry Barofsky, L3 Communications; and Todd DeBruyne, Cameron

An open forum on industry-sponsored projects, and especially senior projects, with STEM industrial leaders from the Grand Rapids, MI area.

Breakout Session 3-2

Teachers in Training: Building Formal STEM Teaching Efficacy Through Informal Science Teaching Experience

Georgia Bracey, Molly Brooks, Stephen Marlette, and Sharon Locke, Southern Illinois University Edwardsville

This presentation describes the first year of a collaborative university program that provides informal summer teaching opportunities for preservice elementary teachers in order to increase their comfort level and competence in teaching STEM concepts. Preliminary data analysis indicates a significant increase in the participants' science teaching self-efficacy as well as positive changes in their science interests and attitudes.

Creating a Foundation for Engineering Education in Five K-12 Rural School Districts

Stephen Marlette, Allison Fahsl, Gary Mayer, and Georgia Bracey, Southern Illinois University Edwardsville

This study describes a collaborative project between a university and five rural school districts focused on introducing teachers to engineering design and technology-related concepts. The professional development

model utilized immersion experiences with engineering design during the summer and lesson study during the school-year follow-up. Participants demonstrated increased content knowledge related to engineering design and there was some evidence of changed teaching practices among the teachers.

Breakout Session 3-3

Enhancing STEM Education Through Project-based Learning: Barriers vs. Benefits

Susan Mendoza and Robert P. Smart, Grand Valley State University

This presentation focuses on the role of undergraduate research in increasing opportunities for project-based learning at Grand Valley State University. Despite extensive literature on the value of undergraduate research within and beyond the curriculum, institutional barriers often limit and reduce program impact. The presenters will speak to methods and models to increase institutional capacity for embedding undergraduate research in the culture, policies, and processes.

A Contract Research Organization as a Model for Engaged Learning in STEM

Mary Nelson, Salt Lake Community College

This presentation is a description of an innovative approach to providing undergraduate and high school students with real-world, relevant research experiences. The work describes a partnership that has been established between companies and Salt Lake Community College in which a contract research model provides benefits for both students and local biotechnology companies. Students gain valuable experience in experimental design, methodology, and soft skills valued by employers while companies benefit from low-cost research services and a highly skilled talent pool. The paper was authored by Craig Caldwell, who could not attend the conference.

DESCRIPTIONS OF BREAKOUT SESSIONS

Session 3 (continued)

Breakout Session 3-4

Eliminating Confounding Variables to STEM Implementation in a Rural School District Using Mobile 1:1

Diane Brissette, Greenville Public Schools, and James Anderson, Ventra

This presentation describes how the mobile 1:1 project at Greenville Public Schools is being used to enhance student engagement in learning by increasing accessibility to technology resources within and beyond the school building and school day.

sHaPe (Summer Health Activities and Professions Exploration) Camp for Middle School Students

Kathryn Agee, Regional Math and Science Center, Grand Valley State University

This presentation will describe the Grand Valley State University Summer Health Activities and Professions Exploration (sHaPe) summer day-camp. Now in its fourth year, sHaPe Camp provides area middle school students with the opportunity to explore careers in the health sciences. The primary goal of camp is to bring underrepresented populations onto a college campus to encourage them to pursue careers in the health sciences, while educating them about healthy lifestyles. Our hope is that these students will be inspired to succeed academically and pursue post-high school education.

Session 4

June 4, 2:40 p.m. – 3:30 p.m.

Breakout Session 4-1

Developing an Advanced Manufacturing Certificate Program for High School Students

Christopher Reis, School District of Kettle Moraine (WI), and Donald Patnode, Second Chance Partners for Education

This presentation offers a collaboration between a K–12 school district and a

nonprofit agency to design a program where high school juniors and seniors receive vocational training through work experience with local manufacturers, take technical college coursework while completing their high school diplomas, and are prepared to fill the growing skills gap in American manufacturing.

Pre-Engineering STEM Capstone Project to Design an Oil Cap Remover Tool to Help General Aviation Cessna Pilots

Sandy Feola, National Center for Manufacturing Education (NCME) and Sinclair Community College

This presentation describes a capstone project experience by a two-student team applying pre-engineering concepts to design a new product to solve a problem that women and older general aviation pilots encounter—difficulty in opening over-tightened Cessna 152 or 172 engine oil caps during the preflight check. Industry professionals from three local companies provided STEM mentorship for technical and product realization support for the student's project plan. To help facilitate communication between students and industry mentors, a collaboration Web 2.0 tool, mycareerme.org, was used to post status and communicate progress, and encouraged online participation when it was difficult for mentors and the students to meet in person.

Breakout Session 4-2

Learning by Doing: A Case Study of a Clinical Model for STEM Teacher Preparation

Caryn M. King, College of Education, Grand Valley State University

This case study describes an experimental teacher preparation program designed to prepare STEM career changes for teaching in high-needs schools. The curriculum, collaborative design process, and findings regarding the first year of implementation are discussed.

DESCRIPTIONS OF BREAKOUT SESSIONS

Session 4 (continued)

Breakout Session 4-2 (continued)

Bridging the Creativity and STEM Crisis

Daniel Katanski, Eastern Michigan University

This presentation examines the risks to creativity and STEM from both inside and outside the United States. Then, learn the definition of technology competition and discuss the STEM aspects of technology competitions such as the FIRST robotics competitions. Finally, it suggests using technology competitions with industry and community support to bridge the creativity and STEM gap.

Breakout Session 4-3

How Do We Know? Inquiry-based Front Ends for Conventional Topic Treatments in STEM Textbooks

David Schuster, Mallinson Institute for Science Education, Western Michigan University

Most conventional science textbooks present what we know as an established body of knowledge, but little if anything of how we know. Science is presented largely as product, with the inquiry practices of science largely absent. To remedy this imbalance, we have been devising inquiry-based "front ends" for use in instruction as precursors to direct textbook treatments. We illustrate the issue with an example of a direct textbook exposition of refraction, and then show this can be enhanced with an inquiry-based conceptual introduction to the topic. Similar inquiry-based front ends are being developed for other science topics.

Using Models to Teach and Learn Engineering

Slobodan Urdarevik, Western Michigan University

One of the biggest problems engineering students are facing is visualization. In fact, visualization skills have been found to correlate highly with successes in

engineering, and mathematics in general. In order to help students develop this skill and make teaching and learning more productive and interesting, a new teaching strategy based on using models has been developed. Experience in using the models shows that students are able to learn the topic in the most effective and easiest way, and become more engaged in the learning process. In addition, using the models makes students feel that engineering is an interesting field to study. The benefits for instructors are less lecture time; the models make it easier to explain the topic; and students' learning outcomes are improved.

Breakout Session 4-4

Blending Innovation, Student Co-learning, Entrepreneurship, and Informal Education – Innovation 5

Thomas L. Deits, Michigan State University, and Katherine LaCommare, Lansing Community College

We are engaged with Impression 5 Science Center in a student co-learning project to systematically investigate how the new technologies of additive manufacturing and rapid prototyping can be adapted to the informal education environment. We will describe our progress in creating a sustainable plan to integrate these new technologies into a hands-on science museum in order to stimulate interest in STEM among young people, engage students in entrepreneurship and innovation, and provide an accessible community resource for everyone from tinkerers to micro-entrepreneurs.

An Integrative STEM Experience Onboard a Research Vessel

Janet H. Vail and Michele H. Smith, Grand Valley State University

A unique STEM education experience in a nonformal education setting is the topic of this presentation. K–12 students work as scientists onboard specially designed research and education vessels on Lake Michigan and its adjacent waters.

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The exhibits will be in Kennedy Hall of
Engineering Room 330. The exhibits are
open on June 3, 1:00 p.m. – 5:00 p.m. and
on June 4, 10:00 a.m. – 3:30 p.m.

Many thanks to the staff of the Seymour
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