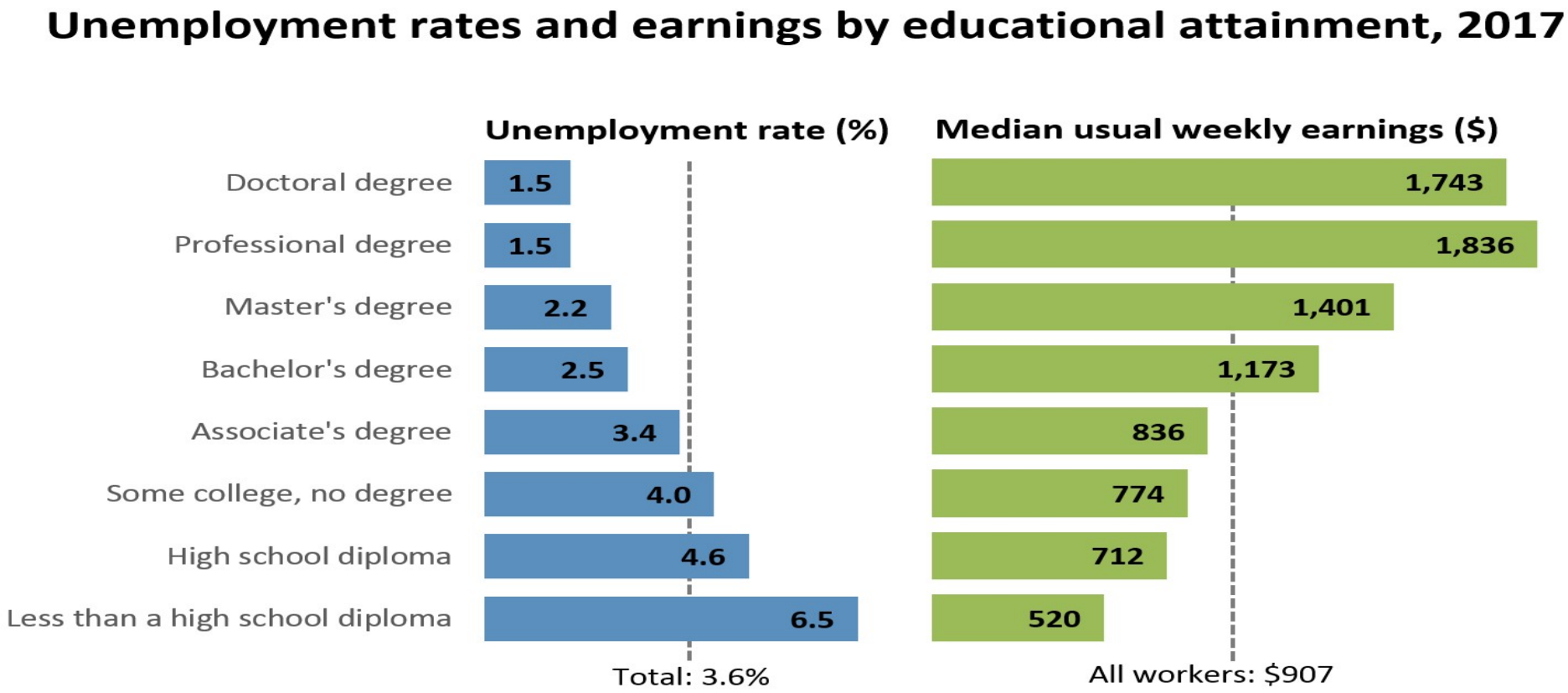
TECH FORWARD
Preparing Students II

November 15-16, 2018

Michigan Tech

The future looks bright for our students

College grads earn more, have greater job security



Source: MASU; based on data from the U.S. Bureau of Labor Statistics, Current Population Survey.
Note: Data are for persons age 25 and over. Earnings are for full-time wage and salary workers.

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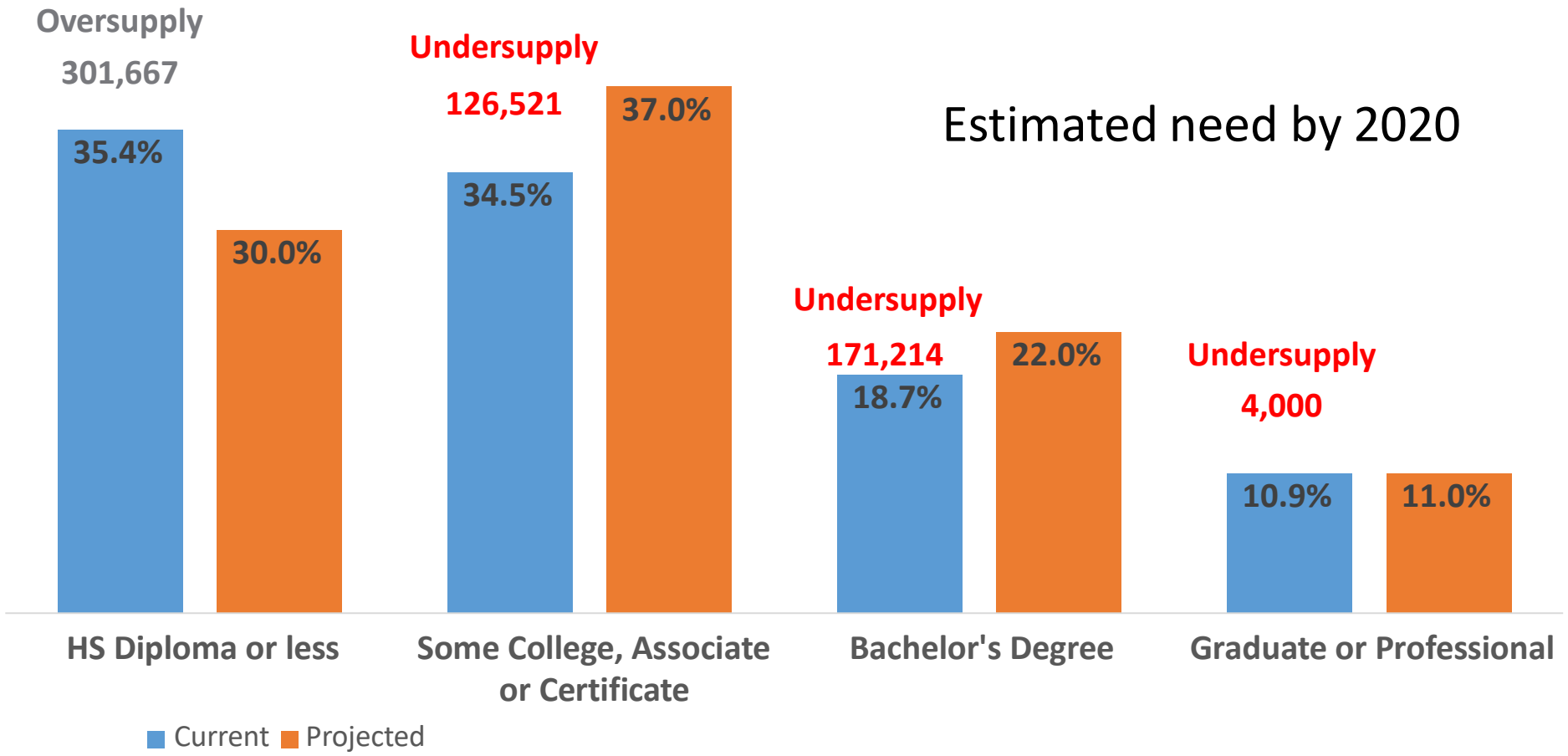
Michigan needs college-educated workers



Source: MASU; based on information from the Georgetown Center for Education and the Workforce.

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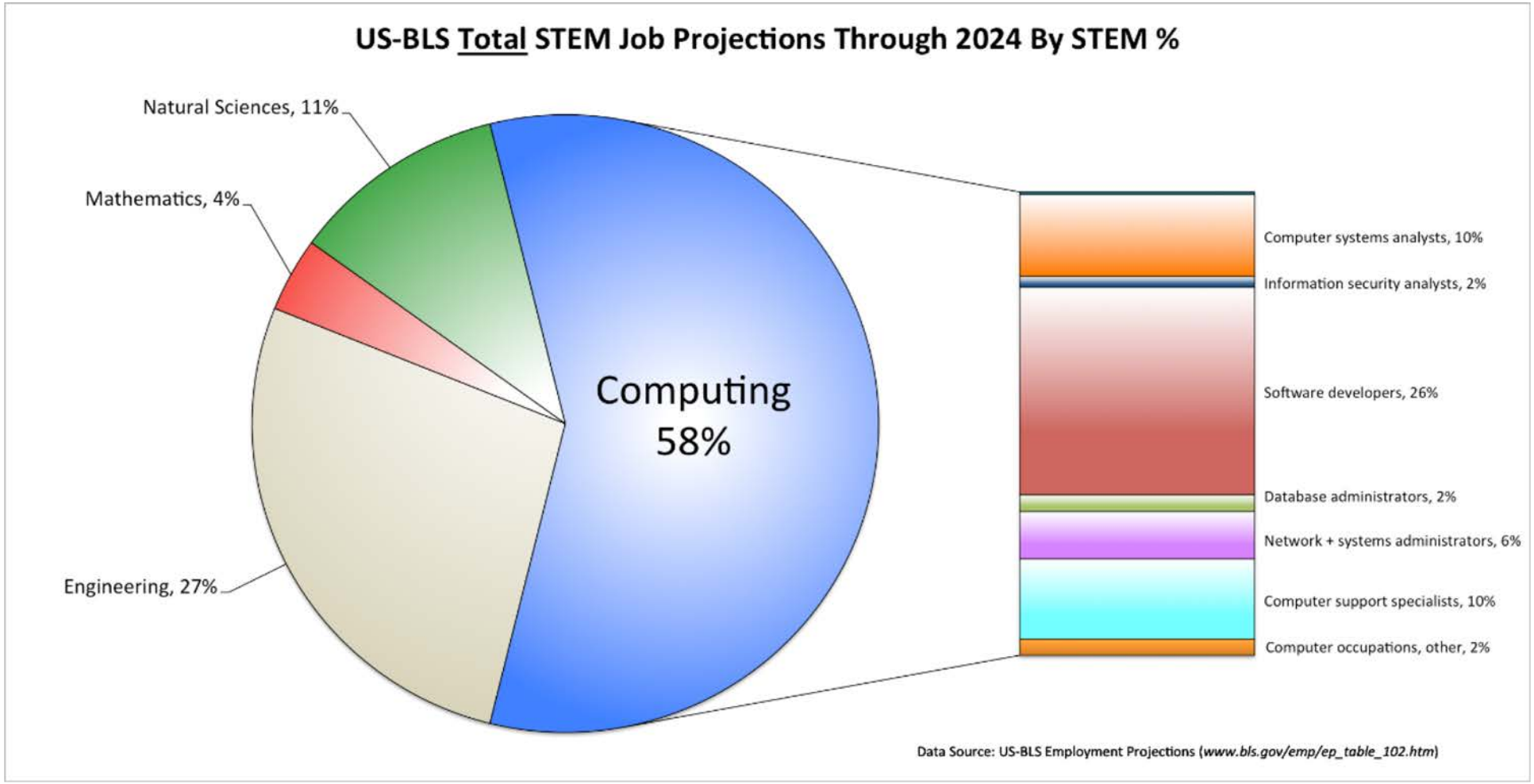
Michigan Tech's STEM focus will help meet the state's need for talent

HOT 50: Michigan's high-demand, high-wage careers

- Of the **50** high-demand, high-wage occupations in Michigan through 2026, **35** require a four-year college degree or higher.
- Annual HOT 50 jobs requiring a four-year degree: **$51,100.**
- Annual HOT 50 jobs not requiring degree: **$30,290.**

Source: MASU; based on data from the Michigan Bureau of Labor Market Information and Strategic Initiatives.

Jobs Outlook – *All* STEM Jobs



Source: Dr. Daniel Fuhrmann, based on US-BLS Employment Projections

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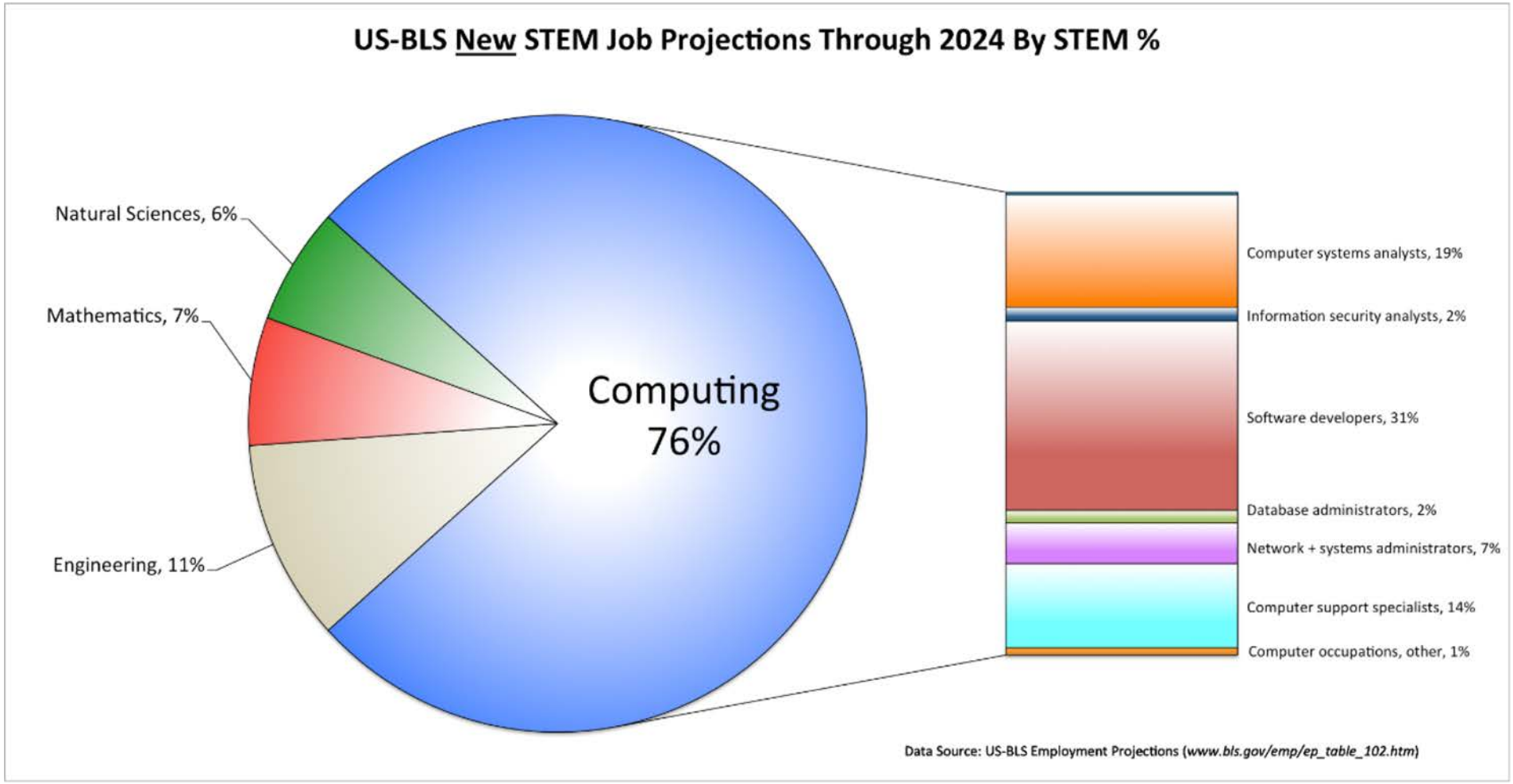
Jobs Outlook – *New* STEM Jobs



Source: Dr. Daniel Fuhrmann, based on US-BLS Employment Projections

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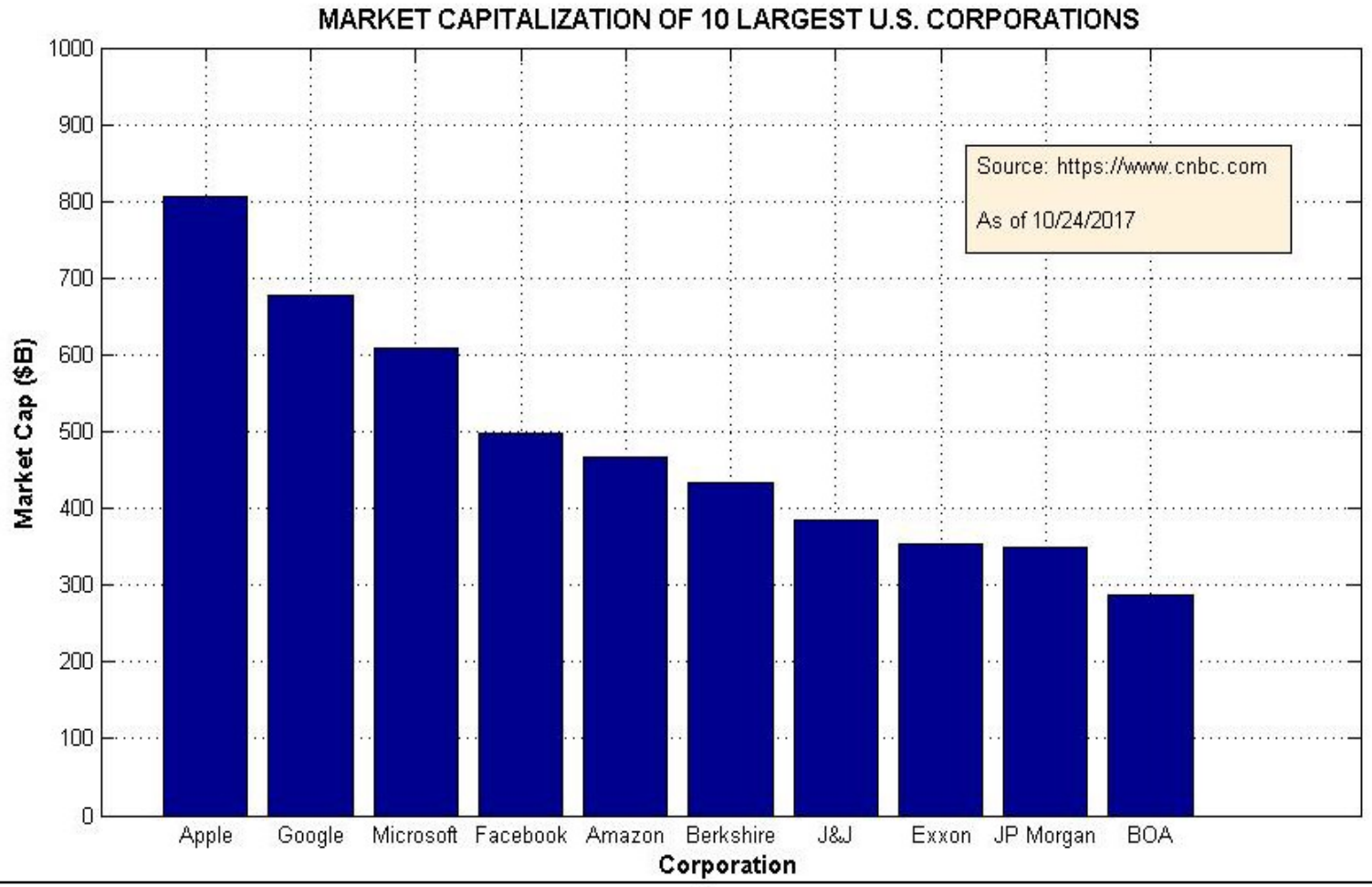
10 Largest U.S. Corporations



Source: Dr. Daniel Fuhrmann, based on data from CNBC

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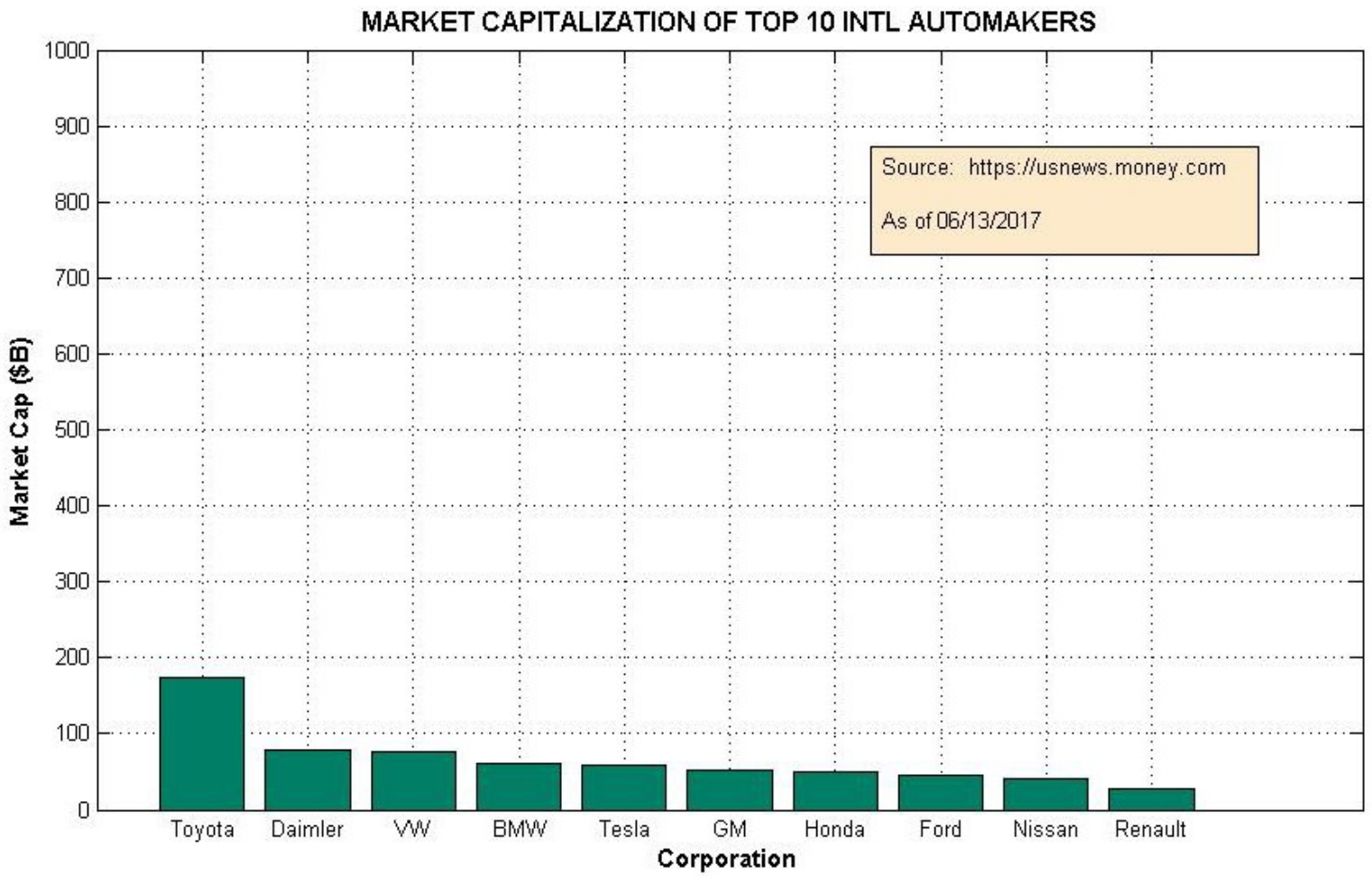
10 Largest International Automakers



Source: Dr. Daniel Fuhrmann, based on data from US News

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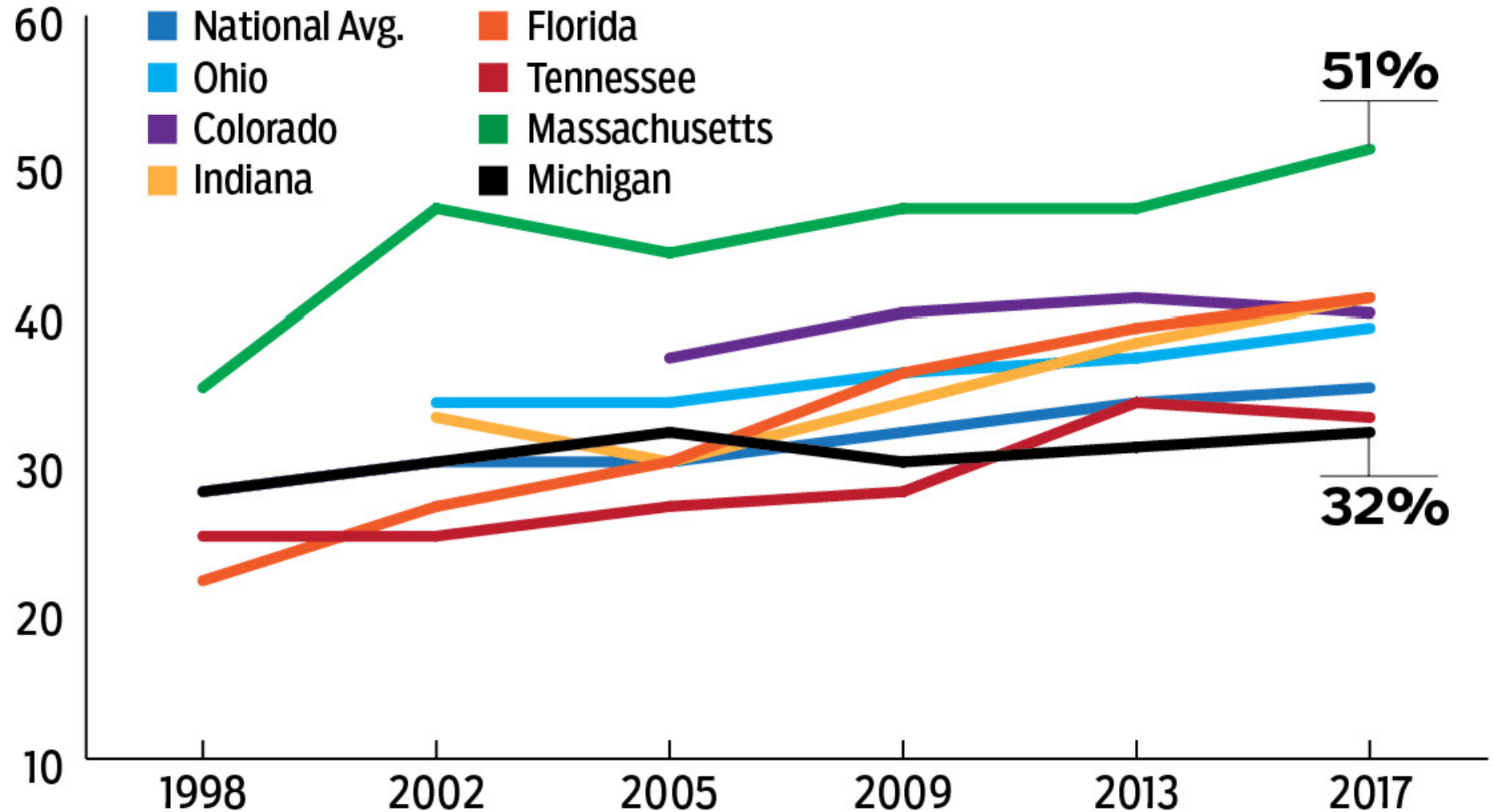
There are challenges, however

4th Grade Reading

How Michigan proficiency test scores stack up against Midwest competitors and some states that have seen improvements.

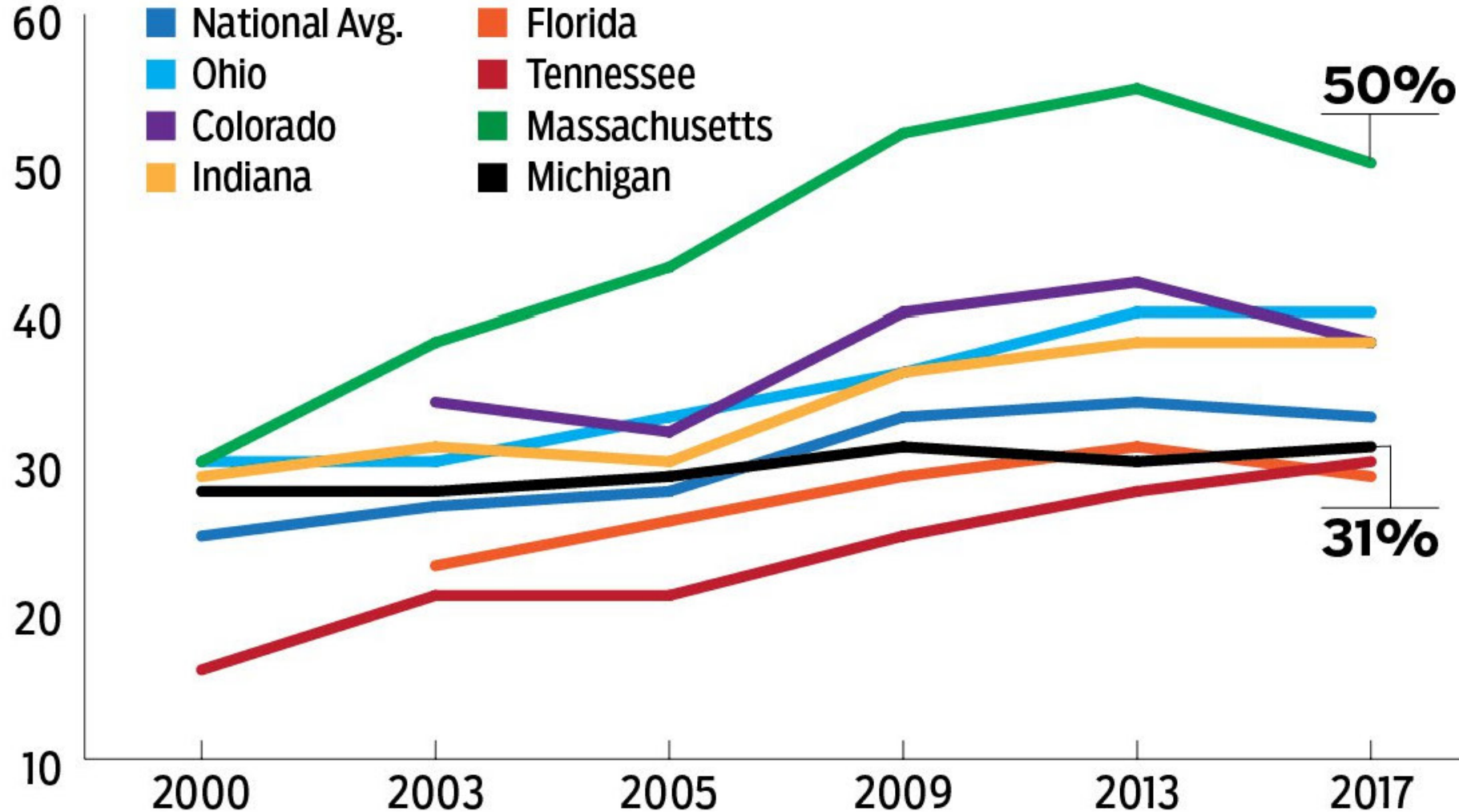


SOURCE: The Nation's Report Card

Slide source: State of Michigan Department of Talent and Economic Development. (2018) *Marshall Plan for Talent* [PDF document]. Retrieved from State of Michigan Department of Talent and Economic Development Website: https://www.michigan.gov/documents/ted/MPT_Workshop_presentation_628929_7.pdf

8th Grade Mathematics

Examining proficiency test results makes it clear that while Michigan has remained largely stagnant, bordering and other economic competitor states have made gains.



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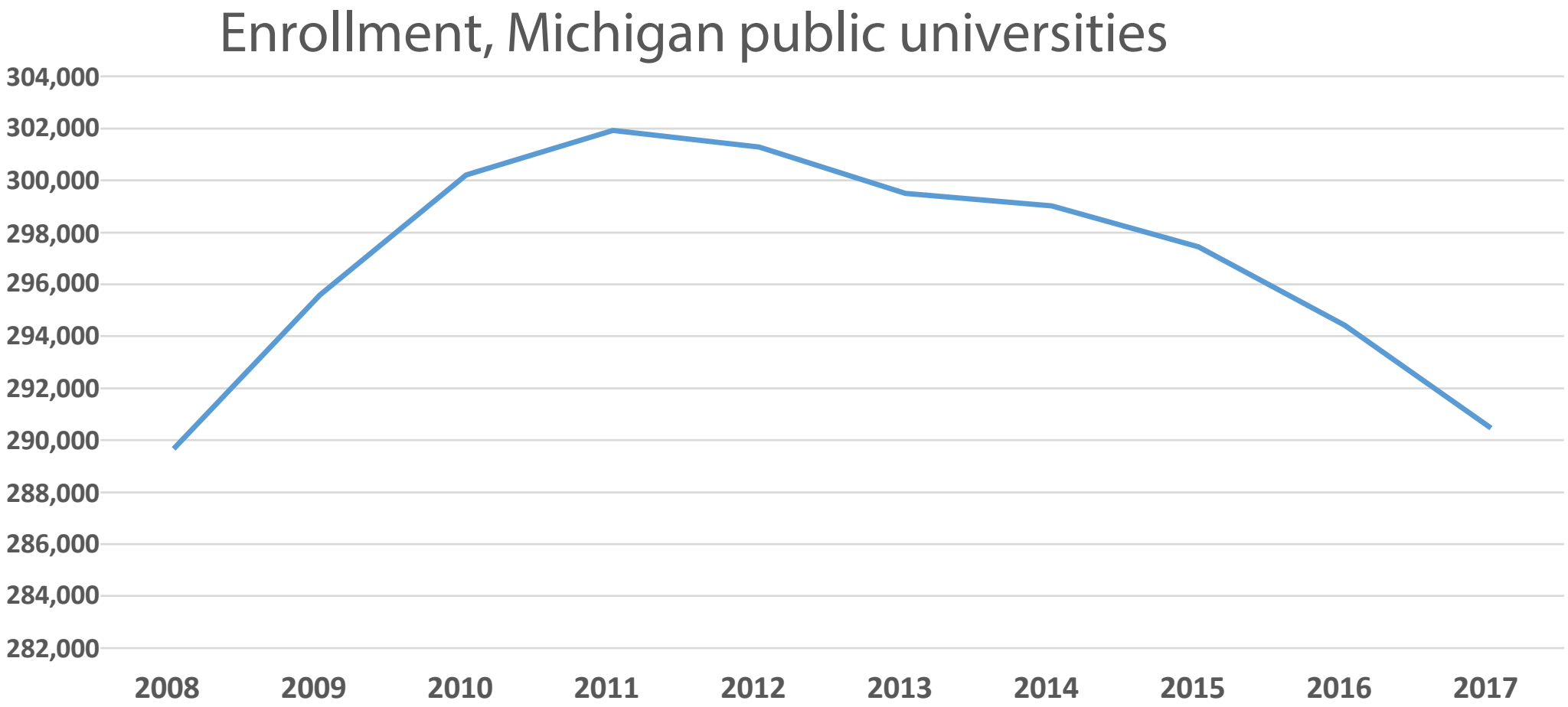
Enrollment challenges



Source: Michigan Association of State Universities (MASU).

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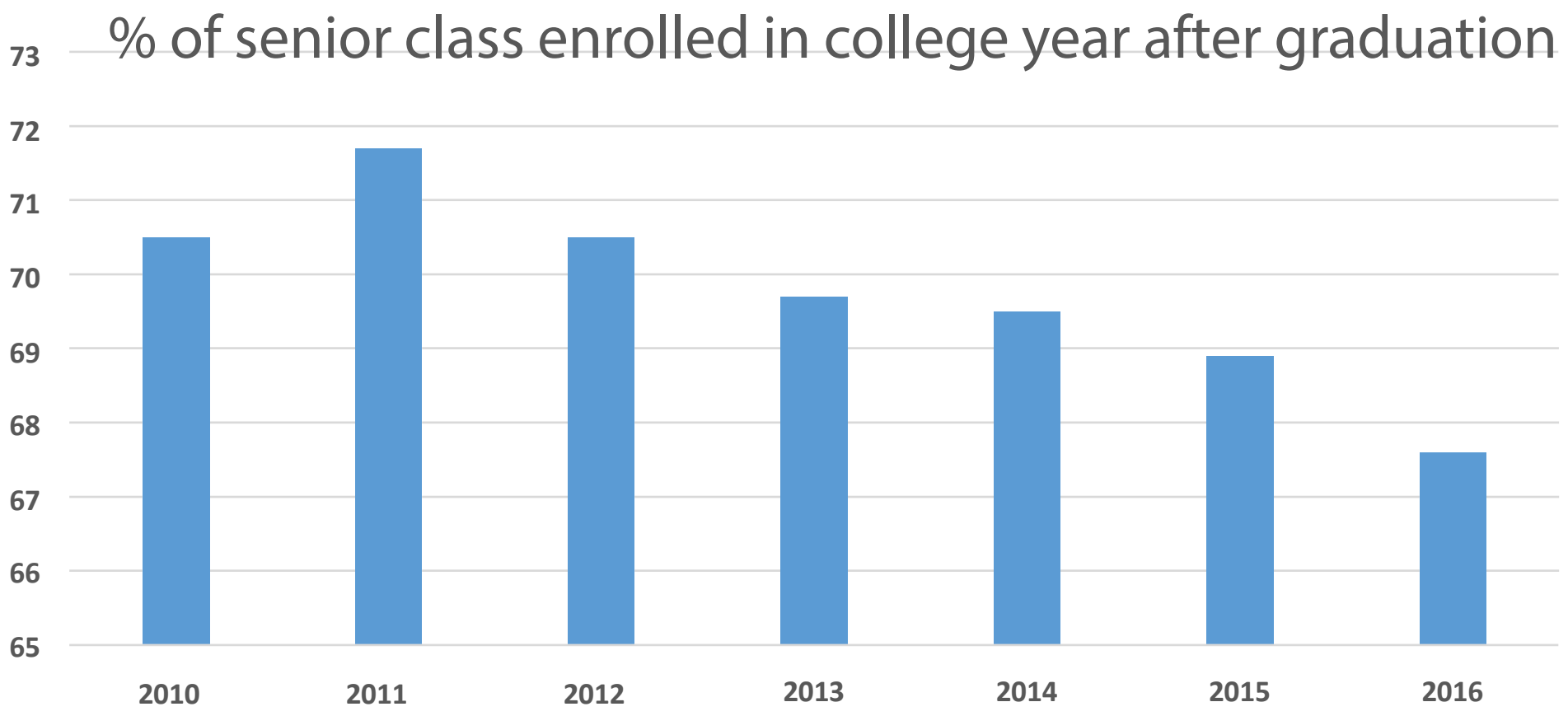
Lower college going rates



Source: MASU; Michigan Center for Educational Performance and Information.

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MARSHALL PLAN FOR TALENT

INVEST · DEVELOP · ATTRACT

SKILLS CHALLENGE

What are Students Thinking and Saying…What's the Result?

Let's start with a group of 24 **kindergarten** students…

1/3 of **4th graders** have "*lost an interest in science*"

By **8th grade,** "50 percent of students deemed science **irrelevant** to their education or future plans"

Upon **graduating high school,** only 32 percent of students are **qualified** to attend 4-year colleges

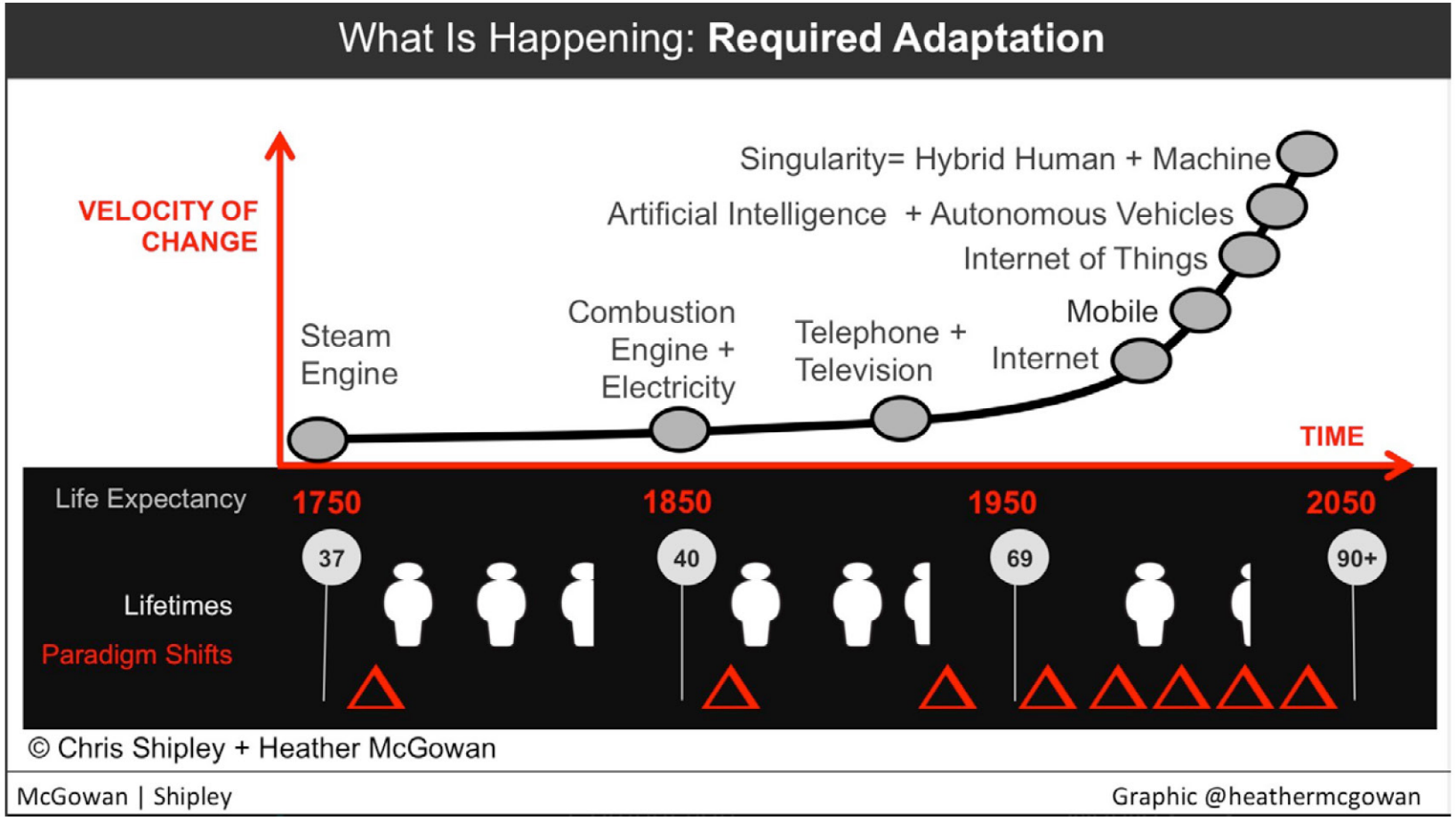
Slide source: State of Michigan Department of Talent and Economic Development. (2018) *Marshall Plan for Talent* [PDF document]. Retrieved from State of Michigan Department of Talent and Economic Development Website: https://www.michigan.gov/documents/ted/MPT_Workshop_presentation_628929_7.pdf

These factors are impacting the outlook for Michigan's publics

Moody's Investors Service – October 31, 2018

- Ratings Rationale:
  - "Michigan Technological University's A1 rating reflection the university's very good strategic positioning, supported by its regional and niche reputation as an engineering-focused and applied sciences university with steady enrollment and good fundraising...."
- Factors That Could Lead to a Downgrade:
  - "Prolonged deterioration in market position as indicated by ongoing declines in enrollment and net tuition revenue."

And the world is changing - fast



Source: Future of Work | Future of Learning. Heather McGowan.

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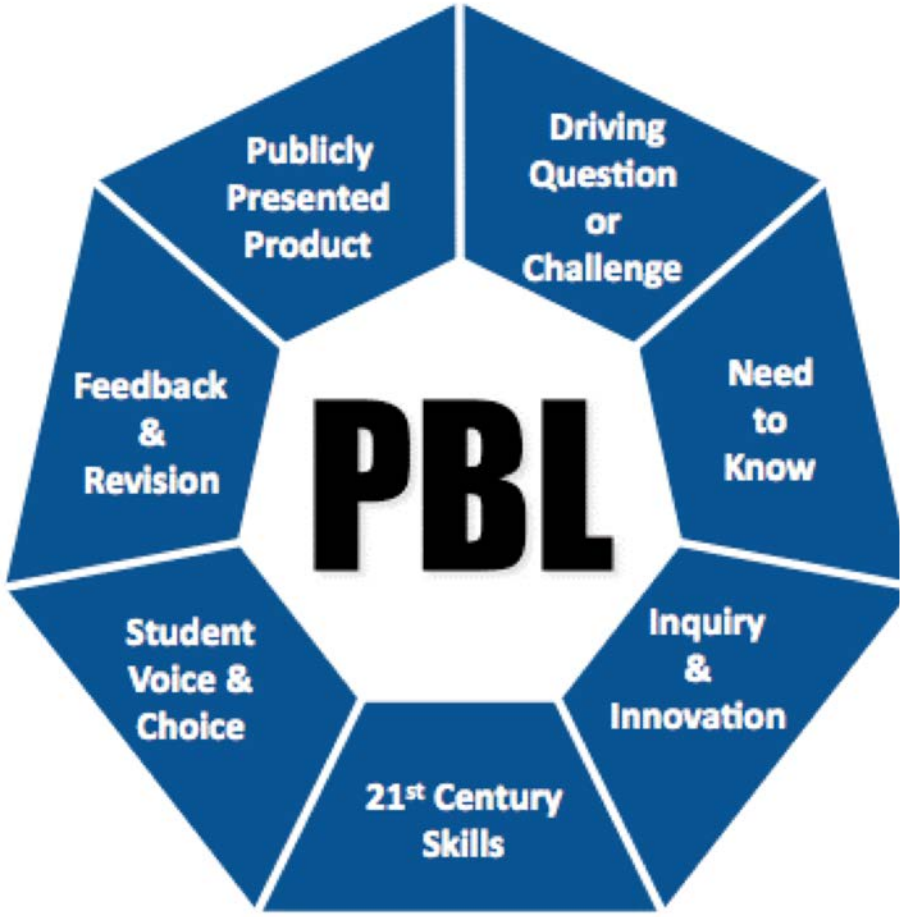
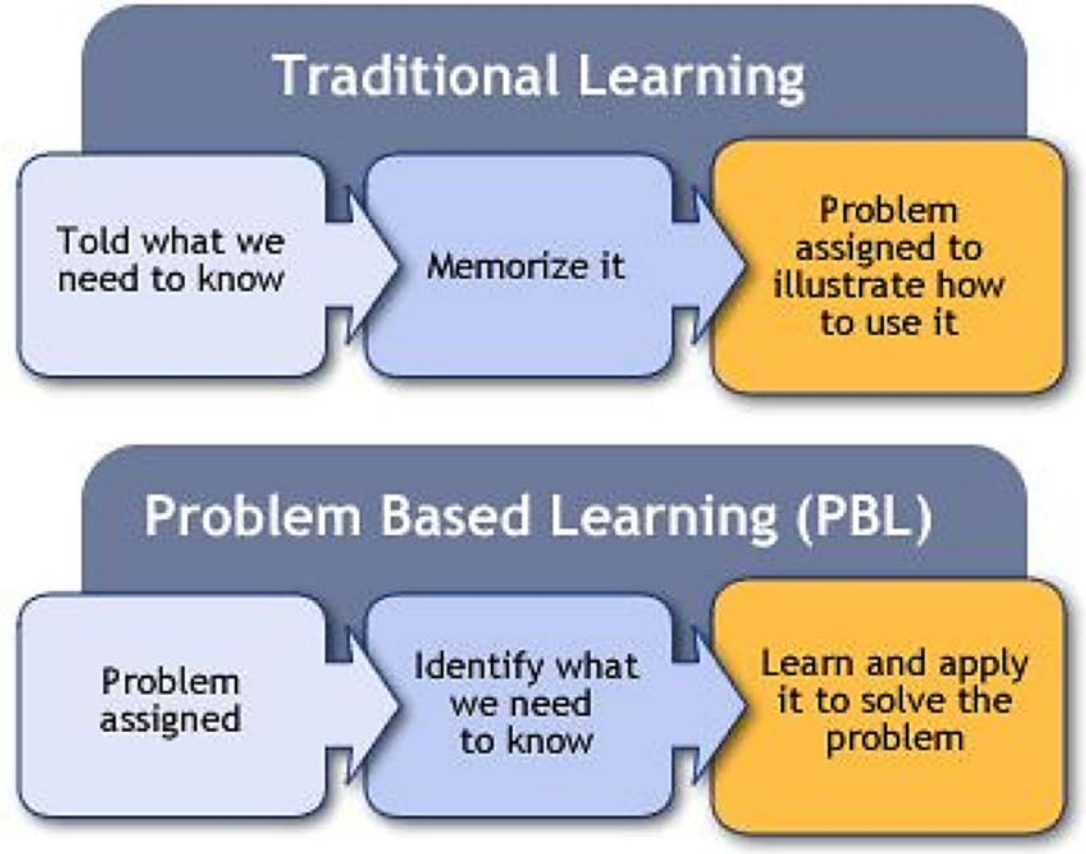
New models for education are being tested/promoted





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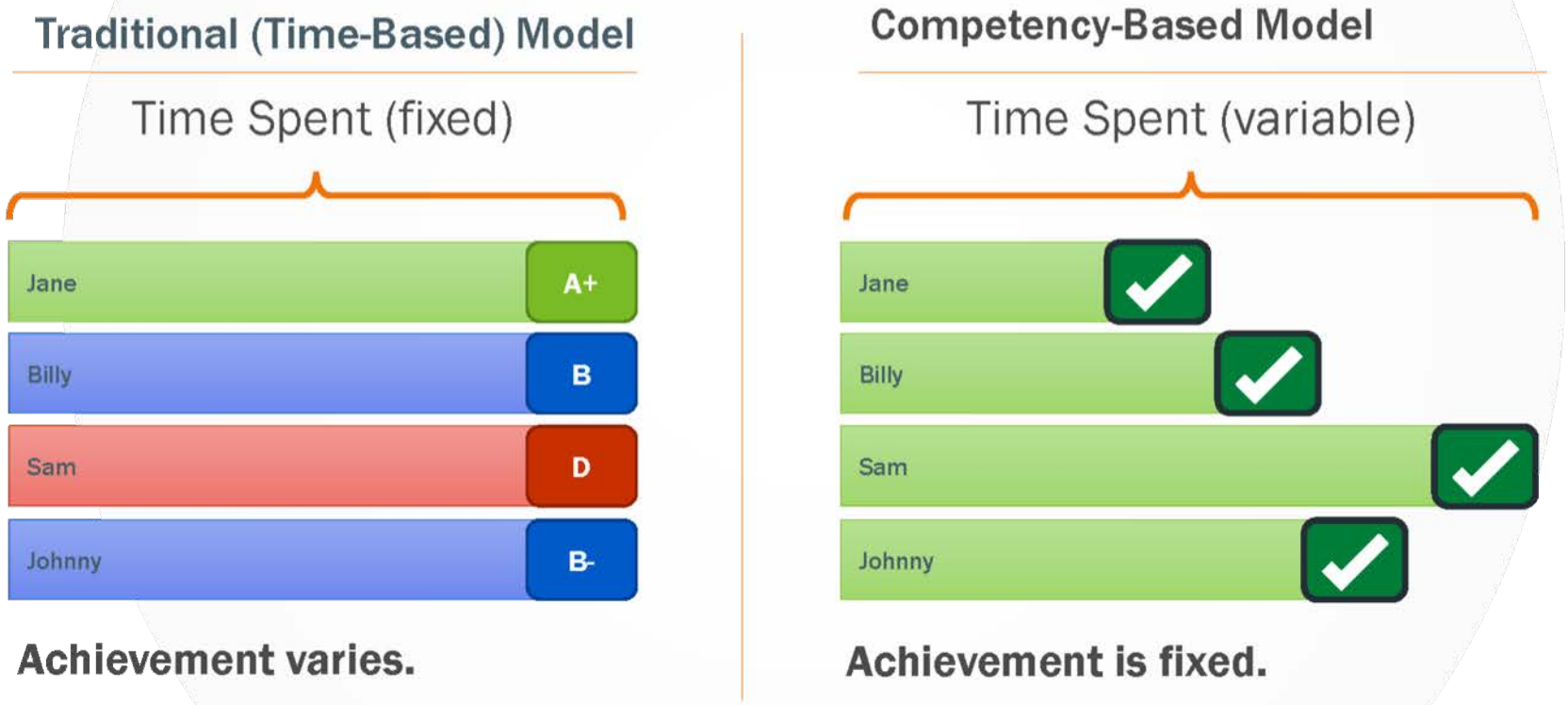
Fundamental Difference



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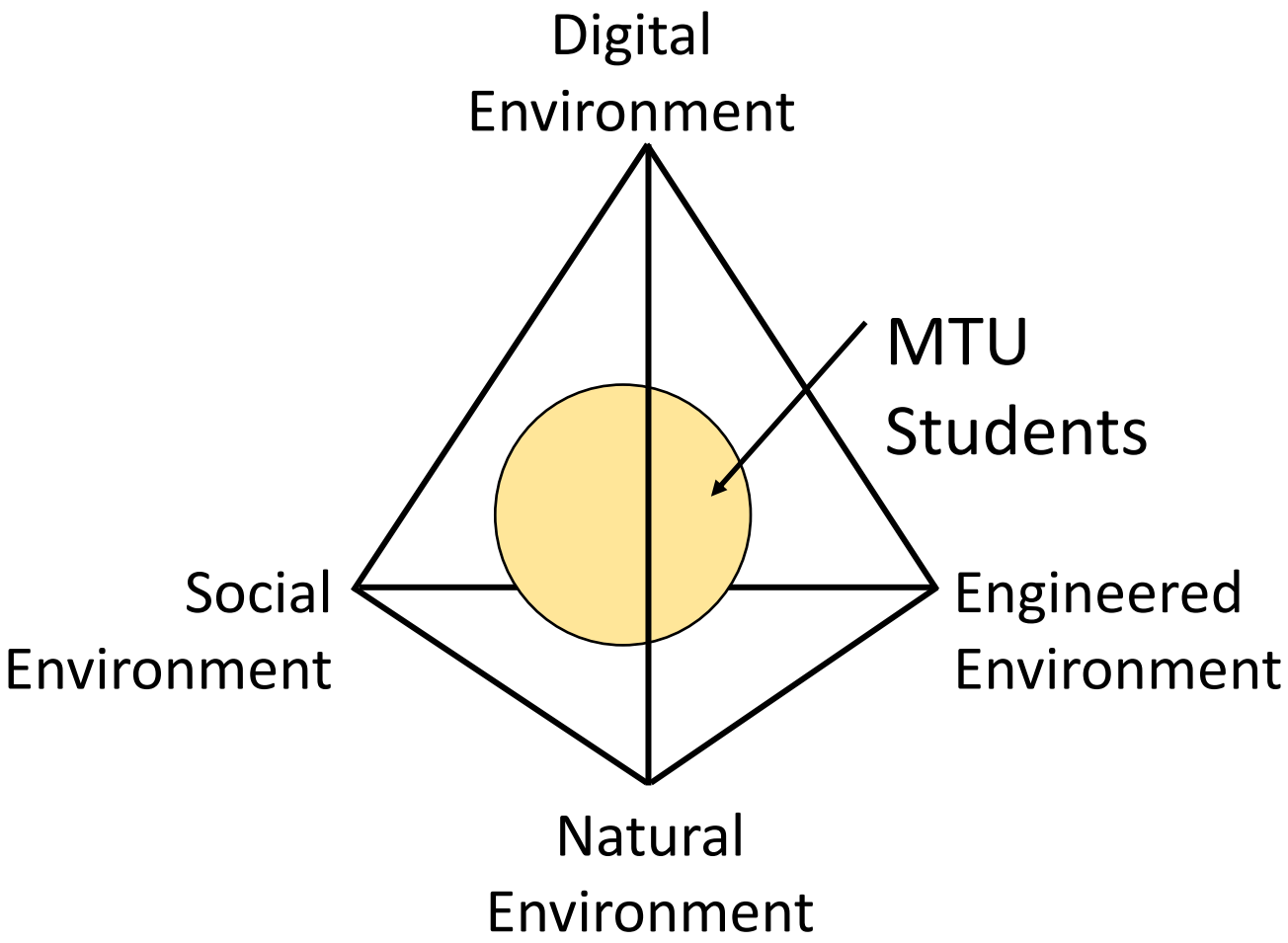
Michigan Tech's response so far

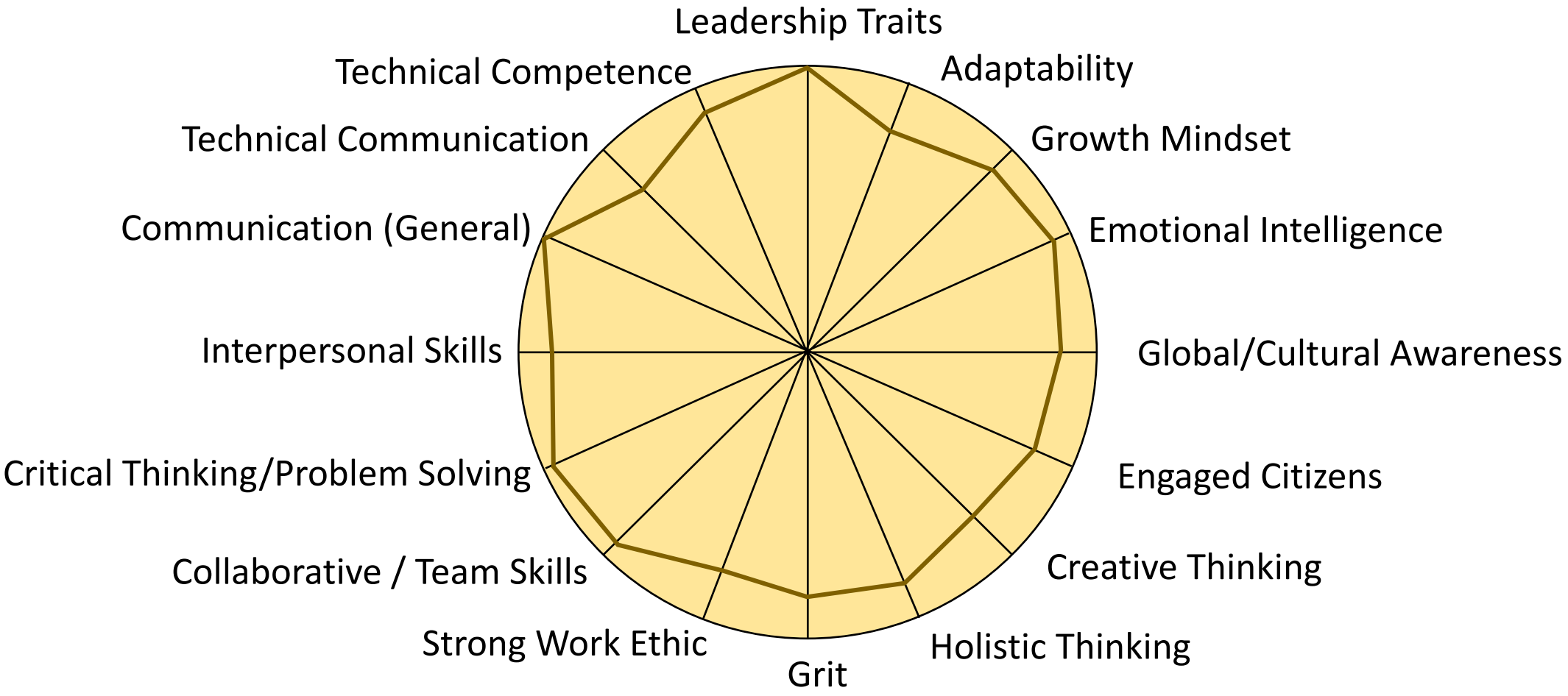
CIS Working Group Report

- Form new college- or school-level CIS unit
- Identify, strengthen, publicize, and invest in CIS niches
- CIS unit will:
  - Collaborate closely with other units
  - Enhance connections with government and industry
  - Contribute to campus-wide computational literacy

Deans Council “Tetrahedron”



The Importance of “Transferable Skills”



Based on survey results for Tech Forward Preparing Students 1; values are for illustration purposes only.

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Tech Forward
Preparing Students I

Competencies for SUCCESS in First Job

Tech Forward Sessions:

- Effective communication skills
  - Verbal
  - Written
  - Listening
- Growth mindset & lifelong learning
- Networking skills
- Drive, passion, enthusiasm, confidence
- Demonstrated ability to work with diverse people
- Critical thinking / strategic thinking / systems thinking

Survey:

- **Habits of Mind**: critical thinking & problem solving ability, emotional intelligence, leadership traits, adaptability
- **Communication**
- **Skills**: technical competency, hands-on practical experience

Competencies for SUCCESS 10+ Years After Graduation

Tech Forward Sessions:

- Self-motivated
- Adaptable
- Systems thinking
- Think critically using data
- Leadership
- Teamwork skills
- Ability to work with diverse communities
- Work ethic
- Positive / optimistic

Survey:

- **Habits of Mind**, specifically:
  - Leadership traits
  - Growth mindset / Lifelong learning

Helping Students have SATISFYING AND FULFILLING Careers

Tech Forward Sessions:

- Early real-world experiences
- Exposure to a variety of career paths
- Self discovery / reflection / realization
- Growth mindset
- Willing to take responsible risks
- Good community / global citizens
- Able to face challenges & thrive

Survey:

- Help students develop/learn/gain:
  - Self-reflection
  - Engaged citizenship
  - Real-world experience / engagement
  - Global cultural exposure
  - Holistic learning
  - Grit

Michigan Tech Students Should be Known For...

Tech Forward Sessions:

- Cross-cutting sustainability focus
- Hands-on / can-do
- Being a change agent
- Interdisciplinary skills
- Adaptable
- Leverages transferable skills
- Passion for work
- Confidence (creative, courageous, curious - risk taker)

Survey:

- **Habits of Mind**, specifically:
  - Leadership traits
  - Creative thinking & Innovation
- **Global Skills**, specifically:
  - Being engaged citizens
  - Humanitarianism

65% of today's students will have jobs that do not exist yet; how do we prepare students for their future?

Tech Forward Sessions:

- Adaptability
- Resilience, tenacity, reflectivity
- Interdisciplinary education
- Transferable skills (habits of mind)
- Big data (analysis & awareness of what it can reveal) + communication
- Comfort with ambiguity
- Self-learning

Survey:

- **Habits of Mind**, specifically:
  - Growth mindset & lifelong learning
  - Adaptability
  - Critical thinking and problem solving

Disruptive Forces Panel

- Convergence of physical and cyber worlds
- Data are distributed – available to all
- Opportunities abound
- Entrepreneurial mindset needed
- Agility is necessary to respond to unpredictable future

Disruptive Forces Panel (cont.)

- Cross-disciplinarity & lifelong learning are critical
- Cybertechnology now a part of every discipline
- Ethical considerations abound
- Traditional residential campuses experience will change
- Institutions need to be agile, entrepreneurial

Tech Forward: Responsive Research - $250k

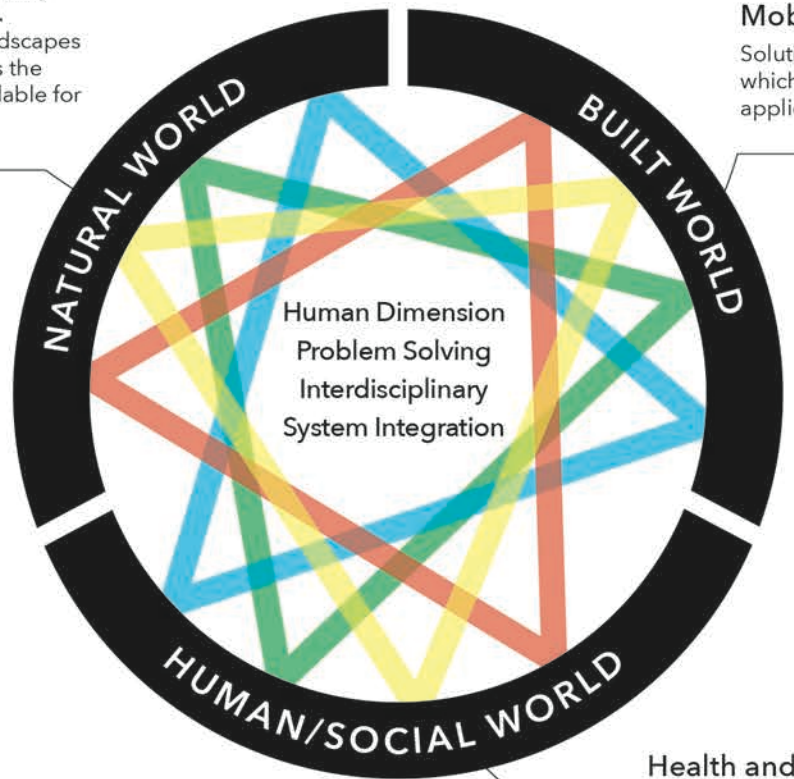
- Support teams working across disciplines
  - Provide seed funding to develop capacity/proposals
  - Incentive integration of human dimension with STEM
  - Address community (local, state, national, global) concerns
- Develop collaborative spaces & shared facilities
  - Upgrade and remodel existing spaces
- Relocate faculty into themed buildings
- Provide additional resources for proposal development
- More graduate student fellowships

Tech Forward: Responsive Research - $10M

- Invest in more MTRI-like research facilities in key locations
- Improve campus' physical infrastructure
  - Bond for upgrades and new construction
- Leverage $10M to launch $100M campaign for research
- Make MTU a green campus
- Initiate an SFHI for technology transfer / commercialization

Water, Energy, and more

Solutions for sustainable resource utilization including energy, water, land, forest, and mineral resources. Access to extensive local natural habitats and landscapes with unique environmental characteristics such as the great lakes and seasonal weather conditions available for study and use as dynamic laboratories.



Mobility and Autonomy

Solutions for resilient and connected infrastructure which support innovations in development and application of autonomy and mobility.

Health and Quality of Life

Solutions for the betterment of society that span the boundary between humankind and technology toward a longer and more fulfilling life and livelihood.

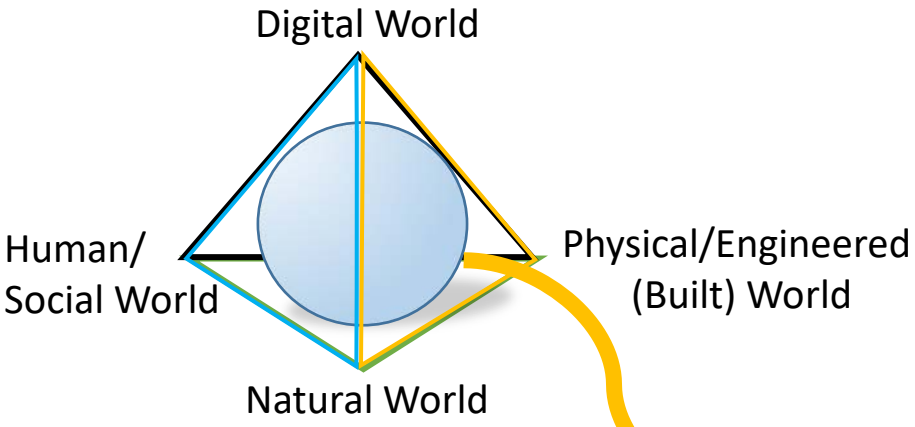
Data Revolution and Sensing

Policy, Ethics, and Education

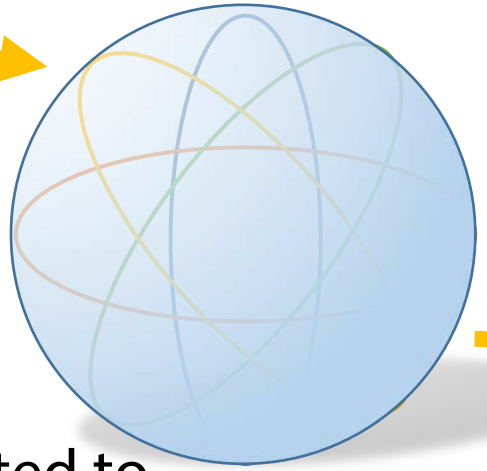
Sustainability and Resiliency

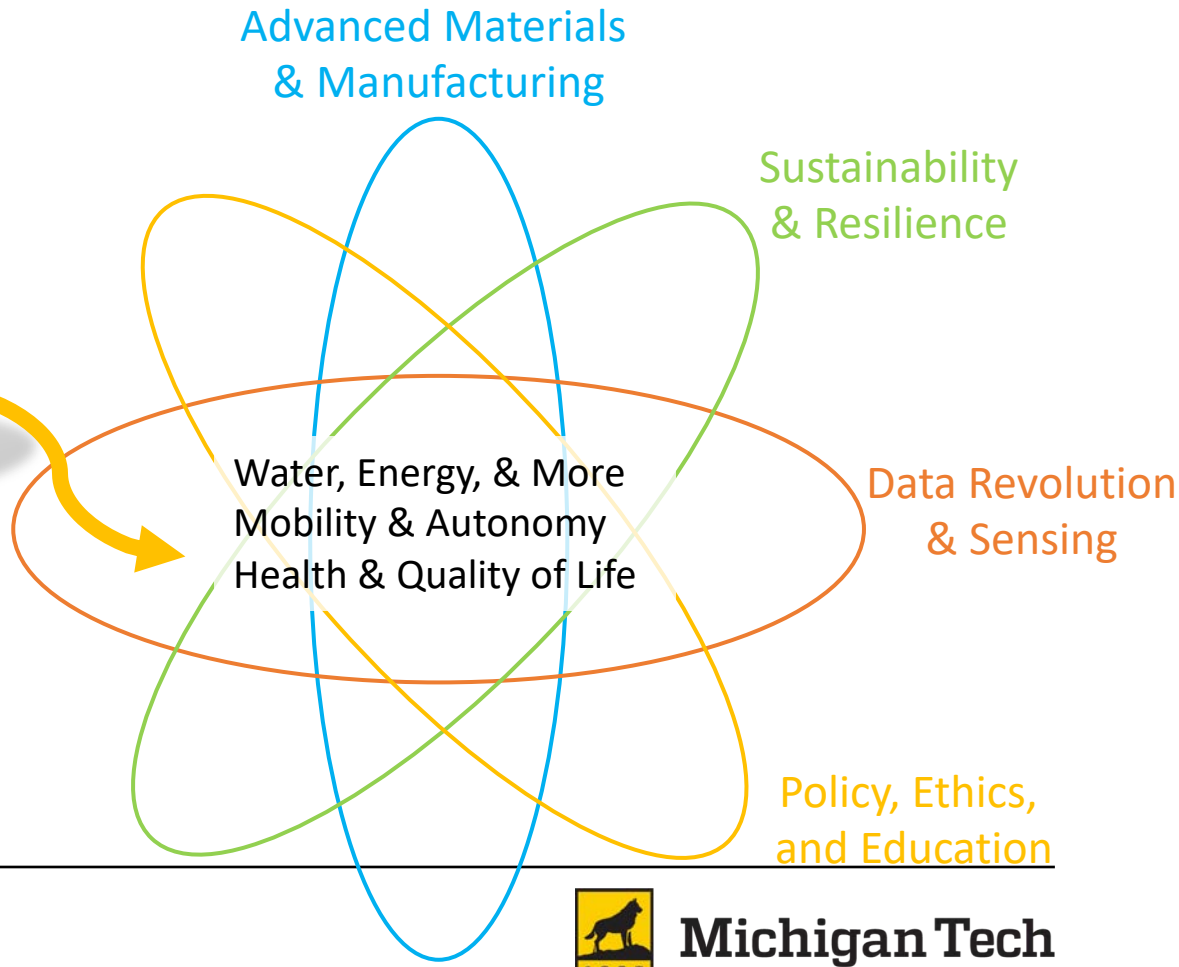
Advanced Materials and Manufacturing

Putting it all together



…and our education and research activities must relate to all domains.





To promote transdisciplinarity, each domain must be connected to all others…

Crosscutting **themes** for research and education =

- Advanced Materials & Manufacturing
- Data Revolution & Sensing
- Sustainability & Resilience
- Policy, Ethics, and Education

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Preparing Students - Skills

- Communication
- Computational Thinking
- Critical Thinking
- Leadership
- Networking
- Systems Thinking
- Teaming

Preparing Students - Qualities

- Adaptable
- Comfortable with Ambiguity
- Confident
- Good Community/Global Citizen
- Hands-on/Can-do Approach
- Resilient / Tenacious
- Self-Motivated
- Self-Aware
- Willing to take Responsible Risks

Preparing Students - Education

- Early real-world experiences
- Exposure to a variety of careers
- Focus on sustainability
- Interdisciplinary