Michigan Tech
Michigan Technological University

CENTER FOR PRE-COLLEGE OUTREACH

2015 Annual Report

www.mtu.edu/precollege

ANNUAL REPORT 2015

The Power of a Spark

Many of you have likely heard this narrative: The US faces a deficit in workforce development pipelines nationwide, most of which are tied to industries in science, technology, engineering, and math. Bridging this talent gap is pivotal, but a greater challenge remains: developing and deploying a robust, innovative workforce driven to propel the global marketplace in the 21st century with resilience and tenacity. At Michigan Tech, the Center for Pre-College Outreach (CPCO), shoulder-to-shoulder with campus, industry, government, and community partnerships, addresses these challenges through meaningful programming designed to provide students with hands-on learning experiences in their formative years. We believe children who are exposed to exciting, engaging, and consequential non-traditional experiences are more apt to develop and sustain interest in and affinity to STEM.

All it takes is a spark.

Surely there are many indicators to predict what ultimately prepares students for future academic success. Without programs and systems in place to advance opportunity and access for all students, or experiences built to support and supplement traditional curricular participation, efforts to catalyze a college-driven culture are deterred. Imagine the possibilities a moment of excitement—the spark—can make when blended with unabashed learning.

The core of every CPCO program and experience is the overt directive that our participants leave with new knowledge, resources, and understanding that result from authentic, creative, adventure-based learning. The data highlighted in this report shows we are succeeding.

Woven within the fabric of CPCO programs is a prevailing mission: if there is an opportunity to make a profound impact on young students' lives, we will seize it with passion and diligence. Throughout 2015, our efforts, including Summer Youth Programs, Mind Trekkers, and College Access Programs, reached more than 70,000 people from around the world. This report conveys the impact of our initiatives. We can't wait to see what is in store for 2016.

Thank you for your support,

Cody Kangas
Director, Center for Pre-College Outreach
Michigan Technological University

Our Impact

17

MIND TREKKERS EVENTS

42

TOTAL SUMMER YOUTH PROGRAM COURSES

72,479*

TOTAL OUTREACH PARTICIPANTS IN 2015

*Total number of SYP, Mind Trekkers, and College Access participants

Across government, industry, the non-profit community, and educational institutions, a consensus has been reached: the US must develop a sustainable system that develops human capital equipped with knowledge and expertise in science, technology, engineering, and mathematics (STEM). The best way to increase STEM interest and competence is by reaching youth in their formative years, sparking their sense of wonder at what these fields offer.

Our programs invite students from across the United States and abroad to dive into STEM intentionally and purposefully. Our College Access programs offer project-based experiences for local youth in schools and on campus. Summer Youth Programs provides a platform for more than 1,000 students from across the world to become immersed in a field and explore future career paths. Mind Trekkers, our wide-reaching mobile roadshow, showcases STEM in action for thousands of people. These programs not only introduce youth to the fundamentals of STEM—they enable students to be scientists, mathematicians, and engineers.

Many of these students come to Michigan Tech where they continue their STEM education.

TOTAL SYP ALUMNI ON CAMPUS:

614
students

8.4%
of student body

53%
increase over 5 years

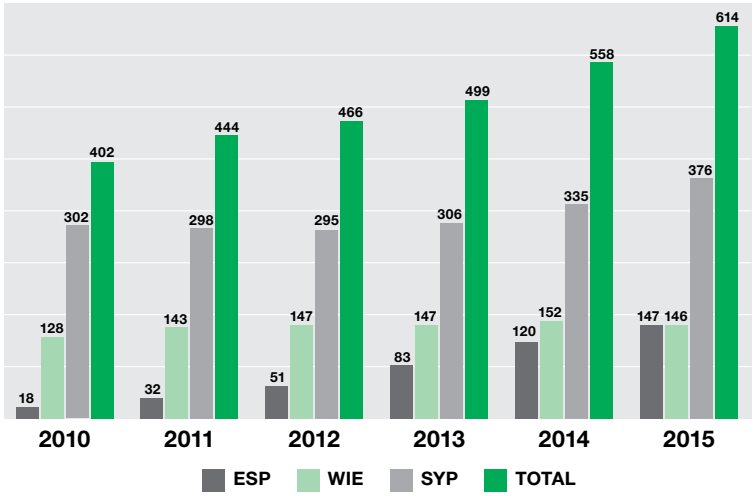
94%
majoring in STEM fields

250
are female students

80%
call Michigan home

24%
enrolled in Mechanical Engineering-Engineering Mechanics

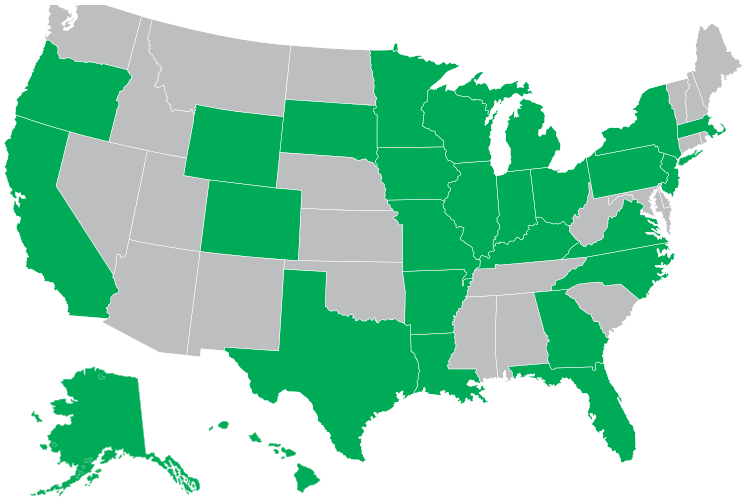
SYP ALUMNI: SIX-YEAR SCOPE*

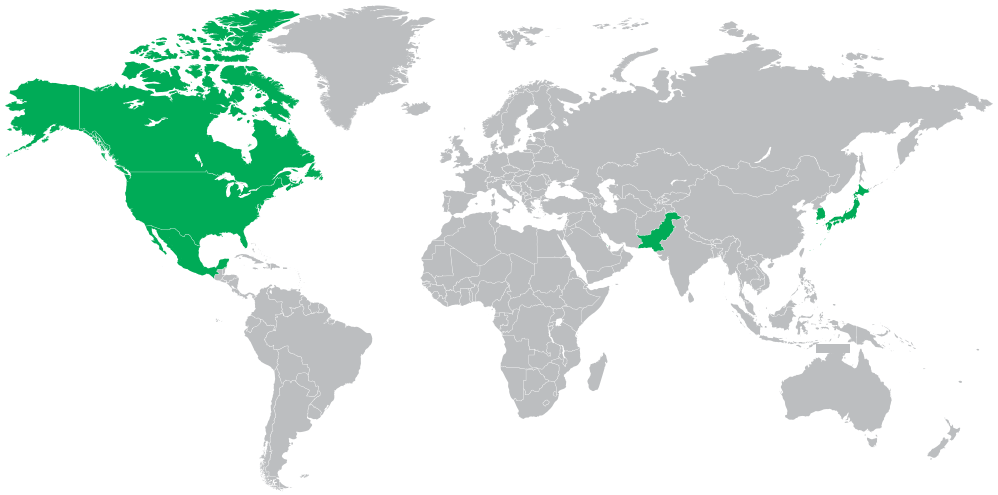


*Six-year overview of matriculated students at Michigan Tech

SYP 2015 ATTENDEES

28 states and five nations represented





Summer Youth Programs

Michigan Tech Summer Youth Programs

1,163

TOTAL PARTICIPANTS (THE MOST SINCE 2005)

syp.mtu.edu

FACEBOOK
facebook.com/MichiganTechSYP

TWITTER
Michigan Tech SYP—@mtusyp
twitter.com/mtusyp

FLICKR
flickr.com/photos/michigantechyp

YOUTUBE
youtube.com/c/MichiganTechCPCO

As a strong advocate for experiential learning, Summer Youth Programs encourages participants to be bold, choose adventure, and push the limit. Our mission is to offer quality, innovative teaching and learning experiences that promote investigation of collegiate studies, college life, and career awareness to a diverse group of pre-college students. Through hands-on and discovery-based programs, our students get the opportunity to step out of their comfort zone and stretch their imagination without the pressure of grades, exams, or assignments.

Michigan Tech prepares its students to create the future, and we provide a bridge to pre-college students to grant them insight into what that future may look like. Summer Youth Programs strives to prepare students in the pivotal fields of science, technology, engineering, and math (STEM) so that college can be a viable option for their future. The specialized facilities at Michigan Tech, along with our research and teaching faculty, college deans, and advisors help students develop clear college and degree goals. Interactions with successful current college students provide relatable role models, encouragement, and guidance.

After completing their explorations, 99% of participants were inspired to learn more about the subjects they studied.

95%
felt their exploration differed from their classrooms back home

70%
felt more likely to attend college

88%
showed interest in coming back for another summer

89%
gained confidence in their ability to be successful in a college atmosphere

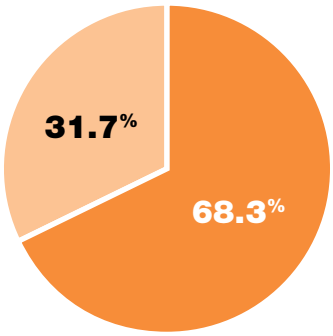
96%
would recommend their exploration to others

16%
could not have attended without a scholarship

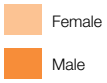
42 total courses offered in 2015, including:

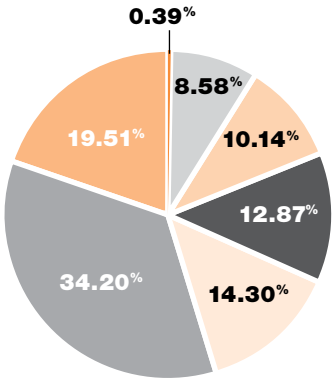
Aviation and Aerospace
Computer and Electrical Engineering
Chemical Engineering
Blacksmithing
Video Game Programming
Outdoor Leadership
Forensic Science and CSI

DEMOGRAPHICS

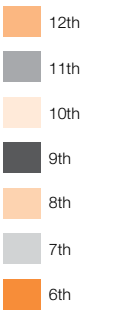


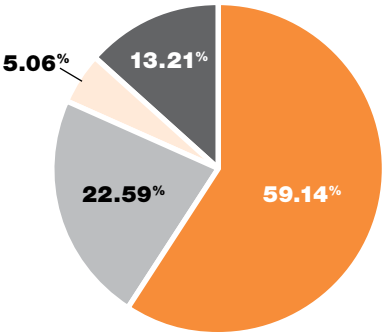
GENDER



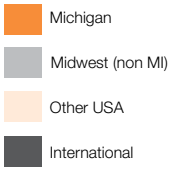


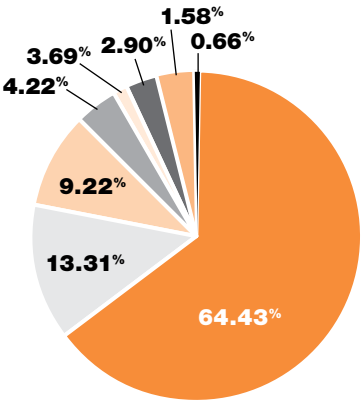
GRADES IN FALL 2015





GEOGRAPHIC DISTRIBUTION





ETHNICITY

"Summer Youth Programs showed me what the wonders of college are all about. Now I know how I want to spend the next 10 years of my life."

Women in Engineering

Through Women in Engineering, 150 young women explored different areas of engineering and their applications. They learned about engineering careers, investigated the many ways engineers impact the quality of our lives, and developed team skills through ImagiNation simulations. The participants also met female role models who work in engineering fields, and discussed how to be successful in undergraduate engineering programs.

The young women got a taste of campus life as well. They met other students, built networks and friendships while enjoying the recreation and natural setting of Michigan's Upper Peninsula.

150
TOTAL PARTICIPANTS

"Women in Engineering showed me that even in a male-dominated field, women can thrive and make a mark."

FACEBOOK
facebook.com/MichiganTechWIE

3.99
Women in Engineering average GPA

95%
would recommend Women in Engineering to others

91%
felt more likely to pursue a career in engineering

83%
considered themselves very informed regarding the variety of career options available in engineering

88%
rated the hands-on activities as above average

Engineering Group Projects

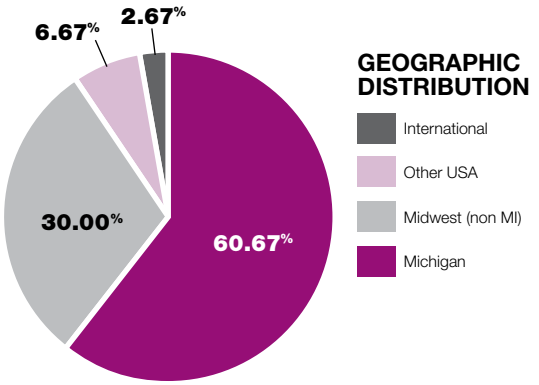
Designing and constructing a balsa wood structure and testing it against an "earthquake"

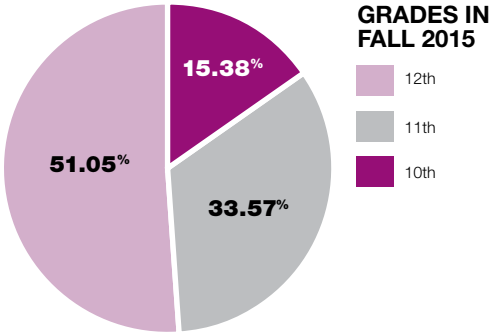
Constructing a virtual world and experiencing it in a virtual-reality lab

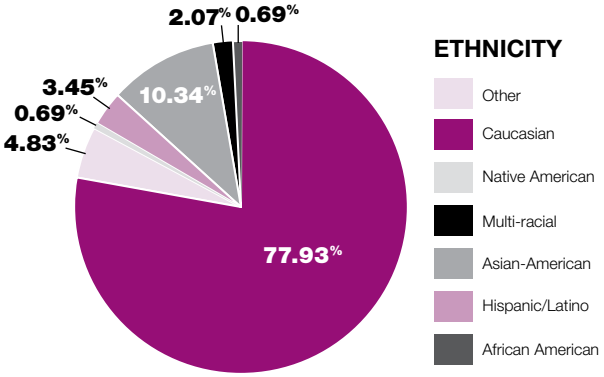
Learning about blacksmithing and creating a project by deformation and thermal processing

Exploring underwater acoustics while communicating across the Portage Waterway

DEMOGRAPHICS







Engineering Sessions

Students participated in projects during their nine different engineering sessions, which included:

Building a motorized robot with toothbrush components

Designing a bridge and testing its strength

Operating a continuous chemical reactor

Recreating natural disasters and studying how natural components affect severity

Thermo-mechanical processing of shape memory wire

Hiking in local wetlands to discover the importance of environmental engineering

Engineering Scholars Program

150
TOTAL PARTICIPANTS

FACEBOOK
facebook.com/MichiganTechESP

During the Engineering Scholars Program, 150 participants explored careers in mechanical, computer, environmental, electrical, chemical, biomedical, civil, geological, and materials engineering.

The students also got inside information from role models working in engineering fields and learned to work in teams to tackle group projects. They developed team skills through ImagiNation challenges, learned about the college application process, and received tips for succeeding in university engineering programs. The young men and women investigated the many ways an engineer can directly impact the quality of people's lives.

Experiencing college life is important as well—staying in a residence hall, exploring campus, and meeting others with similar interests. Students enjoyed team competitions, a variety show, and a number of outdoor activities in Michigan's beautiful Upper Peninsula.

> "I learned a lot, not just about engineering, but Michigan Tech, too."

3.9
Engineering Scholars Program average GPA

99%
would recommend the Engineering Scholars Program to others

95%
felt more likely to pursue a future career in engineering

89%
felt more informed of the wide variety of career options in engineering

92%
rated the hands-on activities as above average

Engineering Group Projects

Saponification: making soap

Mud and fire: geological engineering as it related to natural hazards

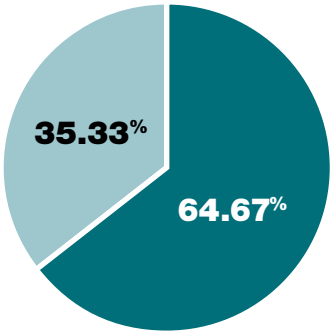
Blacksmithing

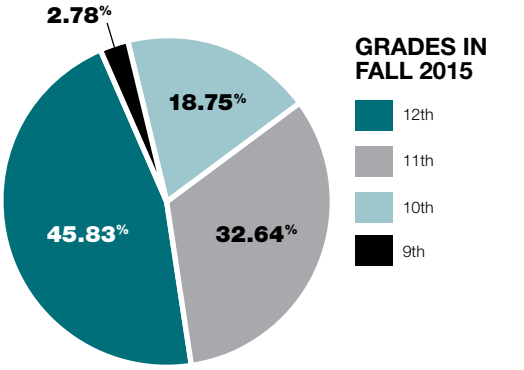
Prosthetic leg: using biomedical engineering while on a budget

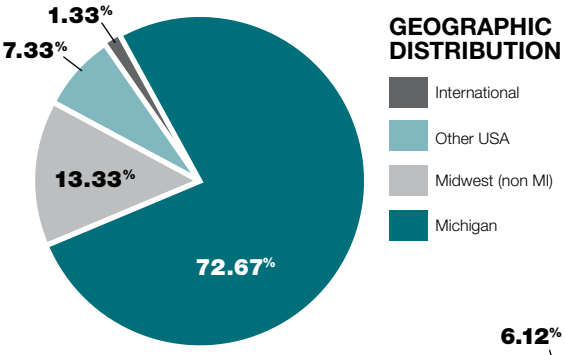
Remotely operating an underwater vehicle and testing it in a dive tank

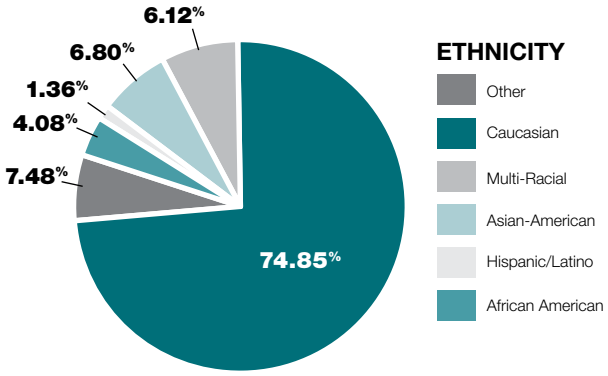
Distracted driving: learning about human factors engineering

DEMOGRAPHICS









Engineering Sessions

Students participated in projects during a series of nine engineering sessions, which included:

Building a 'bristlebot' with toothbrush components

Designing a bridge and testing its strength

Operating a continuous chemical reactor

Recreating natural disasters and studying the part that natural components play in their severity

Hiking in local wetlands to discover the importance of environmental engineering

Thermo-mechanical processing of shape memory wire

Women in Computer Science

36

TOTAL PARTICIPANTS

Participation in the third Jackson National Life Women in Computer Science program remained consistent from 2014 to 2015. Thirty-six young women developed team- and problem-solving skills using the MIT App Inventor to create a useful application for a different demographic than themselves. Guest speaker sessions, industry role model sessions, project work, and tours provided more learning opportunities.

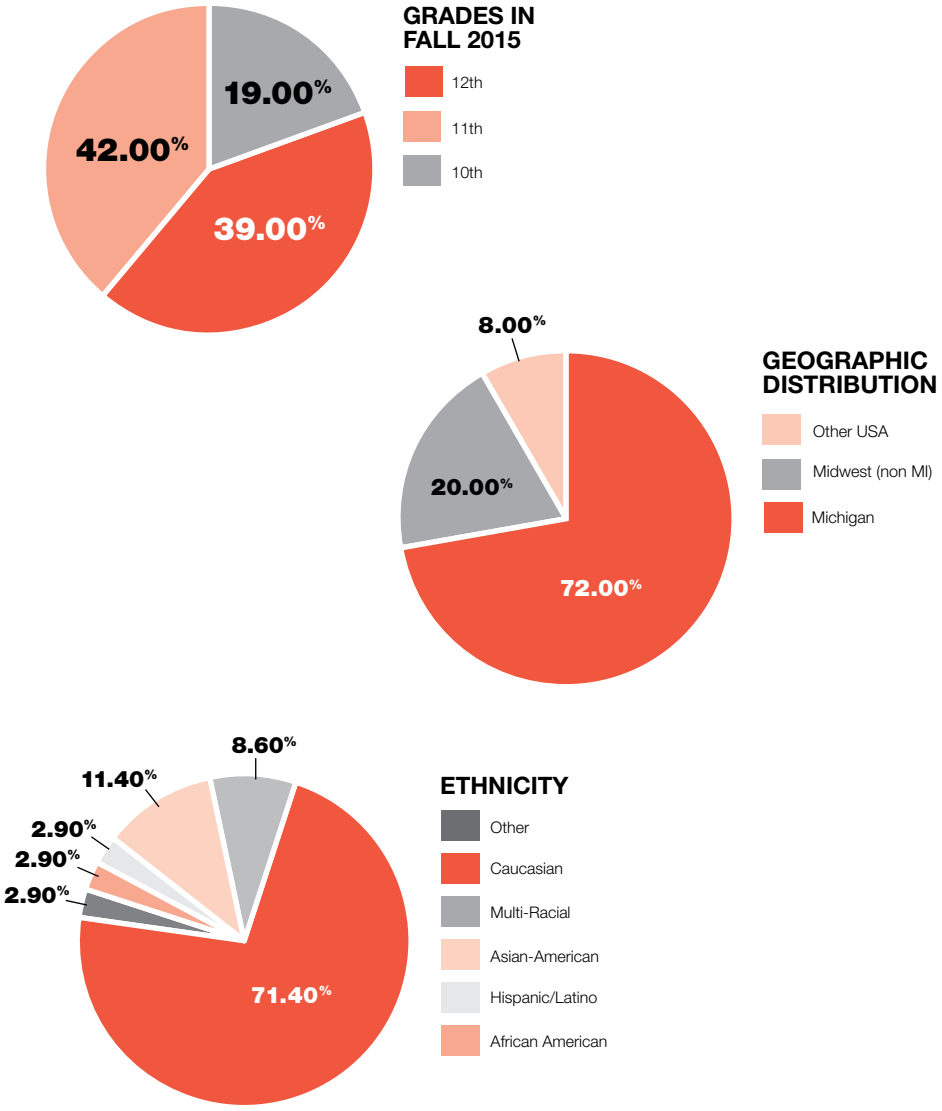
Approximately half of the students had some programming experience—from self-taught using Code Academy, to multiple programming courses.

The guest speaker opportunities were highly successful. Role models from industry spoke to students about data mining, virtual reality, 2-D and 3-D modeling, human-computer interaction, citizen science, and drones. These women work as advisors, testers, developers, project managers, directors, and scientists. Each presenter demonstrated approachable material related to her research.

The 36 students also became acquainted with college life and extracurricular activities on campus. They lived on campus, met other young women with similar interests, and explored the outdoors.

"I always knew I was interested in computer programming, but after this week, I feel confident and ready to pursue it as a career."

DEMOGRAPHICS



AVERAGE WEIGHTED GPA OF WOMEN IN COMPUTER SCIENCE PROGRAM

4.0

Weighted GPAs give additional points for advanced courses such as Advanced Placement courses

Computing Courses

Programming

Artificial Intelligence

Data Mining

Virtual Reality

Visualization

Networks

Cybersecurity

PARTICIPATING ROLE MODELS FROM INDUSTRY:

Google

Netflix

Atomica Object

CQL

IMPORTANCE OF ROLE MODELS

Only half of the young women participating had a female role model in a computing field prior to coming to Women in Computing Science. In most cases that role model was a female computing teacher. Only four young women reported knowing a woman in a computing profession other than a teacher. Students were asked on the pre- and post-surveys to list five adjectives that come to mind when thinking of a woman in computer science. On both the pre- and post-survey, students listed attributes such as creative, smart, nerdy, and brave. Adjectives that were listed on the post-survey that did not appear in the pre-surveys included: unique, awesome, diverse, good communicators, friendly, happy, collaborative, community-oriented, and passionate. Meeting role models in computer science broadened student perspective of women in the field.

National Summer Transportation Institute

30

TOTAL PARTICIPANTS

During the National Summer Transportation Institute, 30 participants used hands-on activities to explore different areas of transportation, including planes, trains, automobiles, and ships. Students learned from role models working in transportation fields about topics like bridge design, airport construction, and snow roads in Antarctica.

Field trips allowed students to explore real-world transportation projects. They visited local attractions, such as the all-wood Eagle River Bridge, Portage Lake Lift Bridge, and Isle Royale. The young women and men also went on a weekend excursion to Sault Ste. Marie and St. Ignace to tour the Soo Locks, International Bridge, and Mackinac Bridge.

In addition to travel, they became acquainted with college life and extracurricular activities on campus while meeting other talented teens with similar backgrounds and interests.

"The past two weeks have been the best weeks of my life!"

97%
feel the transportation industry has greatly contributed to solving world problems

37%
planned on involving transportation in their careers before the program began

73%
felt more informed about their career options in the transportation field

87%
said they are more interested in Michigan Tech

97%
rated the hands-on activities as above average. Many said this was their favorite part of NSTI

69%
felt more motivated to learn about the transportation industry after NSTI

After completing the NSTI program, participants plan to take the following transportation or related classes during high school or college:

83.33% — Math

96.67% — Science

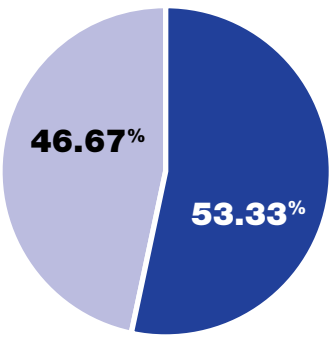
83.33% — Technology

70% — Transportation

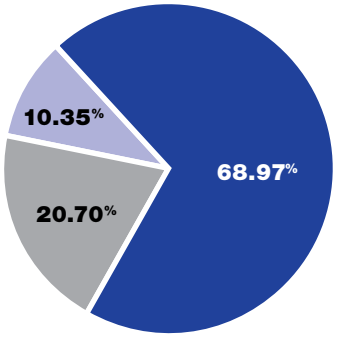
86.67% — Design

53.33% — Shop

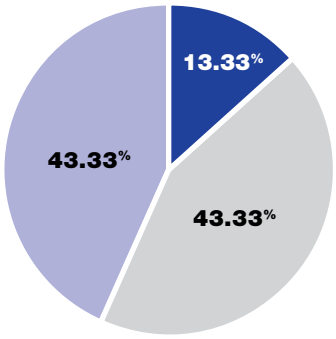
DEMOGRAPHICS



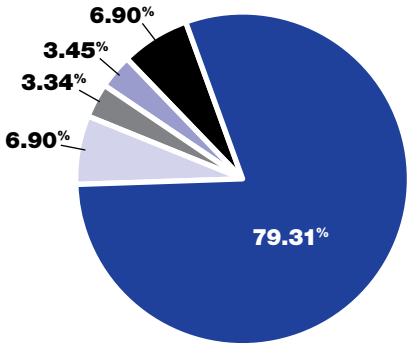
GENDER
- Female
- Male



GEOGRAPHIC DISTRIBUTION
- Other USA
- Midwest (non MI)
- Michigan

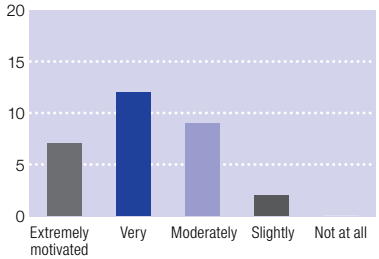


GRADES IN FALL 2015
- 12th
- 11th
- 10th

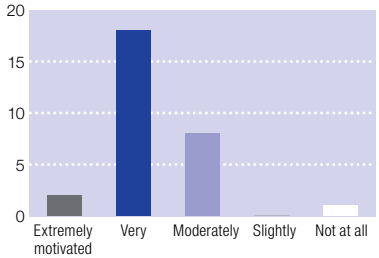


ETHNICITY
- Asian-American
- Hispanic/Latino
- Multi-Racial
- African American
- Caucasian

STUDENT MOTIVATION BEFORE AND AFTER NSTI



PRE-TEST: How motivated are you to learn about different fields in the transportation industry?



POST-TEST: How motivated are you to learn about different fields in the transportation industry?

Mind Trekkers

The Mind Trekkers road show is Michigan Tech's traveling K–12 outreach initiative. The group brings the excitement of science, technology, engineering, and mathematics (STEM) directly to young students. Mind Trekkers attends expos and events throughout the nation to showcase engaging, hands-on experiments and activities. Undergraduate and graduate student volunteers serve as a pipeline, connecting thousands of prospective students to the Michigan Tech family while enjoying one-of-a-kind opportunities and experiences. Mind Trekkers is inspiring our next generation of leaders to seek answers, get excited, and question the traditional boundaries of STEM education nationwide.

mindtrekkers.mtu.edu

FACEBOOK
facebook.com/MindTrekkers

TWITTER
twitter.com/mindtrekkers

FLICKR
mindtrekkers

YOUTUBE
youtube.com/c/MichiganTechCPCO

Founded in 2010, the Mind Trekkers student organization brings together current Michigan Tech students who are interested in sharing the excitement of STEM fields with middle and high school students across the country. The group—nearly 500 members strong—volunteers their time for road show demonstrations and performs at on-campus events, drawing attention to the group's unique hands-on science lessons. Mind Trekkers meets weekly to brainstorm, discuss, test new demonstrations, and prepare for upcoming events.

2015 OVERVIEW

16
events

6
states from Texas and Minnesota to Virginia and Missouri reached an audience of more than

70,500
people

195
traveling Mind Trekker volunteers

MIND TREKKERS ON CAMPUS AND IN THE COMMUNITY

2015

Preschool Cabin-Fever Carnival

Meet the Mind Trekkers

Keweenaw Science and Engineering Festival

Michigan Tech Orientation Week events and K-Day

Sleighbells and Science

2016

Carnegie Museum Science Saturday, January

Preschool Cabin-Fever Carnival, February

Meet the Mind Trekkers, March

Keweenaw Science and Engineering Festival, August

Michigan Tech Orientation Week events and K-Day, August/September

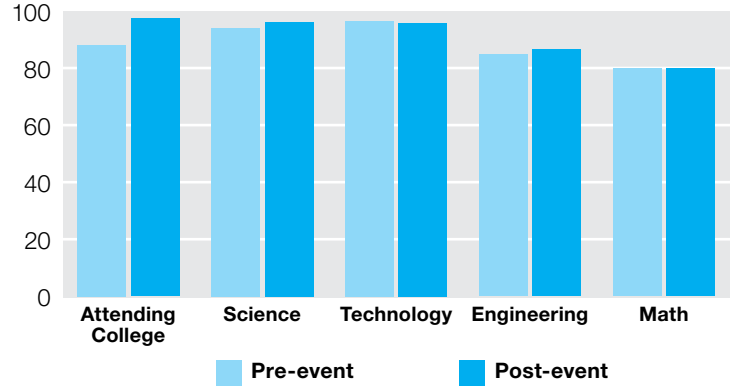
"I really enjoyed the variety of activities available for the students to participate in. I loved the passion displayed by the college students presenting the activities as well. I thought the entire day was very well organized and run."

LOOKING AHEAD

2016 Travel

JANUARY	Einstein Expo, Green Bay, Wisconsin
FEBRUARY	Northeast Wisconsin Technical College Science and Engineering Festival, Green Bay, Wisconsin
MARCH	Adventures in STEM, Houston, Texas National Society of Black Engineers, Boston, Massachusetts
APRIL	USA Science and Engineering Festival, Washington DC
MAY	Exploration Sensation at Lake Superior State University, Sault Ste. Marie, Michigan
SEPTEMBER	Dow Great Lakes Bay STEM Festival at Delta College, Midland, Michigan
OCTOBER	Northcentral Technical College Science & Engineering Festival, Wausau, Wisconsin

PERCENT OF STUDENTS INTERESTED BY SUBJECT*



*2015 Northeast Wisconsin Technical College Science & Engineering Festival results

The Center for Pre-College Outreach has specific College Access programs that are designed to expose students from our community to the university world. The goal is to promote college attendance among students in the Keweenaw and across the Upper Peninsula, and lend support to other efforts.

College Access initiatives vary from visiting a small group of students at their school, to discussing financial aid, to bringing 200 middle school students to campus for a day. Some events happen once each year, while others consist of recurring visits, which allows the program to be unique for each audience.

College Access

gear UP MICHIGAN TECH

FACEBOOK
facebook.com/michigantechgearup

GEAR UP

Michigan Tech partners with MI GEAR UP to provide pre-college programming through tutoring, mentoring, on-campus events, parent workshops, and teacher professional development. Our program assists 380 students in the graduating class of 2017 and works with eight local schools regularly. GEAR UP services range from homework help to college campus tours, family events to fun mentoring days. We also connect students to resources like financial aid information, admissions requirements, and standardized test preparation. Additionally, we offer several scholarships each summer to bring GEAR UP students to Michigan Tech's Summer Youth Programs—this gives students a chance to experience life on campus and make post-secondary education of all kinds feel achievable to all students.

72% of GU students surveyed feel knowledgable about financial aid and the costs and benefits of going to college

Get Women in Science and Engineering

On February 24, 2015, a total of 233 7th and 8th grade girls from the Western Upper Peninsula spent the day at Michigan Tech exploring the exciting and dynamic world of engineering. Participants competed in STEM-themed activities, like designing a miniature catapult, learning the chemistry of tie-dye, and building a bridge with household materials. This event is made possible by continuing partnerships with the Western Upper Peninsula Center for Science, Mathematics, and Environmental Education, the College of Engineering, and the College of Sciences and Arts. Get WISE is also partially funded by donations made to www.superiorideas.org.

Get WISE

96%

say the event made them think about math and science differently

94%

plan on attending college in the future

TiViTz®

TiViTz Tournament

A combination of checkers, logic, and arithmetic, TiViTz is a fantastic mental exercise. The 2015 TiViTz Tournament and Math Day, held on March 18, welcomed 180 area students to participate in three rounds of the game and several logic-based math exercises. TiViTz is made possible by continuing partnerships with the Western UP Center for Science, Mathematics, and Environmental Education and Michigan Tech's Department of Mathematical Sciences. The 2015 event was also generously supported by donors via Superior Ideas.

Engineering Olympics

The 25th annual Engineering Olympics was held on March 24, 2015. The event challenged 116 high school students from seven Western UP schools to work on projects—including trebuchets and mousetrap-powered cars—throughout the school year. With support from the Michigan Space Grant Consortium, this year's event also incorporated Destination ImagiNation challenges and provided take-home activity kits to all teachers in attendance. The event was put on with continuing support from the Department of Engineering Fundamentals and the College of Engineering.

ENGINEERING OLYMPICS Michigan Tech

Lighthouse Learners

Lighthouse Learners is a program hosted at the Public Schools of Calumet, Laurium, and Keweenaw (CLK). Founded by Barbara and Paul Horton '69, Lighthouse Learners aims to make college a reality for those who participate. Currently, a small cohort of high school students from the class of 2018 are involved with the program. Lighthouse Learners focus on several areas of personal and academic development including service learning/community service, study skills and success, spiritual life, and building a connection to Michigan Tech. The 2014-2015 year brought a smooth transition into high school life for the Lighthouse Learners.

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