



2014 Wisconsin STEM Education Leadership Summit

Executive Summary

October 8, 2014





Introduction

Thank you to the 100+ attendees for joining us at the 2014 Wisconsin STEM Education Leadership Summit on October 8th. We enjoyed a fruitful day of learning from STEM programs in other Midwest states and STEM leaders within our own state. This summary will detail the events of the day in the order they occurred, giving highlights of presentations, table discussions, and calls for particular work moving forward. The summary will also connect to the following goals that we established for the STEM Summit:

- 1) Define key characteristics of STEM education needed to equip more students with necessary skills to fulfill our workforce needs, acknowledging regional variations,
- 2) Delineate a sustainable plan for moving STEM education forward across Wisconsin, and
- 3) Outline essential features of a statewide organization necessary to support this work and foster sustainable partnerships.





Setting the Stage

In the first portion of the meeting, we had four individuals set the stage for us on the need for STEM education, the importance of statewide partnerships in supporting STEM education, and the foundational work that a statewide committee did through the STEM Navigators report. Comments are summaries, not direct quotes, except where quotations are included.



Scott Jansen

**Administrator of the Division of Employment & Training
WI Dept. of Workforce Development**

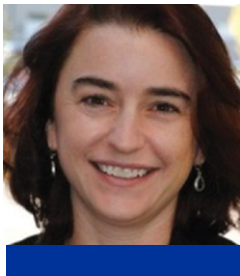
We have a shortage of workers in Wisconsin with the skills and competencies in STEM fields. Currently, we are rich in K-12 and Technical College infrastructure, but we don't have the level of educator and employer connections we need. "We are not going very far without collaboration." Employers need to be involved in contextualizing careers for students, teachers, and parents along the way, not just recruiting after graduation. [Wisconsin Fast Forward](#) is one effort to make these connections and unify workforce assets across Wisconsin.



Dennis Winters

**Chief Economist
WI Dept. of Workforce Development**

Data shows that STEM is a key economic growth area for our state. STEM workers drive innovation and competitiveness in fields much broader than typically realized (includes 125 fields that DWD tracks), and STEM jobs have grown at twice the rate of other job segments. The average pay is \$66K/year for STEM professions vs. \$45K/year for other sectors. Further, STEM workers are significantly less likely to be unemployed. We need to work together to promote this work as viable and attractive.



Sheila Briggs, PhD

Assistant State Supt., Division of Academic Excellence
WI Department of Public Instruction

We need a systematic approach to supporting STEM education across the state. It will take a lot of collaboration to fill the pipeline. We have to foster those connections to share the good things going on across the state and ensure businesses are letting educators know what they need. We must ensure that parents and students don't say, "No one ever told me that." There is great work going on that shows "STEM is greater than the sum of its four parts."



Joshua Schultz, PhD

Director of STEM
Milwaukee School of Engineering

STEM job growth continues to outpace other economic sectors, and demand for STEM employees remains high. [The STEM Navigators](#) report, created by a wide range of stakeholders across Wisconsin, details five goals for STEM education leaders: 1) eliminate barriers keeping learners from exploring STEM, 2) emphasize learning of STEM skills and knowledge for all, 3) increase partnerships, 4) establish a STEM awareness campaign, and 5) invest in STEM professional development for educators. The Milwaukee School of Engineering continues to work to support STEM education training and initiatives.



Learning from Other States

In the next segment of the morning, we had the opportunity to learn from state STEM education leaders from other Midwest states. Almost all states throughout the Midwest currently have statewide STEM efforts in place, so in this portion of the day we hoped to learn from their experience. These leaders shared the basic history and current work of their networks, along with lessons learned.

Minnesota

Anne Hornickel

Chair

Minnesota STEM Network and SciMathMN Executive Committee

<http://scimathmn.org/mnstemnet/> - main page

<http://scimathmn.org/stemtc/> - STEM Teacher Center



The Minnesota STEM Network is a statewide business and education collaborative advocating for quality STEM education. They provide policymaker briefings and support a STEM Teacher Center. They work for broader engagement in STEM and cross-sector community connections. They grew out of the SciMathMN when they received matching state funding to an NSF grant (even though they did not get the NSF grant). SciMathMN receives funding from state and corporate/private donors. They have seven regional networks across the state, and each is at a little different place as each has grown somewhat organically instead of being determined centrally. These regions connect to a central hub with systematic communication. There is a general feeling in the state that student career exploration needs work, so they aim to help connect the dots to STEM careers and what is necessary to prepare and engage students in these career pathways. A state initiative called mncompass.org publicizes high school graduate interest and ability in STEM subjects and careers using ACT data.

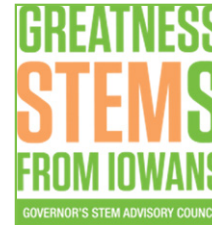


Iowa

Carrie Rankin

Asst. Director for Development
Iowa Governor's STEM Advisory Council

<http://www.iowastem.gov/>



There are 47 members and hundreds of volunteers working on this governor's council that began in 2011 largely as an economic development initiative. Supporting this STEM work is bipartisan legislative support which provided a \$4.7 million state appropriation in its first year, followed by \$5.2 million appropriations in the two subsequent years. The council separated Iowa into six regions, each with a manager that is hosted by a post-secondary institution (or two), which were selected through an RFP process. One of the STEM council's major initiatives is to create greater visibility for STEM and build a public understanding of STEM literacy for all. The group partnered with Strategic America, an Iowa marketing agency, for a statewide STEM awareness campaign (see logo!). Other missions and strategies of Iowa STEM include: supporting STEM Scale-Up programming PK-12, creating a STEM teaching endorsement, providing STEM professional development, sharing models of STEM-focused schools, engaging businesses and developing a toolkit to aid that work, linking teachers to real-world summer externships, and helping develop the conversation on statewide access to high-speed internet in every school.

Indiana

Paul Ainslie

Managing Director
I-STEM Resource Network

<https://www.istemnetwork.org/>



Started in 2006 as a collaboration among 18 institutions of higher education in 10 regions throughout Indiana, the I-STEM Resource Network receives no direct state funding. It is a partnership of public and private higher education institutions, K-12 schools, businesses, and government, hosted by Purdue University. I-STEM provides professional development, instructional resources, and materials to educators around Indiana. They have a strong collaborative relationship with the Lilly Endowment and Eli Lilly and Company, which provides volunteer STEM mentors for classrooms. I-STEM also leads the Indiana STEM Action Coalition which is guiding the state's efforts to ensure college and career readiness of high school graduates in STEM disciplines.



Michigan



Barbara Bolin

Former Director, Michigan STEM Partnership

<http://mistempartnership.com/>

Barbara began by sharing some alternative STEM acronyms, such as Strategies that Engage Minds and Solutions to Everyday Mysteries. Any other ideas? The Michigan STEM Partnership began as a grass-roots initiative to emphasize STEM education across the state. The Department of Education asked the Mathematics and Science Centers Network (a non-profit made up of 33 centers) to take the lead. The Network created a steering committee that divided the state into five hubs with each hub having a leadership team, several Math/ Science Centers, at least one four-year research university, community colleges, and multiple economic interests. In 2012, the legislature provided funds that allowed for the hiring of a state director and in 2013, funds were increased to allow the Partnership to provide money for seed grants. These funds have been maintained for the current fiscal year. In 2013, the state leadership board was restructured to include 50% educators and 50% employers. A key lesson learned is the careful balancing act of negotiating with multiple partners over funding, decision-making, and state vs. regional jurisdiction, which is now made more difficult with the creation of ten economic prosperity regions that do not align well with the hubs.



Model Education Partnerships in Wisconsin

For the next panel, we invited five varying education partnerships from around Wisconsin to share their work. These partnerships each have a unique mission and approach, so we had a goal of learning from their models about how their structures and successes could inform a state STEM network with regional hubs.

BioPharmaceutical Technology Center Institute (BTC Institute)



Barbara Bielec

K-12 Program Director

<https://www.btc.org/default.html>

Promega Corporation founded the BTC Institute as a separate nonprofit in 1993, though Promega continues as the primary sponsor (along with contributions, grants, and program revenue). Programs include: biotech field trips for middle and high school students, a Biotechnology Youth Apprenticeship Program, summer science programs for underserved populations, teacher courses and workshops, and advanced courses for scientists and graduate students. Educator programs consistently have scholarships available. They also host conferences on STEM cells, Consciousness, and human proteomics.

STEM Forward

Rich Merkel

Executive Director

<http://www.stemforward.org/>



STEM Forward is a Milwaukee-based 501(c)(3) organization that originally started as the Engineers & Scientists of Milwaukee professional organization in 1905. They have a staff of 2.5, with an annual budget of \$350k (largely corporate sponsors and fundraising events). They support STEM education by serving as a clearinghouse, providing direct or affiliated program implementation support, and advocating for STEM. They support programs such as Future City, Rube Goldberg, and Day of Engineering that serve over 3,000 children. To support connections, they work with MPS STEM Partners and TEM7, support a website and calendar, and provide impartial sources. Their events include the sySTEMnow Conference and an Engineers Week banquet.



Fox Valley Writing Project (FVWP)



Pat Scanlan

Director

<http://www.uwosh.edu/deptblogs/fwp/about-fwp/>

This affiliate of the National Writing Project is a network of 55+ teacher leaders in the Fox Valley area. Housed in the College of Education and Human Services at UW-Oshkosh, FVWP provides professional development to educators in the region, with an emphasis on reaching out to rural districts. Beyond the Fox Valley in Wisconsin, there are also local writing projects through UW-Madison, UW-Milwaukee and Carroll University; these are among the nearly 200 NWP local affiliates across the country. During the 2013-14 academic year, FVWP partnered with area school districts, CESAs, and UW-Oshkosh to provide more than 5,400 hours of professional development to almost 240 K-12 teachers. FVWP's work is centered on a "teachers teaching teachers" approach. They believe that effective in-service provides frequent and ongoing opportunities for teachers to practice and examine theory collaboratively, with an emphasis on teacher inquiry.

Wisconsin Space Grant Consortium

Kevin Crosby

<https://spacegrant.carthage.edu/>

Hosted at Carthage College, the WSGC is an affiliate network of 40+ higher education, government, and industry partners supported by NASA, with a goal of STEM research support and aerospace workforce development. The national program began in 1988 and comprises consortia in all 50 states, Washington, D.C., and Puerto Rico. The WSGC supports programs from K to infinity, in areas such as research fellowships, scholarships, internships, faculty research, higher education, pre-college, and informal education.





Wisconsin Advanced Manufacturing Pathway Education Network (WAMPEN)



Mark Schommer

DC Everest School District Mathematics Coordinator

<http://www.wampen.com/>

Developed under a grant from the U.S. Department of Education, WAMPEN created applied mathematics and literacy programs linking to student work in Career and Technology Education (CTE) courses. The work has included extensive business partnerships. The Applied Math Project is a year-long geometry course focused on the skills manufacturing employers want. It also offers six transcripted credits through Northcentral Technical College (NTC). Mathematics and CTE teachers collaborated extensively on developing the program. They also worked with a literacy coach from NTC, where CTE instructors learned and applied literacy skills in their classes. Webinars on these literacy connections can be found at: <http://breeze.fvtc.edu/wampen>. Students receive a Technical Skills Attainment (TSA) certification upon completion.



Comments from Legislators

Senator Luther Olsen and Representative Mandy Wright

After the Q&A for the model partnership panel, Senator Olsen and Representative Wright were asked to share a few comments on this work. Note – this is a brief summary of their comments, not direct quotes. We appreciate their attendance and input into this important initiative.

Senator Olsen



A rising STEM focus in schools and across the country is helping to direct students into STEM education opportunities. Children need to understand why they are in school, and a focus on STEM is one venue that can provide such purpose. Wisconsin will need students who have had experiences in STEM education; we see this as the future and the foundation for high-end jobs.

Representative Wright



In this work, it's essential that we connect and collaborate across sectors. We need to have higher education, K-12 schools, and businesses all at the table. Businesses up in the Wausau area are clamoring for skilled employees, particularly with STEM skills.



Lunch Conversations

Over lunch we asked participants to discuss two primary questions: What are the key characteristics of quality STEM education? And, what would be the most important elements of a statewide STEM education network? Below is a list of themes from those conversations and ideas shared within those themes.

Characteristics of Quality STEM Education

Integrated and thematic – includes true collaboration across disciplines.

- No one teacher or discipline running the show; all are willing to take risks and learn from failure.
- Teachers have the skills for this approach and ongoing professional development to evolve it.

Real-world – authentic learning captures student imagination and curiosity.

- Business partners help make these connections happen, and an advisory board ensures a continual evaluation of effectiveness.
- Sufficient funding supports the work—equipment, field trips, and professional learning.
- While linked to workforce pathways, effective STEM acknowledges that the “sexy” career or pathway now might not exist in 10 years. Programs focus on 21st century skills, like communication, teamwork, and problem solving, in a context of innovative possibilities and ongoing community needs (like auto mechanics).

All students feel respected, connected, and invited, and all have STEM opportunities – educators give particular attention to groups that are underrepresented in STEM fields. STEM is for ALL.



Elements of a Statewide STEM Network

Clear Structure and Vision

- Statewide goals with visibility, accountability and leadership
- A central point-person, leader, and STEM champion to direct the work, while ensuring it's not a "Madison" initiative
- Regional hubs and pockets of innovation connecting to each other through a central hub

Connected to Stakeholders

- A wide range of stakeholders involved who clearly see what this initiative has to offer them
- Stakeholders include: higher education administration, faculty, and staff; PK-12 administration and teachers; families and students; corporations, small businesses, chambers of commerce, and workforce development organizations; non-profits; and, government agencies and elected officials (particularly at the state level)
- Regional hubs with advisory boards that include these stakeholders and connects this work to unique, regional workforce needs

Convenient Means for Sharing Best Practices and Models

- A website or similar resource to provide models of successful STEM programs and detail specific elements of those programs, such as how to structure for cross-curricular time

Strong Advocacy for and Understanding of STEM

- A cohesive vision of STEM – while not necessarily the same definition across regions, there are essential characteristics
- A marketing campaign that builds understanding and support for STEM
- Communication support, such as toolkits for building parent understanding – Are students on the proper pathway? What are possible careers in STEM?
- Address ongoing societal bias for four-year instead of two-year degrees – Parents, students, counselors, and other education leaders need to understand, market and/or emphasize the value and credibility of a two-year degree
- Work with business leaders to build understanding of STEM and workforce needs
- Develop a toolkit for effective business and education partnerships



Effective STEM Teachers

- Work to better attract innovative STEM thinkers to the teaching profession
- Strengthen teacher education programs to better prepare teachers for integrated STEM pedagogy, particularly at the K-8 level (e.g., develop a K-8 STEM certificate to add on to a license)
- Need ongoing professional development for current teachers and support for K-8 teachers to be able to effectively teach STEM, as that doesn't happen in general teacher licensing requirements

Sustainable Work

- Need a stable source of funding so that stakeholders can be certain of long-term support and so that network leaders are not spending their time fundraising

Other Theme – Challenges in STEM Education

- It's difficult to find teachers with MS degrees for articulation agreements, or to find teachers with proper credentials for physics, computer science, earth science, and computer science.
- Current licensing is a challenge, particularly in doing cross-disciplinary work at the high school. Can a mathematics or science licensed teacher teach a STEM class?
- Sustaining efforts are a challenge, particularly when one teacher leads the effort.
- Mindset - technical college is not seen as being as good as university attendance.



Regional and Looking Forward Conversations

After the lunch conversation, we asked table groups to discuss the following questions. What are effective STEM examples in our region? What are the qualities of effective STEM programs for our region? What are our regional needs, and how can a state STEM network help to meet those needs? Below is a list of themes from those conversations and ideas shared within those themes.

Effective STEM Examples

There are too many examples to be able to effectively list them here; clearly, many discussed at the summit are not listed below. STEM Wisconsin organizers hope to generate a contact list with descriptors of each effective STEM program. Please let us know if you would like to be included or know a group that should be.

- For most Career and Tech Ed programs, the norm is to have an advisory council including business partners. A few that were noted include:
 - Baraboo School District – partners with several local businesses to prepare students for jobs in advanced manufacturing and to build their regional economy.
 - Milwaukee Public Schools – has a growing STEM partnership program, with many volunteer professionals supporting teachers in the classroom.
 - Tomah Area School District – has maintained some traditional tech ed programs while moving forward with a new program, and guided by the lead engineer from Toro on their advisory board.
- Wisconsin Rapids, like several other districts, is developing a school Maker Space.
- Stoughton Area School District [developed a Fab Lab](#) in conjunction with many local businesses and STEM volunteers.
- Many STEM charter schools or STEM academies within schools are part of the Innovative Schools Network, [which has a list of member schools](#).
- Waukesha County Technical College has a transcribed mathematics course co-taught by CTE and mathematics teachers.
- [Wisconsin Science Festival](#) and [Engineering Expo](#) provide teacher support.



Regional Characteristics of Effective STEM and Regional Needs

- Regional partners are essential, based on specific workforce development needs and building on existing partnerships in a region (often do not need to start from scratch).
- Rural areas face particular challenges with staffing, resources, and employer connections.
- Sharing resources across districts is a valued strategy, with the idea of sharing STEM teachers as one option. With current laws, competition for teachers has increased with compensation rising in critical areas such as technical education ([example of Oregon School District in recent newspaper article](#)).
- Regions need to define which industries should be included. While health care could apply in most areas, sectors such as agriculture and computer science might have unique needs.

Support from a State STEM Network – It should:

- Share strategies and direct support for growing K-5 STEM education, and improving teacher training through K-8 in STEM.
- Build a common definition of STEM and 21st century learning – makes collaboration and sharing of models easier, even though regions will need to tweak these definitions to meet their needs.
- Advocate!
- Provide financial support to a director within each region, as all volunteers are not likely to have the same potential for large scale success.
- Provide seed funding to support collaboration/networking.
- Acknowledge and address rural challenges such as attracting STEM teachers and not always having the same financial and community resources.



Participant Survey Results

In addition to ideas generated during the table conversations, we also sent out a brief survey to elicit further ideas in relation to this STEM network. We asked participants the following questions and received 26 responses. What were the highlights from the STEM Summit? In what ways could the summit have been better? What are your hopes for the future regarding a statewide STEM network? (for example, the work of the network in general or plans for a meeting in spring). Below is a list of quotes from the survey responses that exemplify general themes.

What were the highlights from the STEM Summit?

“The best part was the opportunity to meet and talk with people at our table.”

“Hearing the different models used in other states.”

“I was impressed at the . . . wide variety of perspectives.”

“Hearing the general consensus on the need for state leadership and organization.”

In what ways could the summit have been better?

“Increased business [engagement] or a plan [to determine] what businesses want.”

“Discussion of what a state level organization would look like.”

“Who makes the next steps?”

“Maybe organizing into forums that action statements could come out of.”

“Break-out groups.”

“More time for panel Q&A.”

“If real money was on the table.”

“If we had work to do before the next meeting of the group.”

“More state officials.”

“Students at the table.”



What are your hopes for the future regarding a statewide STEM network?

“This is a pipeline issue: a focus on CTE and careers misses the K-5 grades where the battle is won or lost.”

“STEM action clearinghouse” – “A cohesive network of knowledge and implementation.”

“Find a vision for the coalition.”

“Hoping for a regional stem hub that provides assistants with resources, guidance and finances... backed by the state.” - “a formal organization [like Iowa].”

“Regions with real autonomy & power (ie. budgets) that focus efforts on local/regional needs.”

“Talk is good, but money and implementation are what is really needed.”

Need “metrics to show that what we do or could do matters.”

Coordinated “advocacy” resulting in “increased awareness in state government/ leadership of not only the need for more STEM funding, but where this funding will have the greatest effect.”

“I hope there is a spring meeting” to work on these ideas.”



Next Steps

What we ask participants to work on during winter and spring of 2015:

- Locate and/or let us know about effective STEM partnerships in your region. Provide details such as how it started, who is involved, what curricula is used, and how success is measured.
- [Google form to share these ideas.](#)
- Talk to your elected officials about the importance of STEM education and the potential of regional and statewide STEM networks. [Please share your success stories.](#)
- Continue to share your ideas for work we could do together in spring

Convene in spring – plans for that meeting:

- Discuss how to replicate effective STEM practices.
- Collaboratively develop strategies to meet the noted challenges.
- Connect to business leaders from around the state and discuss business needs.
- Workgroups on state STEM topics – rural taskforce, repository of resources, partnership development, etc.

Convene next fall as a collaborative conference of STEM professional organizations from across the state (mathematics, science, technology and technical education, engineering, computer science, environmental education).

For further information or to share ideas, please contact Kevin Anderson,
kevin.anderson@dpi.wi.gov



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Partners in this STEM summit:

