CENTER FOR PRE-COLLEGE OUTREACH
2014 Annual Report

www.mtu.edu/precollege
What do you want to be when you grow up?

That’s a common question we often ask young people today. Maybe it’s because we heard it ourselves growing up, and the words are so ingrained in our brains. Or perhaps it just seems like an easy gateway for gauging what makes them tick. Another reason might be this: hearing people dream out loud is simply infectious. Yet, what if we did not have to resort to patiently envisioning “what might be”? What if we could provide a way to switch “when you grow up” to “right now”? Really. Why can’t we ask, “What do you want to be right now?”

Well, at Michigan Tech, we do.

There’s a lot happening at Michigan Tech, and an incredible strength of ours is having the capacity to greatly impact future generations through innovative, hands-on outreach. An important part of this work is the engaging programs at by the University’s Center for Pre-College Outreach.

At the heart of each experience is student awareness—that they are not merely going through the motions of an ordinary field trip. On the contrary, they are embracing the moment, being creative, and getting their hands on unabashed, fun learning.

At Michigan Tech, we strive to inspire scholarship. Our community doesn’t idly wait for our future workforce to stumble upon educational opportunities; we reach out and provide experiences that play with possibilities, shape dreams, and help make them a reality. We have created a culture that fosters the talent and skills of our prospective leaders and change-makers. And we are proud of what we do!

Thank you for your support,

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

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 fully immersed in a field and explore future career paths. Mind Trekkers, our wide-reaching mobile roadshow, showcases STEM in action for hundreds of thousands of people. These programs not only introduce youth to the fundamentals of STEM—they actually enable the students themselves to be scientists, mathematicians, and engineers.

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

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**TOTAL SYP ALUMNI ON CAMPUS:**

- **558 students**
- **7.9% of student body**
- **39% increase over 5 years**
- **91% majoring in STEM fields**
- **241 are female students**
- **81% call Michigan home**
- **24% enrolled in mechanical engineering-engineering mechanics**

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**SYP 2014 ATTENDEES**

44 states—an increase of 21 states over 2013. Additionally, 13 nations are represented.

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**SYP ALUMNI: FIVE YEAR SCOPE**

<table>
<thead>
<tr>
<th>Year</th>
<th>SYP</th>
<th>WIE</th>
<th>EBP</th>
<th>TOTAL</th>
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</tr>
<tr>
<td>2011</td>
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<tr>
<td>2014</td>
<td>152</td>
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<td>152</td>
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*Five year overview of matriculated students at Michigan Tech

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14 TRAVELING EVENTS FOR MIND TREKKERS

56 TOTAL SUMMER YOUTH PROGRAM COURSES

140,965* TOTAL OUTREACH PARTICIPANTS IN 2014

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*Total number of SYP, Mind Trekkers, and College Access participants
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 inherent 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-related subjects) 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, 97.18% of participants were inspired to learn more about the subjects they studied. 93.84% felt their exploration differed from their classrooms back home. 69.67% felt more likely to attend college. 88.66% showed interest in coming back for another summer. 86.3% gained confidence in their ability to be successful in a college atmosphere. 96.86% would recommend their exploration to others. 11.68% could not have attended without a scholarship.

56 total courses offered in 2014, including:
- Chemical Engineering
- Mechanical Engineering
- Blacksmithing
- CSI and Forensic Science
- Stop the Hackers!
- Rocketry and Space Science
- Mobile Robotics

**PARTICIPANT COMMENTS**

“It focused more on understanding the content than finishing a worksheet for a grade. There was also much more one on one time with instructors.”

“It was such a great experience, and there is such a diverse range of participants; everyone can find their place here.”

“This exploration was great for learning about Michigan Tech and the opportunities they have for students as well as good for learning about mechanical engineering categories.”

**DEMOGRAPHICS**

- **Gender**
  - Female: 41.6%
  - Male: 58.3%

- **Grades in Fall 2013**
  - 12th: 32.16%
  - 11th: 8.17%
  - 10th: 6.68%
  - 9th: 9.28%
  - 8th: 10.66%

- **Geographic Distribution**
  - Michigan: 64.61%
  - Midwest (non Michigan): 23.05%
  - Other USA: 18.57%
  - International: 11.68%
Through the Women in Engineering program, 142 young women explored different areas of engineering and their applications. They learned about the variety of engineering careers, investigated the many ways an engineer can directly impact the quality of people’s lives, and developed team skills through Destination Imagination simulations. The participants also met female role models who work in engineering fields and discussed how to be successful in undergraduate engineering programs.

90.85% felt more likely to pursue a career in engineering.

83.10% considered themselves very informed regarding the variety of career options available in engineering.

88.81% rated the hands-on activities as above average.

3.9 Women In Engineering Average GPA

94.41% of participants would recommend Women in Engineering to others.

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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

Building a motorized robot with toothbrush components

Designing a bridge and testing its strength

Recreating natural disasters and studying how natural components affect severity

Thermo-mechanical processing of shape memory wire

Using an atomic force microscope to explore the strength of nanoparticles

8.40% of participants would recommend Women in Engineering to others.

94.41% of participants would recommend Women in Engineering to others.

88.81% rated the hands-on activities as above average.

3.9 Women In Engineering Average GPA

94.41% of participants would recommend Women in Engineering to others.

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During the Engineering Scholars Program, 152 participants explored careers in areas like 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 Destination 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.

**Engineering Scholars Program GPA**

3.88

**96.93% of participants would recommend Engineering Scholars Program to others.**

**92.86% felt more likely to pursue a future career in engineering.**

**87.35% consider themselves ‘Very Informed’ about the options available in engineering.**

**90.55% said their group projects helped them understand engineering applications.**

**Engineering Group Projects**

- Saponification: making soap
- Mud and fire: geological engineering as it related to natural hazards
- Blacksmiting
- 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
- Thermo-mechanical processing of shape memory wire

**PARTICIPANT COMMENTS**

“Even though we only had a week to explore all the different aspects of engineering, it was enough time to really ignite my passion and encourage me to aspire to become a biochemical engineer after college.”

“These people had no preconceived notions about me, and I was able to really be myself. I liked working in groups where I wasn’t afraid to express myself.”

“The program helped my son decide on his major as he was unsure which computing science field to look into. He now feels confident in his choice of software engineering.”

**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
- Exploring the world of the tiny in nanotechnology
- Thermo-mechanical processing of shape memory wire

**FACEBOOK**

facebook.com/MichiganTechESP

**DEMOGRAPHICS**

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<th>Gender</th>
<th>21.71% Male</th>
<th>78.29% Female</th>
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<td>Grades in Fall 2013</td>
<td>10.84% 10th</td>
<td>55.42% 11th</td>
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<tr>
<td>Ethnicity</td>
<td>74.85% Caucasian</td>
<td>0.6% Native American</td>
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**TOTAL PARTICIPANTS**

152
For the second Jackson Women in Computer Science program, participant numbers doubled compared to 2013. The young women developed team and problem-solving skills by completing a hands-on team project, which challenged the young women to use MIT App Inventor to create a useful application aimed for a different demographic than themselves. The guest speaker sessions, industry role model sessions, project work, and tours provided a number of learning opportunities. Approximately two-thirds of the students had at least some programming experience ranging from self-taught using Code Academy to multiple programming courses.

Similar to the program’s first year, the guest speaker opportunities were highly successful. Role models from industry spoke to students about data mining, virtual reality, data visualization, artificial intelligence, and security. These women work in a broad range of computer science positions including an advisor to a senior VP, tester, developer, project manager, director, and scientist. Each presenter demonstrated approachable material related to her research areas. The 36 students also became acquainted with college life and extracurricular activities on campus. They met other young women with similar interests, lived on campus, and played outdoors.

**PARTICIPANT COMMENTS**

“Talking to women in computer science really opened my eyes about how computer science is all about problem solving and working with others. After attending the program, I am definitely more interested in the field of computer science.”

“My school does not offer computing classes and I have generally never been encouraged to pursue an education or career in science because I’m a girl. The program proved to me that computer science is important and women in the field are very successful.”

“Amazing. Fantastic. Life-changing.”

**IMPORTANCE OF ROLE MODELS**

Only a third of the young women participating had a female role model in a computing field prior to coming to Women in Computing Science. For about half, that role model was a computing 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 smart, nerdy, and brave. Adjectives that were listed on the post-survey that did not appear in the pre-surveys included: fun, problem-solver, thinker, wonderful, and beautiful. Meeting role models in the field broadened student perspective of women in the field.
During the National Summer Transportation Institute, 27 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 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.

85.19% of participants felt more likely to have a future career in the transportation industry. 31.03% had planned on involving transportation in their careers before the program began. 92.59% felt more encouraged to attend college after completing the program. 96.3% agree that the transportation industry has contributed greatly to solving problems found in the world. 92.59% rated the hands-on activities as above average. Many noted the activities as their favorite part of NSTI. 81.48% said they are ‘Very Informed’ about the different transportation career options.

88.89% — Math
81.48% — Science
81.48% — Technology
62.96% — Transportation
57.69% — Design
44.44% — Shop

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

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?

Gender

- Female: 20%
- Male: 74%
- Other: 3.70%
- Asian American: 7.40%
- Hispanic/Latino: 3.70%
- Multi-Racial: 3.70%
- African American: 14.81%
- Caucasian: 29.63%

Grades in Fall 2013

- 12th: 3.70%
- 11th: 7.40%
- 10th: 18.52%
- 9th: 59.26%
- Other: 3.70%

Ethnicity

- Caucasian: 74%
- Female: 20%
- Male: 74%
- Other: 3.70%
- Female: 20%
- Male: 74%

PARTICIPANT COMMENTS

“Before this program I was sitting around the house wasting time. Here, every day is a new adventure.”

“I’ve never learned so much about anything in the STEM field as quickly or as thoroughly as the transportation topics here in the program.”

“This program was an amazing experience; when I went into this I knew almost nothing about bridges. Now being finished with this course I know about the field, what it’s like, and how to design a successful bridge. This has taught me so much that I wouldn’t have expected to learn, yet while having fun.”
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.

2014 OVERVIEW

14 events
7 states
from Louisiana to Washington D.C., Minnesota to Tennessee
reached an audience of more than 139,000 people

MIND TREKKERS ON CAMPUS AND IN THE COMMUNITY

2014
Orientation Week and K-Day
Preschool Fun Days
What is Mind Trekkers?

2015
Preschool Cabin Carnival, February 21
Meet the Mind Trekkers, March 29
Keweenaw Science & Engineering Festival, August 5–8
Michigan Tech Orientation Events, August 23–29

PRECENT OF STUDENTS INTERESTED BY SUBJECT*

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<tr>
<th>Subject</th>
<th>Pre-event</th>
<th>Post-event</th>
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<td>Attending College</td>
<td>85.1%</td>
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<tr>
<td>Science</td>
<td>64.0%</td>
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<td>Technology</td>
<td>68.7%</td>
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<td>Engineering</td>
<td>52.2%</td>
<td>49.7%</td>
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<tr>
<td>Math</td>
<td>53.0%</td>
<td>45.1%</td>
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*AT&T Sheboygan Science and Engineering Festival results

PARTICIPANT COMMENTS

“I didn’t know science could be fun until Mind Trekkers showed me it could.”

“The science festival really changed me because it wasn’t boring like sitting in a classroom for two hours learning. When you go to do Mind Trekkers, you are learning the same things, but you are really having fun and you’re doing all the activities too.”

“I didn’t know before that sodas with less sugar float in water and sodas with more sugar sink in water. I loved it so much when I went with my school on Friday that I took my family and went again on Saturday.”
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.

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.

77% of GU students surveyed feel knowledgeable about college entrance requirements after two years

Get WISE
On February 25, 2014, a total of 250 7th and 8th grade girls from the western Upper Peninsula spent the day at Michigan Tech, where they participated in a range of activities to connect them with the exciting, dynamic world of engineering. Each year, the participants compete in three challenges, which have included building a bridge with household materials and designing a miniature catapult. 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.

TiViTZ Tournament
A combination of checkers, logic, and arithmetic, TiViz is a fantastic mental exercise. This year, the Center for Pre-College Outreach piloted a Math Day to go with TiViz. On March 24, 2014, a total of 215 area students participated in several hands-on math activities about surfaces and game strategies, then wrapped up the day with a presentation on geometry in the real world. TiViz is made possible by continuing partnerships with the Western Upper Peninsula Center for Science, Mathematics, and Environmental Education and Michigan Tech’s Department of Mathematical Science.

Engineering Olympics
The 24th annual Engineering Olympics was held on March 25, 2014. This event challenged 92 students from six area high schools to work on projects throughout the school year—including trebuchets and mousetrap-powered vehicles using physics and engineering principles learned in school. The event provided a fantastic opportunity for 9th through 12th grade students to experience a day on campus while exercising their engineering skills in friendly competition. The event is put on with support from the Department of Engineering Fundamentals and the College of Engineering.

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.