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Details: Informational hearing, 2/12/2009 re: STEM

(FORM UPDATED: 08/11/2010)

WISCONSIN STATE LEGISLATURE ... PUBLIC HEARING - COMMITTEE RECORDS

2009-10

(session year)

Senate

(Assembly, Senate or Joint)

Committee on ... Education (SC-Ed)

COMMITTEE NOTICES ...

- Committee Reports ... **CR**
- Executive Sessions ... **ES**
- Public Hearings ... **PH**

INFORMATION COLLECTED BY COMMITTEE FOR AND AGAINST PROPOSAL

- Appointments ... **Appt** (w/Record of Comm. Proceedings)
- Clearinghouse Rules ... **CRule** (w/Record of Comm. Proceedings)
- Hearing Records ... bills and resolutions (w/Record of Comm. Proceedings)
 - (**ab** = Assembly Bill) (**ar** = Assembly Resolution) (**ajr** = Assembly Joint Resolution)
 - (**sb** = Senate Bill) (**sr** = Senate Resolution) (**sjr** = Senate Joint Resolution)
- Miscellaneous ... **Misc**

* Contents organized for archiving by: Gigi Godwin (LRB) (August/2011)

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State of Wisconsin Department of Public Instruction

Elizabeth Burmaster, State Superintendent

State Superintendent Elizabeth Burmaster Testimony to the Senate and Assembly Committees on Education February 12, 2009

Thank you to Chairpersons Lehman and Pope-Roberts and members of the Assembly and Senate Committees on Education for your leadership and inviting me to speak this afternoon on Science, Technology, Engineering, and Mathematics Education, otherwise referred to as STEM.

It is an honor to serve as your state superintendent and to provide testimony on this very important topic which will determine the future economic security of our state.

Working together, we can meet the future workforce needs in the critical areas of healthcare, skilled trades, agriculture, construction, advanced manufacturing, energy and bio-technology. Our education system can be the foundation for workforce development around these industry sectors and regional economic development.

The people of Wisconsin have long understood the importance of public education in a strong economy and have recognized the interdependence of strong PK-12 public schools, libraries, our technical college system, the UW System, our private and independent colleges, and healthy, productive communities.

The quality of life we have in Wisconsin and who we are today is a direct result of the investment made in us as children. Raising a family in Wisconsin has been built upon the promise of a public education that provided the opportunity to get ahead if you worked hard, did well in school, and were a responsible member of your community.

But, we are at a crossroads, and that promise will only stay alive for this generation of Wisconsin children and families if education truly prepares them for the knowledge-based economy of the 21st century. Education must be the foundation for any successful economic growth plan, and the immediate as well as long-term economic security of our state will be determined by our success in developing PK-16, business, and community partnerships that support and have a shared responsibility for education and workforce development.

Education at all levels, preschool to postgraduate; education of all types, public and private; education, plainly stated, simply works. Education works when we work in partnership with others to build our most cherished resource for the future, the next generation.

We are doing this around Wisconsin and we see pockets of excellence but we must do more. In just the last half of 2008 we announced:

- Partnership grants to 50 school districts for Mathematics and Science teachers professional development so our teachers can teach more relevant and rigorous content which directly applies to 21st century jobs.
- Science, Technology, Engineering and Mathematics grants to innovative programs in 27 school districts to promote best practices and cutting edge curriculum in STEM areas.
- Project Lead the Way engineering education program grants to 79 schools to empower young people to begin career pathways in engineering.
- Wisconsin, through the collaborative efforts of The Department of Public Instruction and the Wisconsin Technical College System, was accepted as one of the first five states in a national project that will be used to attract more girls, students of color, and students with disabilities to the fields of science, technology, engineering, and mathematics (STEM).
- We developed a blueprint to increase the rigor and relevancy of Wisconsin's Model Academic Standards in Mathematics and English/Language Arts at the high school level. This work through the national American Diploma Project and Partnership for 21st Century Skills continues with business and post-secondary representation to align what we expect students to know and be able to do in high school with what will be expected of them in the workforce and post-secondary education.
- We announced new science equivalency options for students in agriculture classes, and we will soon expand student options for science credit in technical education and Project Lead the Way courses. We hope to expand this equivalency option to business courses and mathematics credit.

Additionally, in my 2009-11 biennial budget request I have a significant STEM proposal. It would provide funding to assist high schools and middle schools to conduct state-of-the-art instruction in Science, Technology, Engineering, and Mathematics (STEM). It has four components:

- 1) "STEM Stewardship" \$5,000,000 state bonding (BR) in fiscal year 2011 for capital projects providing technological improvements to STEM classrooms. It would include \$400,000 GPR in FY11 for annual debt service costs;
- 2) Increase the current STEM grant program by \$938,500 GPR (for a total of \$1,000,000 GPR) in fiscal year 2011;
- 3) Establishment of four regional STEM academies to provide intensive training to STEM educators: \$253,000 in fiscal year 2010 and \$1,148,000 in fiscal year 2011; and
- 4) Continue to provide \$250,000 GPR in FY10 and FY11 for annual grants to Project Lead the Way.

STEM education plays a critical role in preparing our students for employment and careers that are central to Wisconsin's economic prosperity and job growth. The department has a number of initiatives that involve STEM education and links that coursework to career guidance and employment.

As a state we have embraced the national Career Clusters & Pathways model for delivering contemporary career and technical education programming. I would like to share more about this important initiative. The Career Clusters model includes 16 broad career clusters and 79 pathways and aligns educational programming, both academic and technical skill training,

around a common set of knowledge and skill statements that have been identified by industry leaders at the national level.

This model is part of a national effort to reform education by providing students with a pathway to careers and expanding opportunities to gain knowledge and skills necessary for success in today's 21st century. As you can see from the handout, there are career clusters and pathways to address all types of occupations.

I'd like to take a minute to just briefly share with you how this Career Pathway is played out for a student interested in Manufacturing. As you look at this sample Program of Study, you will see that this is the result of planning at Kenosha Unified School district and addresses the Manufacturing Production Process Development pathway for students at Lakeview Technology Academy.

As you look at the courses you will see that the first four columns include the academic courses that are recommended for this pathway. The next column includes the Career & Technical Education courses that are central to this pathway. There is also a column to outline other experiences that are helpful for students, including Career and Technical Student organization involvement, or work-based learning.

The final column lists sample occupations related to this pathway so students can see the relevance of their coursework and open their eyes to the numerous possibilities that exist for a career in this area.

This cluster and pathway model requires schools to:

- actively engage business partners and other stakeholders,
- utilize labor market information to determine educational programming and focus on communities' needs. Career and tech education programs must build relevancy for students and focus on workforce realities.
- integrate academic and career and technical education content; as you can see that science and mathematics are clearly important components in the Program of Study examples. and
- align secondary education with post-secondary education so that students can see the importance of their high school experiences and how it's connected to future education and employment opportunities. We are working closely with the technical colleges, both at the state and district levels, as we develop the programs of study and identify relevant course work for students.

In the example I just shared, you can see that the development of this pathway included Gateway Technical College and UW-Stout.

While this is a voluntary program, schools receiving federal Carl Perkins funds are required to use those funds to develop career pathways. Already, 370 of the school districts with high schools are engaged in incorporating career clusters in their career and technical education programs.

And the NGA Policy Academy Wisconsin Workgroup, led by Secretary Gassman, is examining how the Career Clusters could be used by school districts and Workforce Development Boards throughout the state to jointly develop the Education for Employment plans required under State Statute 121.02(1)(m). Under this provision *every school board shall provide access to an education for employment program approved by the state superintendent.*

Work-based learning is an important component of career and technical education and the implementation of a career pathway. Wisconsin's State Certified Cooperative Education Program is designed in partnership with business, industry labor representatives, and educators. The program integrates school-based and work-based learning with appropriate career development experiences.

The program is designed to provide paid work experience for junior and senior high school students which will contribute substantially to their educational and occupational development. Students learn technical tasks and employability skills validated by business and industry representatives in cooperation with high school, technical college, and university instructors.

The student attends school part of the day and works part of the day. A teacher along with the business mentor supervises this arrangement in one of the following areas: Agriculture, Business, Family and Consumer Education, Health Sciences, Marketing and Technology education.

DPI currently administers 17 State Certified Coop Programs, including the Employability Skills and Youth Leadership skill certificate programs. Students involved in certified skills co-op receive high school credit for the work experience and the related school class and a certificate of proficiency in the technical area.

We are currently in the development stage of the Construction State Certified Cooperative Education Program and will pilot this program in six schools this fall. (Those school districts include Appleton, Burlington, Fond du Lac, Marshfield, Milwaukee Public Schools, and Sun Prairie). Some of you may have read the recent article in the Wisconsin State Journal which highlighted this program as a way to get young people involved in this career area.

We are excited about this business and education partnership. The Associated General Contractors (AGC) with the leadership of Bob Barker and Laura Cataldo, has played a critical role in moving this program forward.

As I mentioned, I am participating in the National Governor's Association Policy Academy on State Sector Strategies. Wisconsin is one of six states participating in this project and we are focused on aligning resources and policies to support regional solutions to employer and workforce needs. STEM education is critical to this effort.

We are well aware of the workforce challenges that we face and the urgency with which we must address these concerns in order to maintain our economic competitiveness.

Our education system must emphasize career development and the applicability of STEM coursework. We all know the important role a school counselor can play in a student's decisions and future plans and goals. We also know that placing that responsibility on one individual

cannot adequately address the complex needs of students' academic, personal/social and career needs.

To address this challenge, the Department has recently released the new Wisconsin Comprehensive School Counseling model which focuses on using all resources in the school and community. This model builds upon the important counselor/student relationship, and provides the framework to expand programming and foster conditions within schools to ensure academic, career, and personal development.

Through the counseling model, students take part in systematic standards-based classroom instruction to help them learn about career options, including examining the career clusters and pathways. The individualized learning plan is one specific element in this new counseling model where students can map out an academic plan that reflects their unique interests and learning goals and helps them see career opportunities.

So we have two new models — the career clusters and pathways model and the new school counseling model which align and support students in their academic and career development. Schools throughout Wisconsin must make use of these innovative models if we are going to see success.

Having a rigorous and relevant curriculum is critical to preparing our students for the 21st century. In March of 2007, the PK-16 education leaders convened Wisconsin's Business Summit on Education to identify key skills that today's students need to be successful in work, postsecondary education, and citizenship. The list generated by participants emphasized critical thinking, problem identification and solving, collaborative communication skills, people skills, personal responsibility, ethics, and nimbleness.

Wisconsin joined the American Diploma Project and the Partnership for 21st Century Skills and became the first state to use both organizations to evaluate the rigor and relevance of Wisconsin's Model Academic Standards in English language arts and mathematics. I convened design teams in English and mathematics as well as a leadership team to prepare a blueprint for revising our standards in those two areas.

We are now moving to develop rigorous common core standards that are internationally benchmarked to ensure that students have essential 21st century knowledge and the skills and experience to apply them. By aligning with the feedback from Wisconsin's business community and also with these national projects, we can ensure that our students are prepared to be successful in Wisconsin, as well as nationally and internationally.

We are in discussion with UW System, WAICU, and WTCS to identify the common expectations in English language arts and mathematics for admission to college-level, credit-bearing coursework. Part of this is to identify in our standards the content of mathematics preparation beyond what is required for high school graduation, but that would provide sufficient preparation for entering college credit-bearing coursework. All of these efforts and commitments will serve to build Wisconsin's economy and help to ensure the long-term vibrancy of our state's economic future.

We must use the existing regional economic entities like Milwaukee 7 and New North to strengthen connections between employers and the myriad of education programs in their region. We must use these connections to strengthen the educational programming in our schools, including the areas of STEM education. We are calling on school boards to examine labor market data in their district, CESA, and economic development region and use it to guide programs and career pathway opportunities. We must build the understanding of and commitment to the connection from education to work so that all students are engaged in decisions which will create an economically sustainable adulthood. STEM education has a unique role in building that understanding.

It is the strength of our state's commitment to public education that has fueled our state's economy from day one. It will be a renewal of that commitment that will help us move to a stronger competitive position in the new economy.

Thank you for the opportunity to speak before you today. I would be happy to answer any questions you may have.



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**Testimony of Paul Martell, Technology Education Instructor, Elkhorn Area High School
before the Senate and Assembly Education Committees
on Science, Technology, Engineering, and Mathematics (STEM) Education
February 12, 2009**

Thank you for the invitation to speak today. I am delighted to be here and I'm particularly delighted to speak on behalf of STEM initiatives and, specifically, Project Lead the Way (PLTW) at Elkhorn Area High School.

I believe that these new initiatives being embraced will bring a paradigm shift in education – transforming the 19th century model of public education toward one more appropriate for the students of the 21st century.

I witness and sense the same excitement in the classroom as seen in the 1960's – when JFK brought forth the challenge of space exploration to the nation. Students are becoming more engaged, encouraged to set lofty goals and reach for their dreams while being mentored in the school setting.

Students recognize that the skills emphasized in these classes are the same as those which will allow each student to become successful in other classes as well as their future.

PLTW and STEM courses focus on critical thinking skills. Requiring students to address and implement real solutions to real problems with contemporary technology and applied logic. Students discover these classes as an exciting portal into the world of math and science.

We also engage students in Activity, Project and Problem-Based (APPB) learning experiences which include the following:

- Solve problems
- Participate as part of a team
- Lead teams
- Speak to a public audience
- Conduct research
- Understand real-world impacts
- Analyze data
- Learn outside the classroom

Mary Bell, President
Dan Burkhalter, Executive Director



The fact that students realize the information presented will be used significantly later on is paramount to the successes we witness in our program.

I continue to tell my students "It's not about the amount of knowledge one possesses, but rather how one can and will apply that knowledge."

I also tell them that, "we are more interested in the steps you took to find a solution rather than just getting the answer." "It's Process not Product."

Projects have outcomes that fall within a predictable range, but are still diverse and creative.

In Elkhorn, we acknowledge the importance of changing the perception of Career/Technical Education by instituting department and course offering title change to APPLIED ACADEMICS. As the basis of much of our course offerings address the National and State Standards for Technology, Science, Math and English.

While the Elkhorn Area School District is in the infancy of developing comprehensive offerings in arena of STEM (Science, Technology and Math Collaborations) I believe that we are developing a unique approach to the delivery and expansion of the integration of curriculums to provide students increased opportunities with finding success in their educational endeavors.

Not only do we offer PLTW's *Introduction to Engineering and Design*, we have developed a Math course which accelerates both Algebra/Geometry components so that students who have not entered High School having already taken and passed Algebra in the Middle School, can follow the High School Math curriculum and finish with Calculus prior to graduation preparing those students to be equally prepared to enter high demand post-secondary programming.

Successes that are being witnessed at Elkhorn in the PLTW class and associated with the course offerings:

- 1) Breaking down the Stereotype that Engineering and CTE courses are primarily for:
 - Male students
 - Non-college bound students
- 2) Students gaining a sense of accomplishment – regardless of the grade they receive.
- 3) Students devoting extra time to work in the lab setting, often times choosing over

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other extra-curricular activities. (Many extra credit activities of the students choosing and interests)

- 4) Students teaming up and entering national competitions which are engaging them in the same exploration and processing as that being offered in the class.

Personal Portfolio

Paul W. Martell



Educational Background: Graduated from Cudahy Senior High School - 1978

Received both BS and MS in Industrial/Technology Education from the University of Wisconsin-Stout

50+ credits beyond the Masters Degree focused on Technology, the Impacts of Technology and Educational Issues.

Certified Project Lead the Way Instructor - MSOE

Teaching Experience: 26 Years of Teaching at Elkhorn Area High School in the Technology Education Department.

- Introduced and implemented a Graphic Arts/ Printing Curriculum
- Introduced and implemented a Building Construction/Trades Curriculum which included both community programs and district projects.
- Researched, Planned, and established a Modular Training Laboratory.
- Established a joint venture with a local builder and the local building association to have students build a Spec Home as a class project.
- Introduced and Initiated the PLTW program into Elkhorn Area School District.

Professional Affiliations:

- Member of the Wisconsin Technology Education Association
- Past Vice President of the Elkhorn Police and Fire Commission
- Current Lead Negotiator and Grievance Chairperson for the Elkhorn Education Association
- Local representative of the EEA to the Southern Lakes United Educators



program leading to a DPI certificate as a *Child Care Teacher (CCT)*. Students with an *ACCT* certificate may work in a child care facility beginning at age 17. Without this certificate, individuals are prohibited from working as an *ACCT* prior to age 18.

On-Line Registration

Each school must register separately for each of the above programs. The website is as follows: dpi.wi.gov/cte/cteskills.html

The online registration walks you through the registration process, and once completed you will receive confirmation that the registration has been received. To register a program and/or to enter the student roster, select the "Registrations" link. **Please follow these steps in this order:**

1. Preview Program Assurances*
2. Register Program
3. Register Students

**Only district administrator or school principal is authorized to complete. (Assurances must be done before registrations will be accepted.)*

If registrations are incomplete, the program is not considered a registered, state-approved program. Please submit first semester registrations by **October 31st** and second semester registrations by **March 1st**. All programs must be renewed annually.

Rosters

Complete the student roster after the program(s) is registered. Verification of entry of students can be achieved by previewing the roster online.

Portfolios

Portfolios are available online and can be downloaded. **Do not** mail completed portfolios back to this office. Students should retain the completed portfolios.

Program Completion

In order to obtain a certificate for the completer(s) of the program, you must complete the final step in the online process. Select "Final Evaluations" and then select the "Program Completion" link.

To successfully complete the *Cooperative Education Skill Standards Certificate* or the *Employability Skills Standards Certificate* program, a student must achieve the "minimum required" number of competencies at a level 2 or 3 in each competency area listed.

A certificate will be mailed from this office to the high school for each student who has successfully completed the program.

For additional information, contact the appropriate member of the Career and Technical Education Team:

Sara Baird, Education Consultant, Marketing Education/DECA sara.baird@dpi.wi.gov	608-267-9253
Janice Atkinson, Education Consultant, Health Science/HOSA	608-266-2347
Janice.atkinson@dpi.wi.gov Marilyn Bachim, Office Operations Assoc., Employability Skills	608-267-2274
marilyn.bachim@dpi.wi.gov Cheryl Bowes, Office Operations Assoc. ACCT & Infant Toddler	608-267-2280
cheryl.bowes@dpi.wi.gov Jeff Hicken, Education Consultant, Agriculture & Natural Resources Ed/FFA	608-267-9255
jeffrey.hicken@dpi.wi.gov Brent Kindred, Education Consultant, Technology & Engineering Ed/SkillsUSA	608-266-2683
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diane.ryberg@dpi.wi.gov Jennifer Wegner, Education Consultant, Business and Information Technology Education/FBLA	608-266-2348
jennifer.wegner@dpi.wi.gov <i>Vacant</i> , Education Consultant, Cooperative Skill Standards Admin.	

Career and Technical Education Team
WI Department of Public Instruction
PO Box 7841
Madison, WI 53707-7841
(608) 267-3161 or 1-800-441-4563
Website: dpi.wi.gov/cte/cteskills.html



Wisconsin

Skill Standards

Certificate

Programs

—Quick Reference Guide—

Elizabeth Burmaster
State Superintendent



Wisconsin Skill Standards Certificate Programs

The Career and Technical Education Team sponsors the following programs:

- *Wisconsin Cooperative Education Skill Standards Certificate Program*
- *Wisconsin Employability Skills Standards Certificate Program*
- *Assistant Child Care Teachers Program (ACCT) and Infant Toddler Program*
- *Youth Leadership Skill Standards Certificate Program*

Program guidelines and information are located on the CTE website.

For confidentiality reasons, a user id and password are required. Please contact individuals listed at the end of this document for this information.

Annual renewal of programs are required. Program assurances need to be reviewed and validated by the administrator annually.

Co-op Skills Standards Certificate

Approved sites will build the program around the following:

- State-approved, industry-based competencies
- Two semesters (year long) of related classroom instruction integrating employability skills
- Paid work experience under the supervision of a workplace mentor for an average of 15 hours per week (minimum of 480 hours total)
- Career planning and placement based on student career goals and abilities, and
- Successful completion (proficiency rating of 3 or 2) of at least 90% of the competencies from each area listed on the student portfolio.

A student will work an average of 15 hours per week in order to experience the whole cycle of a work week. Continuous employment of the student for a minimum of 480 hours is required for exposure to all aspects of the business or industry.

If a student in the program is a junior and has not met the minimum requirements by the end of the school

year, the student may continue where they left off during the senior year. Seniors that have not met the minimum requirements by the end of the school year can continue working in the program to achieve the required competencies through the summer, up until the start of the next school year.

The teacher coordinator must be DPI-certified (vocationally licensed) in the content area of the program and be trained in methods of cooperative education.

Each approved teacher coordinator shall be assigned a sufficient amount of time during the daily schedule to supervise and coordinate the program; i.e., one full class period of coordination time per day per 12 students or 20 minutes per student per week. In addition, it is recommended that teacher coordinators have extended contracts of at least one week to aid in developing new work sites and related program improvement work.

The following lists the certificate areas:

- Agriculture
 - Agribusiness-Animal Systems
 - Agribusiness-Plant Systems
- Business
- Electronics
- Family and Consumer Education
 - Child Services
 - Family and Community Services
 - Food Service
- Health Science Occupations
- Marketing
 - E-Commerce
 - Entrepreneurship
 - Advanced Marketing
 - Marketing
 - Professional Sales
 - Retail Management
 - Sports and Entertainment

Employability Skills Standards Certificate

This program will consist of the following required components:

- SCANS Skills
- A school-supervised work-based learning experience, and
- A career plan

A DPI-licensed teacher serves as the supervising teacher for the program in accordance with all program requirements.

Students age 14 and above are eligible to participate in the program.

The minimum number of work hours required of students is 180 hours.

The program can be completed over the course of a quarter, semester, summer, and year long or longer.

Youth Leadership Skill Standards Certificate

This program consists of any content area with skills related to:

1. Self management
2. Communication and critical-creative thinking and skills: listening, reading, speaking, writing, and observation
3. Information, media, technology
4. Interpersonal, conflict management, democratic organizational and small group skills
5. Ethical principles and behaviors
6. Democratic discussion and problem-solving; reasoned action skills.

The related classroom instruction requires youth leadership development in school, work, and community settings.

A licensed teacher serves as the supervising teacher for the program in accordance with all program requirements.

Assistant Child Care Teacher (ACCT) Certificate

To receive certification as an *Assistant Child Care Teacher (ACCT)*, students must successfully complete a semester child development or parenting course as sophomores or juniors; enroll in a DPI approved *ACCT* course taught by a teacher vocationally certified in child services; and obtain a DPI-issued *ACCT* certificate. An add-on certification in Infant Toddler can be obtained as well. Additional coursework and hours need to be documented. Only ACCT recipients can obtain this add-on certification. The student may enroll in a *Cooperative Education Skill Standards Certificate*





Key Directions in Higher Education for Enhancing STEM Capacity in K-12 Education and the Wisconsin Workforce

I. Undergraduate Research Experiences

- a. Outcomes include:
 - i. Scientific thinking.
 - ii. Confidence in ability to create knowledge.
 - iii. Ability to teach K-12 STEM as an authentic and exciting process as well as a body of knowledge.
- b. Requirement – Enhanced math skills as first-year college students.
<http://www.achieve.org/node/1008>

II. Alignment of Faculty Development with State and National Goals

- a. Outcomes include:
 - i. Enhanced STEM learning for all.
 - ii. Enhanced success of more diverse student populations.
 - iii. Promotion of STEM-based careers, including K-12 teaching.
- b. Requirement – Modified higher ed reward system; alignment with K-12.

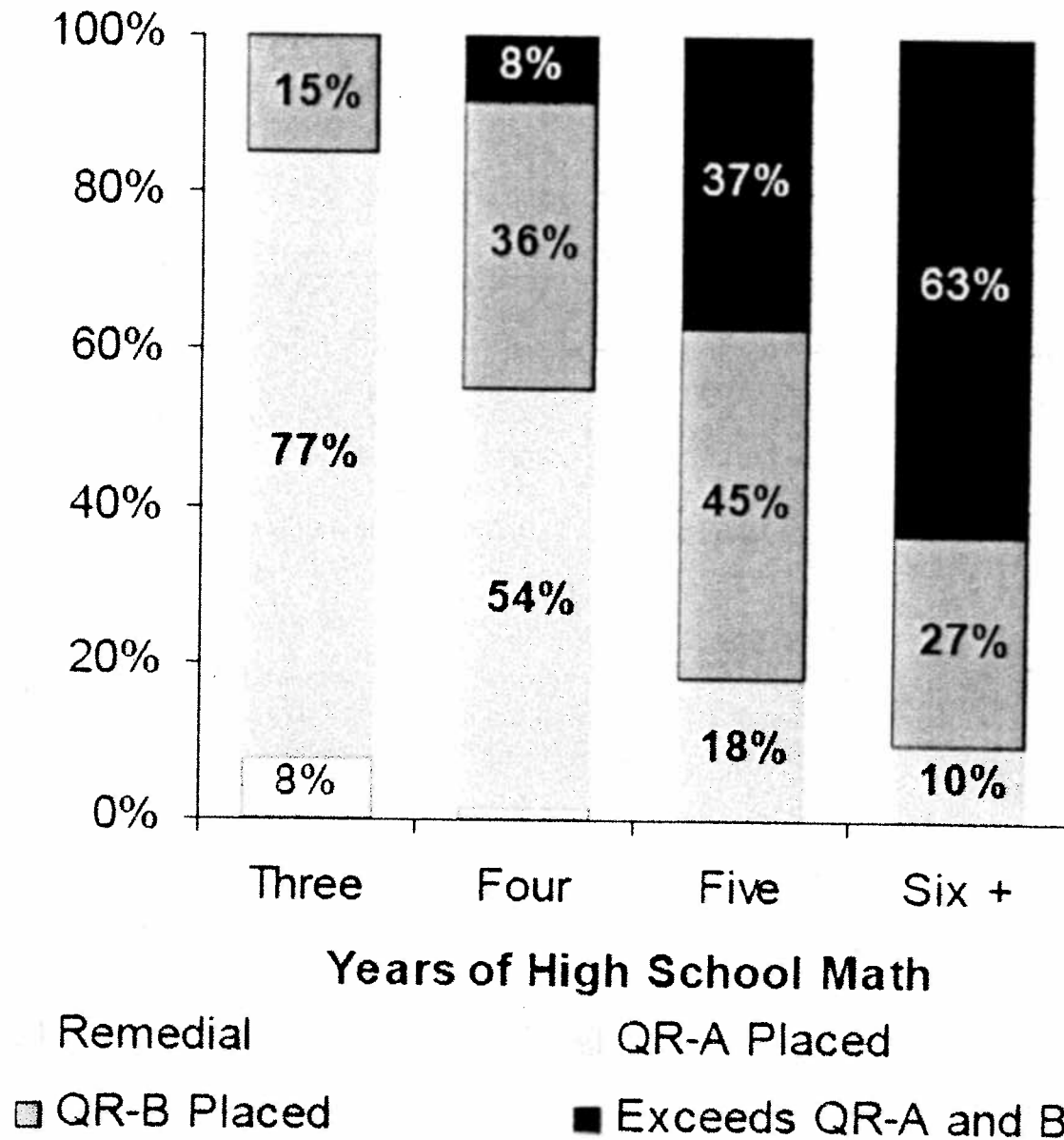
III. Engagement of Undergraduates in STEM Solutions for State Challenges

- a. Outcomes include:
 - i. Recognition of meaningful outcomes of STEM careers.
 - ii. Enhancement of quality of life in Wisconsin.
<http://www.engr.wisc.edu/news/headlines/2009/Feb02.html>
 - iii. Enhanced ability in K-12 to teach STEM as a meaningful career.
<http://www.21stcenturyskills.org/>
- b. Requirement – Enhanced math- and science-confidence in first-year students.

IV. Association of STEM Education with Liberal Education

- i. An integrated approach to enhancing Wisconsin, including STEM

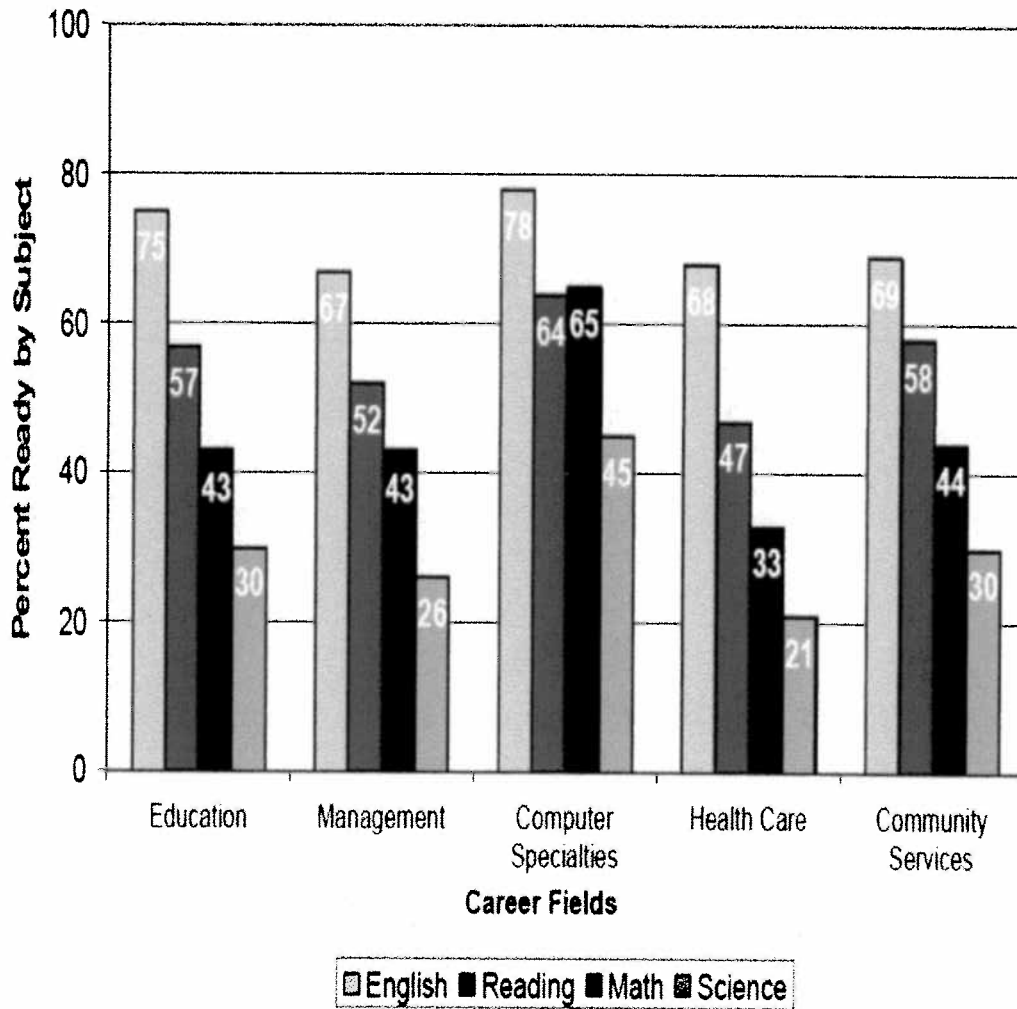
Chart 4
Relationship between Math Placement Level and Years of High School Math



Satisfying Quantitative Reasoning A and B are graduation requirements from UW-Madison. Being placed in QR-A represents placement with the minimum expected skills at admission.

From *The Math Transition to UW-Madison for New Freshman Students*, December 2008

Figure 2: ACT College Readiness Benchmark Performance of Wisconsin High School Students Interested in High Growth Wisconsin Career Fields by Subject³



³Based on 2008 ACT-tested Wisconsin students ($n = 25,884$) with valid subject scores and career information.



Key Directions in Higher Education for Enhancing STEM Capacity in K-12 Education and the Wisconsin Workforce

- I. **Background: Recent Transitions in K-12 STEM Education (specific to science)**
 - a. NCLB
 - i. Standards-based instruction for both content and teaching
i.e. science as a way of knowing and inquiry-based instruction
versus science as a body of facts and teaching standards
 - b. Accountability measures for NCLB
 - i. Reading and Math—science became a second class citizen
 - ii. Disconnect between test and standards
 - c. Changes in professional development (PD) funding
 - i. Demise of federal funds (Eisenhower)
 - ii. Change in National Science Foundation policies regarding K-12 teacher PD programs
- II. **Disconnect with Funding Opportunities for IHE-K-12 Collaborations**
 - a. IHE success is grant driven
 - i. Systemic changes in large systems often requires years
 - ii. Collaborations are established and then the grant ends and typically the IHE moves on to a new initiative
 - b. IHE state budget constraints limit ability of IHE to partner with K-12 without an external funding source
- III. **K-12 Science Education Leadership Challenge**
 - a. Wisconsin has a history of exemplary leadership statewide and nationally in science education but growing lack of leadership at the “junior” level in K-12
- IV. **Mutually Beneficial Relationships Through IHE-K-12 Partnerships**
 - a. What can the IHEs offer K-12 community?
 - b. What can K-12 offer IHEs?
- V. **Big Picture**
 - a. Challenges of K-16 reform are in 4 domains: elementary, middle school, high school, and undergraduate
 - b. Challenges are very similar in all 4 domains—to create a more student-centered, inquiry-based instructional method
 - c. Engaging and effective science instruction for ALL students
 - d. Is the goal of developing scientifically literate citizens as well as an effective workforce in Wisconsin desirable?

Too much emphasis on content, rather than thinking skills & process



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State of Wisconsin Department of Public Instruction

Elizabeth Burmaster, State Superintendent

Sixteen Career Clusters and Their Pathways

Agriculture, Food and Natural Resources

Agribusiness Systems
Animal Systems
Environmental Service Systems
Food Products and Processing Systems
Natural Resources Systems
Plant Systems
Power, Structural and Technical Systems

Architecture and Construction

Construction
Design/Pre-Construction
Maintenance/Operations

Arts, Audio/Video Technology and Communications

Audio and Video Technology and Film
Journalism and Broadcasting
Performing Arts
Printing Technology
Telecommunications
Visual Arts

Business Management and Administration

Administrative Support
Business Information Management
General Management
Human Resources Management
Operations Management

Education and Training

Administration and Administrative Support
Professional Support Services
Teaching/Training

Finance

Accounting
Banking Services
Business Finance
Insurance
Securities and Investments

Government and Public Administration

Foreign Service
Governance
National Security
Planning
Public Management and Administration
Regulation
Revenue and Taxation

Health Science

Biotechnology Research and Development
Diagnostic Services
Health Informatics
Support Services
Therapeutic Services

Hospitality and Tourism

Lodging
Recreation, Amusements and Attractions
Restaurants and Food/Beverage Services
Travel and Tourism

Human Services

Consumer Services
Counseling and Mental Health Services
Early Childhood Development and Services
Family and Community Services
Personal Care Services

Information Technology

Information Support and Services
Network Systems
Programming and Software Development
Web and Digital Communications

Law, Public Safety, Corrections and Security

Correction Services
Emergency and Fire Management Services
Law Enforcement Services
Legal Services
Security and Protective Services

Manufacturing

Health, Safety and Environmental Assurance
Logistics and Inventory Control
Maintenance, Installation and Repair
Manufacturing Production Process Development
Production
Quality Assurance

Marketing

Marketing Communications
Marketing Management
Marketing Research
Merchandising
Professional Sales

Science, Technology, Engineering and Mathematics

Engineering and Technology
Science and Math

Transportation, Distribution and Logistics

Facility and Mobile Equipment Maintenance
Health, Safety and Environmental Management
Logistics Planning and Management Services
Sales and Service
Transportation Operations
Transportation Systems/Infrastructure Planning,
Management, and Regulation
Warehousing and Distribution Center Operations

A QUALITY
EDUCATION
FOR
EVERY
CHILD



State of Wisconsin Department of Public Instruction

Elizabeth Burmaster, State Superintendent

Sixteen Career Clusters and Their Pathways

*Pathways under development as identified by school districts in
Carl Perkins grant applications for the 2008-09 school year*

Career Cluster	Pathways	School District Count
#1. Agriculture, Food & Natural Resources	Agribusiness Systems	17
	Animal Systems	93
	Environmental Service Systems	11
	Food Products & Processing Systems	44
	Natural Resources Systems	26
	Plant Systems	97
	Power, Structural and Technical Systems	14
	Total Schools.....302	
#2. Architecture and Construction	Audio and Video Technology and Film	1
	Construction	170
	Design/Pre-Construction	55
	Maintenance/Operations	6
	Printing Technology	1
	Total Schools233	
#3. Arts, A/V Technology and Communications	Audio and Video Technology and Film	15
	Journalism and Broadcasting	6
	Performing Arts	1
	Printing Technology	33
	Telecommunications	4
	Visual Arts	23
	Total Schools.....82	
#4. Business Management and Administration	Administrative and Information Support	48
	Business Analysis	4
	Business Financial Management and Accounting	174
	Human Resources	5
	Management	39
	Marketing	34
	Total Schools.....304	
#5. Education and Training	Administration and Administrative Support	6
	Professional Support Services	2
	Teaching/Training	20
	Total Schools.....28	
#6. Finance	Banking and Related Services	22
	Business Financial Management	11
	Financial and Investment Planning	37
	Insurance Services	2
	Total Schools.....72	
#7. Government and Public Administration	Governance	1
	Planning	1
	Total Schools.....2	

Sixteen Career Clusters and Their Pathways

*Pathways under development as identified by school districts in
Carl Perkins grant applications for the 2008-09 school year*

Career Cluster	Pathways	School District Count
#8. Health Science	Biotechnology Research and Development.....	3
	Diagnostic Services.....	8
	Health Informatics.....	6
	Support Services.....	11
	Therapeutic Services.....	71
	Total Schools.....	99
#9. Hospitality and Tourism	Lodging.....	7
	Recreation, Amusements and Attractions.....	2
	Restaurants and Food/Beverage Services.....	165
	Travel and Tourism.....	4
Total Schools.....	178	
#10. Human Services	Consumer Services.....	3
	Counseling and Mental Health Services.....	3
	Early Childhood Development and Services.....	87
	Family and Community Services.....	29
	Personal Care Services.....	3
Total Schools.....	125	
#11. Information Technology	Information Support and Services.....	35
	Interactive Media.....	24
	Network Systems.....	8
	Programming and Software Development.....	6
Total Schools.....	73	
#12. Law, Public Safety, Corrections and Security	Emergency and Fire Management Services.....	1
	Law Enforcement Services.....	1
Total Schools.....	2	
#13. Manufacturing	Health, Safety and Environmental Assurances.....	3
	Logistics and Inventory Control.....	3
	Maintenance, Installation and Repair.....	6
	Manufacturing Production Process Development.....	57
	Production.....	104
Quality Assurance.....	4	
Total Schools.....	177	
#14. Marketing, Sales and Service	Buying and Merchandising.....	6
	Distribution and Logistics.....	1
	E-Marketing.....	3
	Management and Entrepreneurship.....	25
	Marketing Communications and Promotion.....	14
	Marketing Information Management and Research.....	3
Professional Sales and Marketing.....	50	
Total Schools.....	102	
#15. Science, Technology, Engineering and Math	Engineering and Technology.....	112
	Science and Math.....	8
Total Schools.....	120	
#16. Transportation, Distribution and Logistics	Facility and Mobile Equipment Maintenance.....	35
	Health, Safety and Environmental Management.....	1
	Sales and Service.....	9
	Transportation Operations.....	23
	Transportation Systems/Infrastructure Planning, Management, and Regulation.....	8
Warehousing and Distribution Center Operations.....	3	
Total Schools.....	79	



District Kenosha Unified
 High School LakeView Technology Academy
 Career Cluster Manufacturing
 Pathway Manufacturing Production Process Development



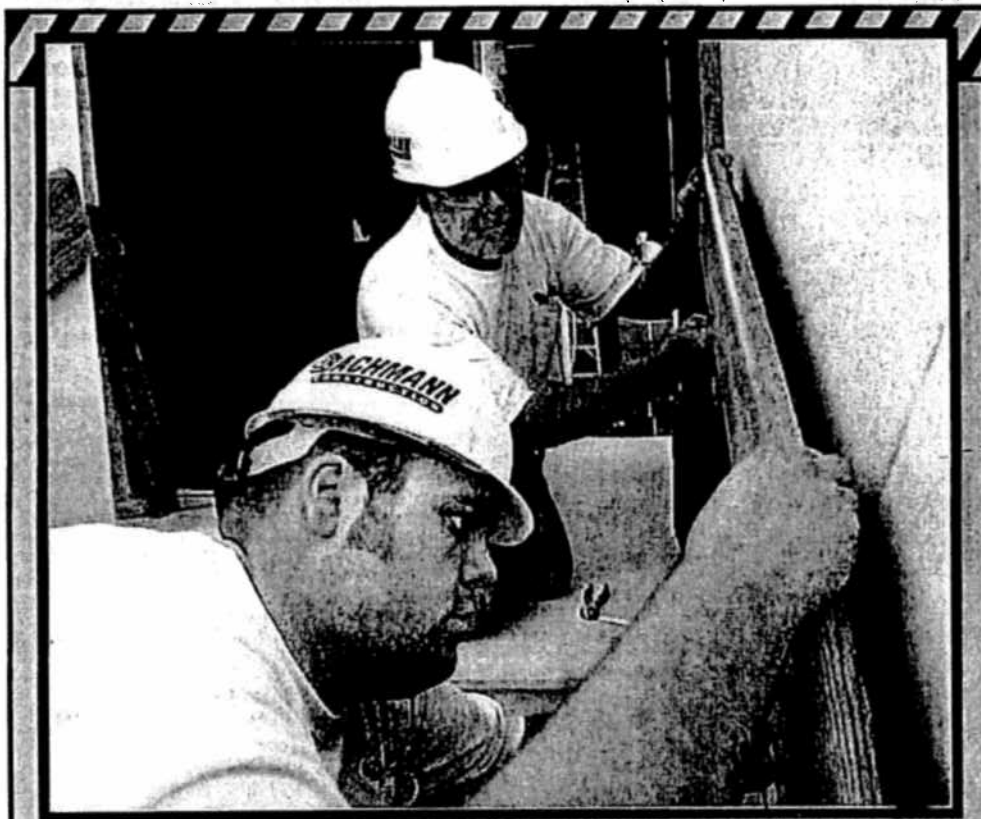
Program of Study Plan

This Program of Study Plan should serve as a guide in the development of a secondary/post-secondary pathway for a secondary Perkins funding application. Courses listed within this plan are only recommended and are indicative of the courses needed to complete a pathway.

EDUCATION LEVEL	GRADE	English/Language Arts	Math	Science	Social Studies/ Sciences	Career and Technical Courses Central to this Pathway	Other Career and Technical Education Courses, Electives, and Student Organizations Related to the Pathway	SAMPLE Occupations Related to This Pathway
SECONDARY								
Career Interest Inventory Administered and Program of Study Initiated for all Learners.								
9	Communications 9	Algebra 1A Algebra 1B	Integrated Science	U.S. History	Technology Systems 1 Technology Systems 2			
10	Communications 10	Geometry	Geology	World History	Fundamentals of Engineering / Manufacturing I		Skills USA Youth Apprenticeship Program First Robotics	Production Assembler Combustion Welder Electrical Appliance Servicer Electric Motor Technician Quality Control Technician Tool & Die Maker Communications Operations Manager Occupational Health & Safety Inspector Production Supervisor
11	Communications 11	Algebra 2	Geology	US Government & Politics, Economics, World Geography	Computer Aided Design - Beginning Metrology - Applied Measurement - Metrology - GD&T CAD Intermediate CAD Solids Mechanical Skills for Technicians			
College Placement Assessments-Academic/Career Advisement Provided (ACT, SAT, etc.)								
12	Communications 12	Trigonometry, Probability & Statistics, Math Analysis	Conceptual Physics	American Society, Psychology, Sociology	CNC/CAM Programming Comp Assisted Program / Robotics & FMS DC/AC I			
GenEd Courses								
13	801-195 Written Communications	804-113 College Tech Math 1A	806-154 General Physics	809-196 Intro to Soc	612-102 Pneumatics/Hydraulics 620-111 Intro to Solid State Circuits 623-189 Metrology			
14	801-197 Tech Reporting	804-114 College Tech Math 1B	809-198 Intro to Psych	890-103 Employability Skills	620-110 Robotics/Mechanics 620-140 Programmable Controllers 620- 120 Feedback & Cont Sys 628-112 Adv. Comp Aided Manuf 628-114 MSSC Cert. & Assess			
Courses Related to Major or Minor								
15	ENGL 102 - English Reading & Writing	MATH 120 - College Algebra or higher		ECON 201 or 210	Technology / General Education (2)			
16		STAT 130 - Elementary Statistics	Health & Wellness - (2 cr)	Humanities / Arts Electives (9 cr)	Concentrations - Industrial Management			
POST-SECONDARY								

Advanced Placement = AP, Dual/Transcripted Credit = D/T/C, Youth Options = YO

Pathway-Manufacturing-Production-Process-Devices



JOSEPH W. JACKSON III - State Journal

Dave Wirth, 57, and his son, Derek, 26, both are carpenters for Bachmann Construction Co. in Madison. The construction industry is emphasizing the need to recruit and train younger workers to take the place of skilled trades people who will be retiring.

WORKERS NEEDED

Retiring baby boomers will leave shortage of skilled trades people

By MARK CRAWFORD
For the State Journal

Despite a sluggish overall economy, Wisconsin's construction industry still has plenty of projects to keep it busy.

But what if there aren't enough experienced workers to tackle all the projects? Worker shortages can lead to project delays, higher costs, quality or safety problems and reduced profits.

"The generation gap is creating a knowledge problem with the current work force," said Kelly Hafeman, president of Howard Immel Construction in Green Bay. "There are fewer people joining the trades, and the ones who are coming in are younger and not as experienced. Worker shortages usually occur during the busiest times of the year. If you don't get ahead of the hiring game, you may be stuck with employees who don't fully know their jobs and require more training."

Experienced trades workers are in high demand. Some of them, especially laborers, welders and pipe fitters, are also being courted away from the construction industry by big oil and gas transmission projects in the state, as well as alternative-energy facilities, creating even more shortages.

There aren't enough new workers coming into the trades to eventually replace those who will retire.

Solid growth

Even with the unsteadiness of the economy, the construction industry in Wisconsin expects to see solid growth. According to Industrial Information Resources, Wisconsin is one of the top states for industrial and commercial construction in 2008, with 167 projects totaling more than \$14.6 billion.

Associated General Contractors of Wis-

Please see **WORKERS**, Page C4

CONSTRUCTION CAREERS

Average annual salary/benefits:

Accountant	\$61,514
Architect	\$72,787
Business development manager	\$53,889
CFO/controller	\$113,677
Chief estimator	\$123,311
Estimator	\$63,876
Field foreman	\$69,018
Network administrator	\$68,274
Project manager	\$69,800
Project manager -- entry level	\$41,000
Safety director	\$71,968
Superintendent	\$82,990
Trainer	\$73,713
Carpenter	\$68,477
Construction manager	\$64,815
Electrician	\$77,406
General contractor	\$71,571
Operating engineer	\$80,514
Plumber	\$77,356
Sheet metal worker	\$75,975

SOURCE: AEC of Wisconsin

Workers

Continued from Page C1

consin (AGC), a trade organization, expects construction to reach double-digit growth in the state over the next several years.

Wisconsin Department of Workforce Development (DWD) numbers back up that prediction. Some of the hottest current jobs in south-central Wisconsin are in construction. Cement masons and concrete finishers lead the way with projected job growth of 24 percent from 2004-2014, followed by plumbers and pipe fitters (21 percent), carpenters (20 percent), supervisors and managers (19 percent) and electricians (18 percent).

"These are high-paying jobs with plenty of openings," said Richard Jones, agency liaison for the DWD. "For example, carpenters are eighth on the top-25 job list with a projected 7,000 openings by 2016. The median hourly wage is nearly \$17.60, with an annual salary of almost \$36,600 (not including benefits)." The list also includes electricians, welders, plumbers and pipe fitters.

Changing of the guard

Retiring baby boomers are creating staff shortages in many industries. This is especially true in construction, where workers tend to retire earlier because of the wear and tear on their bodies. The average age for most trades people is about 46.

For welders, the average age is 50; according to Sean Moran, director for American Welding Society's District 12 in Wisconsin. Almost half of all welders are nearing retirement. "Right now there is at least a 35 percent shortfall of new workers coming in to replace retiring welders — that's a huge gap," said Moran.

That gap is similar for other trades. "First-line supervisors, skilled carpenters, cement finishers, masons and steelworkers are all in high demand," said Hafeman.

One reason for the gap is that high school students tend to be directed toward college by parents and teachers.

"The construction industry and related professions have an image problem with high school administrators, teachers, guidance counselors, students and parents," said Laura Cataldo, marketing director for AGC.

"Teachers tend to encourage at-risk students toward the trades and guidance counselors generally don't encourage

good students to consider construction. We're working hard to let these groups know how challenging, rewarding and high-paying construction careers are — and not just the trades, but for all career paths, including a four-year degree from universities."

Ken Starkman, dean of construction, manufacturing, apprenticeship and transportation at Madison Area Technical College, indicated enrollment has increased in the college's construction programs. "Projections by our apprenticeship advisory committee show we'll have to keep increasing the numbers of new trainees to meet the industry demand," he said.

"So far, I haven't seen a lack of qualified tradesmen in Madison, but there is definitely a heightened awareness of the situation," added Dave Beck-Engel, executive vice president for J.H. Findorff and Son in Madison. "Fortunately, spikes in demand have been short-lived. The unions are very good at finding us qualified labor."

Marketing to youth

MATC presents construction seminars at high schools and designs articulation agreements that align high school coursework with MATC programs to provide a seamless transition when students enroll in college.

To create construction work experiences at the high school level, AGC has committed \$75,000 to pilot a construction skills certificate program with the Department of Public Instruction in seven high schools in September. The program provides paid school-to-work experience for juniors and seniors who are interested in construction. "The students attend school part of the day and work part of the day, including summer employment," said Cataldo. "They receive a well-rounded understanding of the work opportunities available, including skilled trades, technical college and university career paths."

AGC has also hired Kennedy Communications to do a campaign to improve the image of the construction industry and educate students about construction careers. The campaign includes establishing a social media presence on Facebook and MySpace and creating a scholarship contest, where students compete by participating in an online construction game.

The American Welding Society is also getting creative in marketing to students. Its

32-page book "Your Career in Welding" is being promoted via a comic book produced by the society and Marvel Comics featuring Iron Man, the superhero in the blockbuster movie by the same name.

The North-Central States Regional Council of Carpenters in Madison has been actively recruiting members through school presentations and advertisements on television and radio. "Our apprenticeship programs have been growing about five to 10 percent a year, a direct result of our marketing efforts," said Tom Benish, the union's business representative. "We have also built a new training center."

Individual companies are also proactive in creating workers for the future.

Bachmann Construction Co. in Madison hosts a golf outing every year that raises money for scholarships for high school students interested in exploring the trades. "Our founder, Fred Bachmann Sr., was very passionate about young people getting involved

in the construction business," said Jan Daggett, human resources director for the company. "The students use the funds for books, tools or tuition and we can then hire them after they graduate."

The construction industry will continue to partner with industry associations, high schools, and training institutes to recruit new workers, as well as conduct more internal training to keep the ones they have.

"We invest heavily in training," indicated Mark McNally, CEO of Bachmann Construction Co. "Today, to be successful, tradesmen need to be more than just talented with tools — they need to understand communication, technology and business practices. This in-depth training creates more energy and enthusiasm and broadens the career paths they can follow.

"Having fulfilling, financially satisfying careers also creates long-term, loyal employees — a definite advantage in a competitive industry."

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Educating a Tech-Savvy Workforce

February 12, 2009
Assembly and Senate Committees on Education
Madison, WI


What we'll discuss today:

- Why it's important to build a competitive workforce in Wisconsin
- Some best practices in and outside of Wisconsin helping to build that workforce
- How you can get involved close to home

What is STEM?

STEM is **not** about stem cells
STEM is an acronym for...

Science
Technology
Engineering
Math



Examples: STEM education, STEM degrees, STEM fields

Why is STEM important to you?

- Competing in the global market
- Maintaining national security
- Enhancing and protecting our quality of life
- Creating the right workforce for today's and tomorrow's "knowledge-based economy"
- Keeping your community competitive in an ever-changing world

Global competitiveness

- Slow but serious U.S. decline in graduates with STEM degrees; 3rd per capita in the world in 1975 and about 17th today
- Emerging economies (China and India) producing far more STEM graduates, by any definition
- 62% of doctoral degrees in engineering went to foreign nationals in 2006
- We're in danger of losing our edge in innovation unless the STEM pipeline is replenished

National security

- National security begins with economic security
- If our innovation edge is dulled, and our manufacturing expertise exported, we become more dependent on others
- Unfavorable balance in exports and imports (trade deficit) for decades - \$760B in 2006
- The U.S. is exporting its long-term defense security as we export or outsourcing our manufacturing and R&D base

Quality of life

- Protecting and enhancing our quality of life rests on creating high-wage jobs, keeping our best and brightest at home, and fostering an economy that is constantly renewing itself

Per capita income

- Wisconsin is below the national average
- Personal per capita income:
 - MN \$41,000
 - IL \$40,900
 - National average \$38,600
 - WI \$36,200
- Meeting the national average would yield \$13B in personal income and \$432M in additional in-state tax revenue

Brain Drain

- Wisconsin ranks high for bachelor's degrees produced (15th)
- Number of people 25-plus with bachelors degrees in Wisconsin (1989-2007) - 377,000
- Wisconsin colleges and universities awarded 506,000 bachelor's degrees
- Net loss of about 129,000 people with degrees
- Wisconsin is among the bottom 10 states in the net attraction of people with bachelor's degrees


Sources: Postsecondary Education OPPORTUNITY Report

Jobs

- Old skills to new skills
 - Since the 1980s the trends have changed for skills used at work, from manual labor to creative, analytical thinking and interactive work
 - It's not your father's factory: Today's manufacturing sector worker is also a **technology worker, member of a team and a problem-solver**
- High growth sectors are high-tech sectors
 - Healthcare delivery, biotech, medical devices, IT, nanotech, bioproducts
- Industry timeline
 - 19th Century – Agriculture Economy
 - 20th Century – Manufacturing Economy
 - 21st Century – Innovation Economy


STEM in Wisconsin

- K-12**
 - Gov. Doyle's initiative for a mandatory three years of math and science
 - STEM programs in many Wis. schools but not all
 - Improvement needed in the competency, quantity and diversity of K-12 students




STEM in Wisconsin

- Higher ed**
 - Public and private collaboration on research and curriculum development
 - Tech colleges
 - Offer college credit for participation in HS STEM programs
 - 300 career programs
 - UW System schools
 - Increased number of programs with industrial applications
 - Programs and research projects at each campus related to various STEM notches




List of STEM programs



<p>Global</p> <ul style="list-style-type: none"> For Inspiration and Recognition of Science and Technology (FIRST): Robotics Competition, Tech Challenge, Lego League VEX Robotics <p>National</p> <ul style="list-style-type: none"> Project Lead the Way The Infinity Project 	<p>National</p> <ul style="list-style-type: none"> National Consortium for Specialized Secondary Schools of Mathematics, Science and Technology <p>State-wide</p> <ul style="list-style-type: none"> Badger State Science & Engineering Fair Science Olympiad <p>See the resource guide for program details</p>
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Project Lead the Way



Students test electrical resistance in one of PLTW's Engineering classes

- Prepares middle and high school students for careers in engineering and technology
- Course topics include: the science of technology, the magic of electrons, computer manufacturing, bioengineering, aerospace, and others
- 250,000+ plus middle and high school students, in 2,300 schools nationwide
- 73% enter engineering or tech programs, 80% earn degree

Project Lead the Way in Wisconsin



Students test a blood pressure monitor made in one of PLTW's Biomedical Science classes

- 102 high schools
- 60 middle schools
- 15,000-plus students
- Since 1994 with support from Kern Family Foundation
- 4th in the country in number of students

Wisconsin – Designing High Schools for Success


A 90% goal of students ready for the 21st century workplace: higher education, active civic participation & life long learning

Source: Wisconsin Department of Instruction Website

Common myths

- 'Money is the only way that business can support schools'
- Internships
- Job shadowing opportunities
- Bring in educators
- Go out to schools
- 'Takes too much time'
- 'School systems want to be left alone'

What can you do?



Workforce development, economic development and K-12 education are interrelated and interdependent

- Help establish or give to existing STEM programs in your schools
 - Financially or in-kind services – provide space, loan workers, tours, speaking engagement
 - Support programs that make sense for your business – PLTW, robotics competition, etc.
- Be an active voice in your community

One question...

What are the workforce needs of your region?

What are the workforce needs of your region?

• What are the workforce needs of your region?

- Contact us: Jack Heinemann | Ryan Pett-Friere
- Wisconsin Technology Council
- Wisconsin Security Research Consortium
- Online: www.wisconsinsecurity.org
- Phone: 608-442-7557
- Mail: 455 Science Dr | Madison, WI 53711

