

WISCONSIN TECHNICAL COLLEGE SYSTEM

STEM & ENERGY SYSTEM-CALLED MEETING

October 28, 2016

Moraine Park Technical College, Worldlink Conference Center, 235 N National Ave, Fond du Lac

In attendance: Turina Bakken, Bethany Sansing-Helton, Ann Thompson, Randy Way (Madison); Gary Kilgas (MSTC); Marcia Arndt, Craig Habeck, Steven Horvath, Kim Olson, James Olson, Jeffrey Quackenboss (MPTC); Darren Ackley (NTC); Lisa Crozier, Pamela Gerstner, Amber Koenig, Pam Mazur, Bala Nagalingam (NWTC); Derek Dachelet (SWTC); Chrystal Seeley-Schreck (WTCS); Mark Rzeznik (WCTC); Josh Gamer, Mike LeDocq (WTC); Ted May (WITC)

- Mix of faculty and administration from STEM cluster programs and General Education (physics, chemistry, and math)

Welcome (Fred Rice, Dean of Applied Technology and Trades)

- The more we know, the better understanding we have of the complexity of things

Statewide STEM Updates (Chrystal Seeley-Schreck, WTCS)

Presentation:

<http://mywtcs.wtcsystem.edu/wtcsinternal/cmspages/getdocumentfile.aspx?nodeid=0a603da2-639a-482c-b9f1-bbb19db80b44>

- Threads of STEM in almost everything the Technical College System does
- STEM cluster includes engineering and science & technology pathways
- Multiple definitions
“STEM education is an interdisciplinary approach to learning that removes the traditional barriers separating the four disciplines of science, technology, engineering, and mathematics and integrates them into real-world, rigorous and relevant learning experiences for students.”
Basques, Sneider & Comer (2013)
- STEM literacy for all DPI Report – [Evolving Notions of STEM](#)
- Wisconsin Energy Consortium update: WTCS: NWTC, MPTC, CVTC, MATC, SWTC
- Project Lead The Way update
- STEM Wisconsin [update](#)

STATEWIDE STEM Conversations:

- Most of our programs have STEM; building the workforce
- Student math knowledge is a challenge

- We need strong physics and math in programs
- Liberal Arts transfer programs provide STEM in science and math
- Applied programs provide STEM cluster (and manufacturing, Ag, IT, healthcare, etc.)
- Program articulations can be challenging, esp. with HLC requirements (BA for AAS, AAS for TD)
- Consensus that there is a desire to better promote the STEM brand as a system
- Better provide System support to show students the STEM pathway available
 - o Articulate and align values
- Challenge: Parents and Students don't *SEE* STEM at WTCS
- How do people find STEM programs at WTCS?

Needs:

- Need to improve system-wide branding for STEM
 - o who needs to be part of this conversation? ISAs? Presidents?
- Requires having a VERY general base definition to work from statewide
 - o Suggestion to use national definitions (explore)
- Need for discussion on how we are handling changes in HLC requirements for instructors
- Work group to look at how we approach PLTW system-wide; include other models; include career pathway folks
 - o Is PLTW just "exploratory"?
 - o Is there a way to partner and provide value without focus on credit?
- Work group to discuss how we

Integrated Technology Spotlight & Technology Tour (Jeff Quackenboss, Thomas Roehl)

- Mechanical Design, Process Engineering, Electro-mechanical are traditionally taught in "silos" but no one works like that in industry; students need to be able to work across the disciplines. MPTC solution: Integrated Manufacturing Course: 3 courses combined
- 2 credits; 4 hours in Fall for planning and design
- Spring semester: Integrated Manufacturing Production
- 40% of students grade is on core manufacturing skills (soft skills)
- One classroom, 3 programs, 3 groups of students (1 from each program working in team environment)
- 3 instructors, 4-5 different classrooms
- Project based classroom
- First 4 weeks is team building
- Courses integrate
- Students get to hear from other instructors on a regular basis
- Designing projects based upon industry needs; real world application
- Mercury invested \$100,000 into using fixtures designed by students to improve line worker dynamics
- Electromechanical tore apart a work cell
- What could this do for your retention
- DMI insurance

General Education & Math Options in STEM programs

Discussion: What's working? What are your challenges? Questions for Each other?

- With reduction of general education credits
 - o Don't get rid of math
 - o But Increasingly need the soft skills
- Challenge: Math Tech series is not transferable
- Look at what we want students to do
- Is it possible to decrease the # required credits for communication/social science and increase # math/science required credits?
- Can we pare up math and science?
 - o Explore Integrated math science classes
- <http://mywtcs.wtcsystem.edu/occupational-academic-excellence/general-education-and-liberal-arts>
- <https://www.wisconsin.edu/transfer/transfer-tools/>

UW System Women and Science Program (Jennifer Schuttlefield Christus)

- **Presentation:**
- 2016 Women in Science Fall Speaker Series 20th Anniversary Session at 4W (Women, Well-being, Wisconsin, & World)
- Summit on Women, Gender, and Well-being: (April in Madison) Transformative Education: Equity, Sustainability, Empowerment
- NSF Advance Grant (5 year grant)
 - Opportunity
 - o Vertical mentoring
 - o Horizontal mentoring
- Lead-It-Yourself! Grant (NSF)
 - Faculty workshop on people in administrative roles
Unconscious Bias & Gender Equity Issues in STEM
 - o August 2017
 - Look into Fair play game on UW Science and Women website
 - Advisory Committee
 - o One faculty and one administrative
 - Advertise nationally
 - Very little funding
- WiscAMP – faculty Wisconsin Louis Stokes Alliance for Minority Participation (WiscAMP)
 - For under-represented minorities
- UW-Whitewater
 - STEM underrepresented groups come in for a week long boot camp before session starts
 - 60% more students going into remedial math than into remedial English

Regional STEM Initiatives & Recruitment Opportunities

Southeast

- WCTC
- STEM Forward: <http://www.stemforward.org/>
- [Southeast](#) - they discussed the need for more coherent and sustained professional development for teachers, as well as support for hiring and retaining STEM teachers. A specific goal noted was to create a systematic communication system around STEM education.

Southwest/ Southcentral

- Doesn't seem to be a lot of cohesive work happening
- Not much coordination happening
- SEEM group Science and Environmental Education in Madison
- [Southwest/Southcentral](#) - work at UW-Platteville, Madison College, Madison Metro School District and Sun Prairie Area School District was shared. They discussed ideas to create and maintain STEM funding, noting the importance of clear return on investment.

Northeast

- New North economic development group
- New Era
- Scholarships/ tours
- Einstein Organization (science curriculum, science activity group) helps run collaborative
- Industry and STEM partnerships
 - o NWTC formalizing STEM internships
 - o K-12 STEM outreach
 - o Career pathways from the high school
- [Northeast](#) - work of the Brown County STEM Network was noted, with goals of a creating a mission and vision to serve as a model for other regional STEM groups.

Northwest

- NW Wisconsin STEM
 - Vision Northwest (not quite as robust as New North, but doing action)
 - WITC collaborating with CESA 12 and Ashland
 - [Northwest](#) - a growing NW Wisconsin STEM collaborative will be conducting a skills gap analysis across businesses/industries and mapping that on a GIS system along with STEM programs in the area. This work is supported by the economic development regional group [Vision Northwest](#). Efforts of the Wisconsin Science Olympiad and the Wisconsin Center for Environmental Education were also noted.
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College Updates - STEM Initiatives & Program Updates (All)

Asked to address:

- 1) *Cross-cluster/ college-wide STEM initiatives: What is goal/focus of the initiative(s)? Which programs and/or specific student groups are impacted by the initiative(s)? How are they funded? How are they staffed?*
- 2) *Industry and community STEM partnerships*
- 3) *Exciting developments or major challenges AAS and technical diploma programs in the STEM pathway cluster or Energy*

Two colleges identified having specific College-wide STEM groups/ initiatives, cross-discipline

- Madison College
- Western Technical College

Chippewa Valley Technical College (via email from Jeff Sullivan)

- Cross-cluster/ college-wide STEM initiatives: We have an increased interest in CAD, Solidworks, GD and T and blueprint reading in areas of Welding and Machine Tool. Strategically we are developing greater transcripted credit options with our K-12's
- Industry and community STEM partnerships: We've developed training involving our Technical Diploma in Manufacturing Quality at area employers where we go on site and teach credited classes with in the TD.
- K-12 STEM outreach efforts: Our mobile lab helped promote manufacturing month throughout the region. We hosted a MFG day event and had 225 students attend tours at our campus and visit regional businesses.
- Updates for AAS and technical diploma programs in the STEM pathway cluster: We are looking at the Mechanical Design program as an addition for 2017-18. We are pursuing an embedded TD in CAD related curriculum based on industry support. We continue to pursue fair transfer agreements for our graduates into 4 year programs.

Northcentral Technical College

- STEM Festival – partnership with Michigan Tech
 - o 6000-7000 people on campus
 - o 125 3 minute experiments
- STEM Scouts
 - o 13 sites across US
 - o 5 sections of 10-15 students (all genders)
- STEM events for 5th-8th graders + parents
- Dual credit options for HS
- STEM Academy
- Emerging Technology Trailer with T-shirt cannon
- Faculty need 5 days for “professional days”, some volunteer for outreach events
- Barnes in Nobles mini-maker fairs
- Good partnership with Michigan Tech (save \$80K) Houghton, Michigan, 3+2

- Transfer Mechanical Design and Electrical Engineering, -- Mechanical Design Engineering Technology
- Challenges with partnering with UW Stout

Western Technical College

- Strong partnerships with UW Platteville, UW Lacrosse
- On Campus STEM working group: grants, faculty, applied and general studies, administration
 - Figuring out how to fund efforts right up front to be sustainable
 - Starting high school academy to get students on campus (Mechanical Design)
 - Developing pre-engineering pathways
 - AAS Transfer program....working on developing 1-2 year transfer program
 - NSF technological education grant to
 - NSF S-STEM grant for scholarships
 - US Labor Dept. for at risk students – paid instruction for construction program
 - Huge amount of interest and support for STEM on campus
- Program transfer, Pre-engineering, Collaborative engineering
- Looking at becoming ABET accredited (EET)
- Potentially for pre-
- Midwest Hydro Users groups
- Purchased small vans with funds
- AMN grants
- Upper Mississippi Manufacturers Alliance

Southwest Wisconsin Technical College

- Mobile welding lab to go out to high schools for a road show
 - ProAm
- Educational Cooperative
 - Non-profit, community based, focused on doing STEM outreach as well
 - Will recruit students from high schools to attend classes out

Moraine Park Technical College

- Tooling It camp – exploration of programs
- Engineering for Girls camp
- Bots IQ
- Divided between 3 economic development areas
- 800 middle and high school student at career fair
- 150 students from 6 high schools
- Master cam -- 3 times a semester
- Project Grill
 - 7-8 high schools that go out to visit manufacturers

- High School competitions
- Electromechanical technology
 - o Associate degree in Industrial Maintenance Technology
 - o Electro-mech first year, second year 2 tracks (high school)

Wisconsin Indianhead Technical College

- Mechatronics
- Trying to get more environmental programming

Mid-State Technical College

- Completed Mobile Innovation and Knowledge Expansion Vehicle
- 9 pcs, instructor system, machining, 3D printer and more
- Engineering Day as part of national engineering week in February
 - o 172 students
 - o Tours of program, presentations from engineering firms, job opportunities
- College Initiative Day
- Auto and Diesel technology cart – hook up to GoPro to show what’s going on underneath the vehicles
- Civil engineering: Embedded surveying 1 yr TD
- Instrumentation and Controls program morphing towards automation and manufacturing
- Sand Valley golf course collaboration with Civil engineering students
- High School STEM Scouts program
- Heavy Metal Bus Tours
 - o 32 businesses
 - o Visit automation and manufacturing
- UW 4.5 million dollar STEM facility in Marshfield focused on healthcare
- Vex Robotics camp each summer
- NASCAR race camp each summer
- J term – engineering this year, next year – welding & critical thinking and problem solving
- Partner with UW-SP:
 - o UW-SP, boys STEM exploration day
 - o UW-SP girls STEM exploration camp
 - o Treehaven STEM opportunity for northern Wisconsin students

Waukesha County Area Technical College

- Novacon STEM fair: <http://www.usasciencefestival.org/about/team/item/2860-novacon-stem-fair.html>
- Boy scout merit badge help
- Manufactures in morning; college in the afternoon – with all 17 high schools in the district
- First robotics competition
- Dual Enrollment Academy – welding and machine tool and other areas

- Company sponsored
- Held to college standards
- Strong Engineering programs; ABET accreditation
- EET – MSOE, Marquette and UW transfer agreement.....Save \$60K at MSOE --- ABET
- ABET – electrical engineering reapproved, new mechanical engineering approved

Madison College

- College-wide STEM initiative starting out
- Really a lot of success with boot-camps – provide a college record
- Pathway to Prosperity network
 - MDSN, MMSD, chamber, workforce development
 - Students pick cluster in in 9th grade, build pathways
- UW-Stout 3.5 + .5 – Biotechnology students come onto Madison campus for last semester in Biotechnology Post-Baccalaureate Certificate
- Million Women Mentor – STEM Connect
 - 37 states involved
 - No other state led by an educational unit
 - Book – Women’s Quick Facts.
- STEAM camp with boys and girls club – run thru 3824 continuing ed
- EET/ Electronics
 - First Lego League competition - hosting
 - Bringing in students and retention
 - Started a robotics club
 - Doing robotics boot-camp
 - Interested in VEX boot-camp
 - Problem getting faculty to involved
 - 2+2 with Edgewood program – go through EET program to a physics degree.....serves students heading toward graduate school
 - Started doing open labs; using peer support (some paid, some work study)
 - Looking to increase retention above 17%
- WiscAMP scholars program
- Engineering transfer program
- Pockets of STEM throughout the college
- College is really big and wants to bring work that is happening across the college together
 - Planning phase to see what’s happening
 - Unify efforts
 - Half of college is liberal arts transfer/ have applied programs
 - Change way communication happens across the college
 - Hoping for physical space by next year

Northeast Wisconsin Technical College (in-person and via email from Pam Gerstner)

- 3rd year of NSF welding grant – real math videos to be used in
- Training instruct
- Professional development
- Engineer trades, laboratory science program collaboration on NSF grant
- Lab science technology in general studies (2 tracks)
- Collaboration between
- 7 employers, 2 colleges,
- UW Oshkosh accepting lab science technology to UW-O Biology degree
- Recruitment
 - o Engineers week open house – middle school, high school, parent, teacher
 - o Evening; UW, MOSE, employers for each engineering field during Engineering week
- Architecture – nonperishable build
- Northwoods and Aurora Academies in northern parts of the state teaching in rural areas
- 200 middle schools – Women at Work (AMN grant); employers
- NSF Welding Grant, we are in our 3rd of 3-years. Math faculty and Trades faculty collaborated in applied/contextualized math problems to Trades programs, and then REAL Math videos were created, and a math-related / contextualized toolkit was created. These videos were further collaborated with industry experts, and their businesses and their staff members were utilized in the creation of these videos. These videos can be utilized by any faculty member within WTCS. Additionally, high school instructors and other WTCS technical college math instructors have been or are being trained on utilization of the Math Toolkit and REAL Math Videos for instruction in math courses.
- Cross-cluster/ college-wide STEM initiatives

Fall 2016: The opportunity to collaborate for a National Science Foundation grant, as well as a local Water Quality Project, brought together the Environmental Engineering (Trades program) and the Laboratory Science Technology (LST) (General Studies program) faculty together to brainstorm opportunities to work together for students to engage in research and internships. While the ultimate decision after much discussion and brainstorming was to hold on submitting a grant proposal until next year, it was a great way for faculty to engage across academic departments and learn about one another’s programs in a much more in-depth way.

Conversations with students often occur to help them make decisions/determinations of what is the best pathway based on their desires and abilities. We’ve watched students shift between the Engineering and the LST programs each way. In addition, some health students are learning about the LST program through their microbiology classes and are considering shifts in career choices. While we are not encouraging students to jump from one program to another, the awareness of options/pathways is beneficial for students who may not find the right fit in their first program choice.

- AAS and technical diploma programs in the STEM pathway cluster (see webpage shot below)
AAS-Transfer Articulation Agreement with UW O



- **GENERAL STUDIES:**
Laboratory Science Technology AAS – first cohort began Fall 2016. Two tracks

1. Biological Sciences

2. Physical Sciences

LST Curriculum Biological Sciences Track					
Pre-program	Fall 1	Spring 1	Summer 2	Fall 2	Spring 2
<ul style="list-style-type: none"> Integrated Intermediate for All 	<ul style="list-style-type: none"> College 101 (1) College Chem 1 (5) College Algebra and Trigonometry w/ Apps (5) General Bio (4) 15 credits	<ul style="list-style-type: none"> College Chem 2 (5) General Physics 1 (4) Microbiology (4) English Composition 1 (3) 16 credits	<ul style="list-style-type: none"> Laboratory Internship Experience (1) Intro to Ethics (3) Intro to Diversity Studies (3) 7 credits	<ul style="list-style-type: none"> Intro to Psych/PHR (3) Analytical Chem 1 (5) Applied Statistics (4) Cell/Molecular Bio (4) Experimental Design (1) 16 credits	<ul style="list-style-type: none"> Organic Chem 1 (4) Capstone (2) Technical Reporting (3) General Physics 2 (4) 13 credits
Other potential courses: Calculus, Calculus-based Physics, A&P, Economics, Speech					Total credits: 67

LST Curriculum Physical Sciences Track					
Pre-program	Fall 1	Spring 1	Summer 2	Fall 2	Spring 2
<ul style="list-style-type: none"> Integrated Intermediate for All 	<ul style="list-style-type: none"> College 101 (1) College Chem 1 (5) College Algebra and Trigonometry w/ Apps (5) General Bio (4) 15 credits	<ul style="list-style-type: none"> College Chem 2 (5) Calculus-based Physics 1 (5) Calculus 1 (4) English Composition 1 (3) 17 credits	<ul style="list-style-type: none"> Laboratory Internship Experience (1) Intro to Ethics (3) Intro to Diversity Studies (3) 7 credits	<ul style="list-style-type: none"> Intro to Psych/PHR (3) Analytical Chem 1 (4) Applied Statistics (4) Calculus 2 (4) Experimental Design (1) 16 credits	<ul style="list-style-type: none"> Organic Chem 1 (4) Capstone (2) Technical Reporting (3) General Physics 2 (4) Calculus-based Physics 2 (1) 14 credits
Other potential courses: Microbiology, Cell & Molecular Biology, A&P, Economics, Speech					Total credits: 69

- Industry and community STEM partnerships Will be working on for student internships

GENERAL STUDIES:

Members of the LST advisory committee include representatives from:

- [Payne and Dolan, Inc / Northeast Asphalt](#)
 - [Genex Cooperative/CRI](#)
 - [Pace Analytical Services](#)
 - [Nature's Way](#)
 - [Schreiber Foods](#)
 - [UW-Oshkosh](#)
 - [Georgia-Pacific](#)
 - [Cherney Microbiological Services](#)
 - [UWGB](#)
- K-12 STEM outreach efforts Transcribed credit offerings-General A&P, General Chemistry, Physics, Einstein Project-Service Learning-Angelo microscopes
 - Trades can speak to the career pathways from high school to their STEM programs/pathways via transcribed credit.
 - UW-Oshkosh just recently signed the articulation agreement accepting the LST AAS into their Bachelors of Science with major in Biology (Health Care Science Emphasis). Students earn the

degree at NWTC and then complete approximately 60 additional (specified) credits at UWO in order to earn a BS degree from UWO. Credits can also be transferred from NWTC to UWO without completing the program. Additional coursework would be required at UWO.

No updates from BTC, GTC, MATC, LTC, FVTC, or NATC (not present and did not provide email response)

Next Steps (needs/ future meetings/ break-outs/ instructor meetings)

Meeting Needs:

Do you want future WTCS STEM meetings?

- Yes; annually
 - Meeting provided good networking and connections
 - Need to clarify who should attend and goal of meeting
 - Perhaps k-12 STEM, career pathway folks should attend

- Perhaps have a STEM strand or breakout at C3 conference
- Future topics: grants, student retention, (solicit more ideas)

STEM Cluster program/ faculty meetings?

- Yes:
 - Mechanical Design
 - Civil Engineering
 - Energy
 - Electronics (combined with EET)
 - EET (meets annually; suggestion to meet every other year)

Next Steps:

- Plan for future meetings as discussed
- Conduct STEM survey
 - o Identify programs & needs
 - o capture STEM initiatives to build collaboration
 - o If there is interest in developing more STEM-focused initiatives at your college, what is the goal/focus of interest? What are the barriers?
 - o What is your interest in faculty training in unconscious bias etc.
 - o What is your interest in exploring funding for mentoring program
- Look into Mobile labs day
 - o a day when all of the mobile labs get together in the Dells, etc.
 - o Check with Jim Mackey on doing this; maybe consider having this in coordination with the Tech Ed conference
- Connect with Jennifer Shuttlefield Christus to pursue professional development partnership opportunities, attend UW Women & Science Spring Conference
- Explore WTCS coordinating Million Women Mentors (as suggested by Turina Bakken at Madison College)

- Explore potential for better promote the STEM brand as a system
 - o improve system-wide branding for STEM
 - o who needs to be part of this conversation? ISAs? Presidents?
 - o Ways to provide better support to show students the STEM pathway available
- Look at national STEM definitions and explore potential definition for WTCS use
- Look into: Is it possible to decrease the # required credits for communication/social science and increase # math/science required credits?
- Convene work-group to look at how we approach PLTW system-wide
 - o include other models; include career pathway folks
 - o Is PLTW just “exploratory”?
 - o Is there a way to partner and provide value without focus on credit?

RESOURCES:

Other k-12 STEM curriculum:

- Stem Academy: <https://stem101.org/>
<http://dpi.wi.gov/te/stem-academy>
- The Cad Academy <http://thecadacademy.com/>
- USA Science & Engineering Festival: <http://www.usasciencefestival.org/>

Webinars: STEM Pathway Development

Marcy Raymond

Thursday, January 12, 3:30-6 p.m. (EST)

To help and assist students in their own exploration regarding the opportunities for their future in science, technology, engineering, and mathematics, a pathway approach is a helpful organizational guide. This session will describe the approach that integrates high school, college, and technical coursework. We will also assist participants in developing their own approach to implementation. Featured will be the “Bodies Pathway” that encourages experiences in pre-medicine and biomechanical engineering; the “Growth Pathway” that encourages experiences in food sciences, health, and genetics; and the “Design Pathway” that encourages experiences in mathematics and engineering.

[Register](#): After your request has been approved, you'll receive instructions for joining the meeting.

STEMtastic Strategies for Implementation of Early College STEM Programs

Marcy Raymond

Thursday, January 26, 4–6:00 p.m. (EST)

There are four basic implementations of STEM schools across the United States. In this session, we will look at the four implementation categories, specific school examples, and the strategies that are most important for the success of each. We will examine each according to the following constructs: leadership as the driver for change, building professional capacity among staff, partnership development (higher education, community interest, and economic drivers), student-centered learning climate, and instructional guidance and matriculation.

[Register](#): After your request has been approved, you'll receive instructions for joining the meeting.