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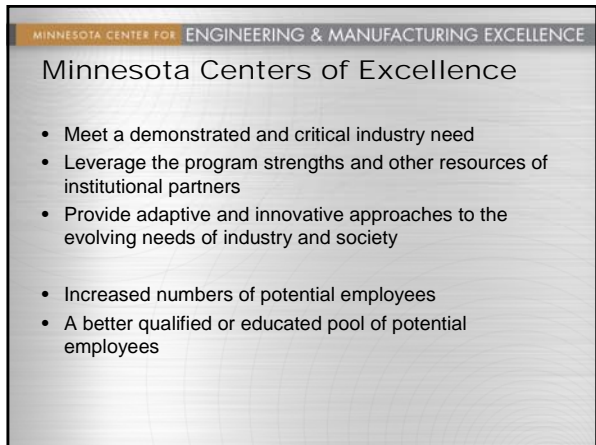
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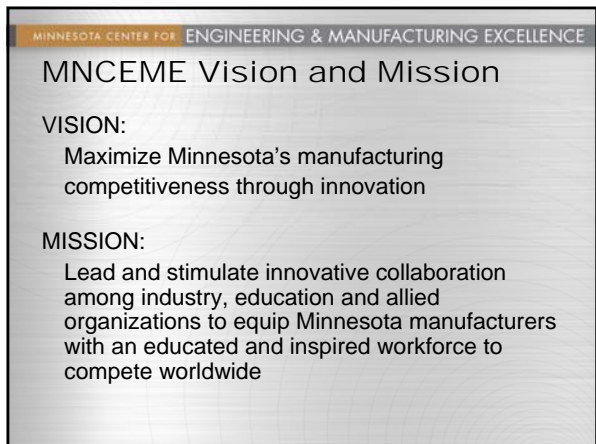
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## MNCEME Goals

- Lead collaborative efforts to increase talent development across the full spectrum of people pursuing or employed in STEM career paths
- Assist industry in meeting critical technical needs of the 21<sup>st</sup> century

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## Critical Issues for the 21<sup>st</sup> Century

<b>Demographic Changes</b> Population Education Food Poverty Disease	<b>Globalization</b> Democracy
<b>Natural Resource Management</b> Energy Water Environment	<b>Infrastructure</b> Transportation Communication
	<b>Security</b> Terrorism and War
	<b>Breakthrough Technologies</b>

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*Environmental issues are emotional*

*Environmental decisions are political*

*Environmental solutions are technical*

Joe Ling, 3M

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## Scientists and Engineers

Scientists discover what is ...

Engineers create what has never been

Theodore von Karman

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## Obligation of the Engineer

Engineer's have made useable nature's vast resources of material and energy for mankind's benefit. Engineers have vitalized and turned to practical use the principles of science and means of technology.

They commit to:

- Practice integrity and fair dealing
- Make best us of the earth's precious wealth
- Give skills and knowledge without reservation for the public good

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## The Competitive Environment

- We are faced with a challenging environment
  - The major issues cited above
  - State demographics
    - Fewer number of students in next decade
    - Few students taking advanced math and science
    - Decreasing number of high school graduates
    - Increasing number of retirees
- We need to increase interest in STEM education, and increase the number of students pursuing STEM careers

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### To create solutions to the major challenges, we need

- Scientists
- Engineers
- Technicians
- Technologists
- Mathematicians
- And widespread technological literacy
  
- How do we get students more interested in STEM?

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### What kids say matters to them

- Understanding the relevance of the topic
  - Why is this subject important?
- The opportunity to work in teams
- The opportunity to fail
- The opportunity to be creative
- Delivery that addresses individual learning styles
- Teachers who are passionate about their subject, and convey their enthusiasm to the student

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### How can we collectively increase the numbers

- Include engineering topics in science standards
- Sponsor competitions that include experiences with hands-on projects
- Deliver STEM summer camps
- Promote use of STEM resources: Bakken Museum, Science Museum, The Works, Leonardo's Basement

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### How you personally can take leadership

- Find the passion in each student and build on it
- Help students learn "why" the subject is important
- Relate the course materials to real issues
- Require students to work in teams, to teach, to actively engage
- Create challenges that demand creativity and critical thinking
- Create an environment where 'failing' is encouraged
- Provide experiences with hands-on projects
- Encourage participation in science/engineering competitions
- Use resources available to assist
- Get to know industry, how science is applied, why their subjects are important

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### Key elements

- PASSION: Show passion for your subject
- RELEVANCE: Make connections and relate to personal life.
- COMMUNITY: Build community among your students
- BASICS: Build on the basic math skills, especially algebra
- LINKS: Connect programs together.
  - Link your course to other courses
  - Lead topic with historical reference: how has topic changed history
- TEAMS: Use teams and encourage failure
- CREATIVITY: Develop both left and right side of students brains

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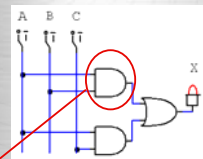
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### Why do I need Algebra? (PLTW)

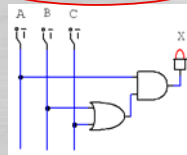
$$AB + AC = X$$



If each electronic component costs say...\$1.00...Total processor cost is \$3.00

Manufacturing cost for one million units = \$3,000,000

$$A(B+C) = X$$



This circuit works exactly the same...Total processor cost is \$2.00

Manufacturing cost for one million units = \$2,000,000

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What resources are available to teachers?

- Project Lead the Way
- Summer Camps
- Science and Engineering Competitions
- ASEE "Why K-12 Engineering?"
- Dissemination of MHTA **getSTEM** portal to industry and schools
- P16 Science Standards to include engineering content

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**Minnesota Center For  
Engineering &  
Manufacturing Excellence**  
[www.mnceme.org](http://www.mnceme.org)

Project Lead the Way Program Director  
Jim Mecklenburg  
[james.mecklenburg@mnsu.edu](mailto:james.mecklenburg@mnsu.edu)  
Work Cell 320-493-5229

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**WHY K-12 ENGINEERING?**

A publication of the  
ASEE EngineeringK12 Center  
1818 N St., NW, Suite 600  
Washington DC, 20036  
[www.engineeringk12.org](http://www.engineeringk12.org)

Produced by:  
Eric Iversen, Chitra Kalyandurg, and Sydney de  
Lapeyrouse  
[outreach@asee.org](mailto:outreach@asee.org)



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## getSTEM Web Portal

[www.getSTEM-mn.com](http://www.getSTEM-mn.com)

- The portal for Minnesota Educators and Businesses/Higher Education to connect and collaborate to build relationships to match STEM needs with STEM resources.
- Key components of the tool include:
  - Just Ask Request List
  - Just Offer Give List
  - STEM Events
  - STEM Successes
  - My STEM

**For more information Contact:**  
 Taylor Pettis  
 STEM Education Program Manager  
 Minnesota High Tech Association  
[tpettis@mhta.org](mailto:tpettis@mhta.org)




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- American Society for Engineering Education, K12
  - <http://www.asee.org/k12/index.cfm>
- National Academy of Engineering
  - <http://www.nae.edu/nae/naehome.nsf>
  - Engineering Girl <http://www.engineergirl.org/>
- Society of Women Engineers
  - <http://www.swe.org>
- Society of Manufacturing Engineers
  - [www.sme.org](http://www.sme.org)
- MHTA getSTEM
  - [www.getSTEM-mn.com](http://www.getSTEM-mn.com)

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- Rising Above the Gathering Storm, NAE
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- The Millennium Report, University of Michigan
- A Century of Innovation: Twenty Engineering Achievements That Transformed Our Lives, Joseph Henry Press

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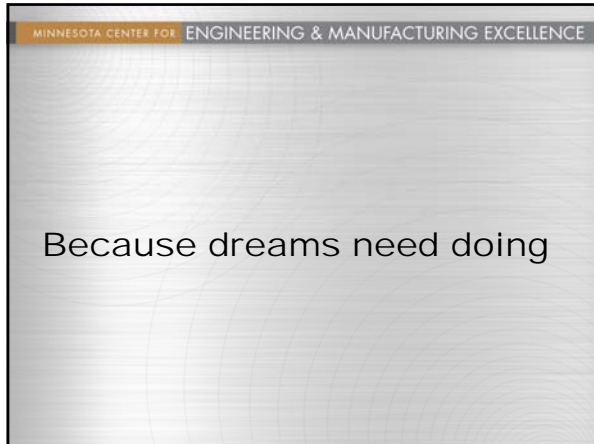
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