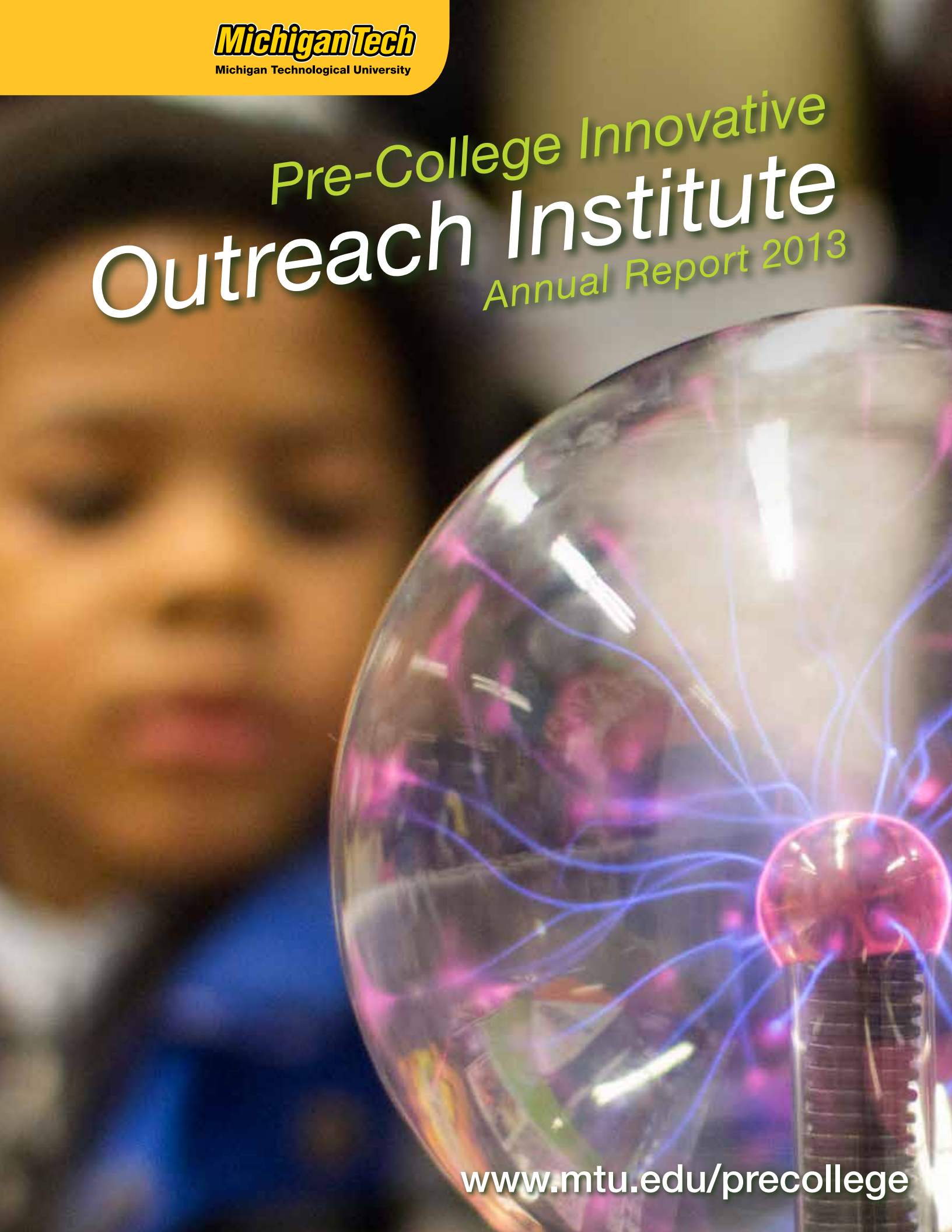
Michigan Tech
Michigan Technological University

Pre-College Innovative Outreach Institute

Annual Report 2013



www.mtu.edu/precollege

Annual Report 2013

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"I can walk away from this program knowing what I want to go to college for, and it's because of you. So again, thank you from the bottom of my heart. You're fueling future minds, and that is awesome!"

"WIE was an experience I will never forget and it has taught me so much more than just engineering. I learned that if I put my mind to something I can achieve it and that I need to leave my comfort zone more often."

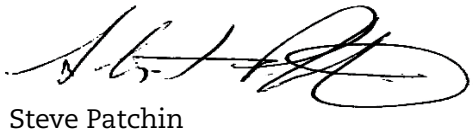
Researcher Angela Duckworth defines grit as "perseverance and passion for long-term goals." Research has found that those students possessing grit are more successful in academic and nonacademic pursuits. So how do you help students gain perseverance and passion?

Michigan Tech structures its outreach programs to put unique learning opportunities into the hands and imaginations of students. This focus on engagement and interaction allows students to explore and discover their interests and aptitudes, helping them relate new-found interests to fields of study and careers. Students leave the program having discovered what academic pursuits they are passionate about!

The K-12 outreach programs provide students problem-solving, intellectual, and team engineering challenges. Residential experiences place students with peers from distant locations, many of whom are taking part in their first adventure away from parents and friends in an unfamiliar location. They share a level of anxiety mixed with uncertainty and self-doubt. Michigan Tech's students, faculty, and staff become mentors who provide these students with tools to spin this anxiety into confidence. After participating in outreach experiences, the increase in each participant's self-efficacy and perseverance is remarkable.

These programs provide K-12 students the experiences that allow them to create their own grit, a recipe for lifelong success. Thank you for supporting our efforts.

Sincerely,



Steve Patchin
Director, Pre-College Innovative Outreach Institute
Michigan Technological University

Summer Youth

A variety of intensive, week-long programs are aimed at students investigating and discovering careers in engineering, science/technology, business, computing, outdoors/environmental studies, and humanities/social sciences.

Summer Youth Programs encourages participants to be bold, choose adventure, and relentlessly push the limit. We offer innovative teaching and learning experiences that promote investigation of collegiate studies, college life, and career awareness. Through hands-on, discovery-based programs, our students have the opportunity to step out of their comfort zone and stretch their imagination without the inherent pressure of grades, exams, or assignments.

98.23% of participants were inspired to learn more about the subject they studied.

100% of participants felt that their exploration met or exceeded their expectations.

53.58% felt more likely to attend college after completing the exploration.

38.11% already planned on attending college.

90.57% of participants would return for another summer.

19.31% could not have attended without a scholarship.

89.95% said that they gained confidence in their ability to be successful in a college atmosphere.

97.25% would recommend their exploration to others.

Programs

37 TOTAL EXPLORATIONS OFFERED IN 2013, INCLUDING:

Chemical Engineering
Gratiot Lake Aquatic Ecology
Blacksmithing
Mining Engineering
Stop the Hackers!
Medical Lab Science
Mobile Robotics

"It might sound strange, but the youth program taught me how to make friends. I usually don't open up and try to meet new people, but this week was different. I met new people and just decided to go with it. I was who I am and it worked out. The most challenging part of this program was leaving."

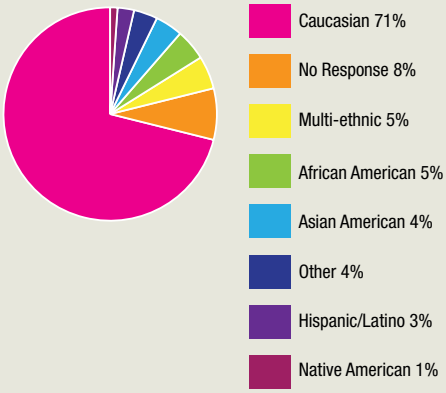
One participant's favorite part of their explorations included "making aspirin because it was a complex and challenging procedure, and we could use an experiment to determine how well we had done it. My group was very successful."

"My son's involvement in Youth Programs spurred his interest in information technology. He really took off, after a couple of explorations that helped him focus on college and other future plans."

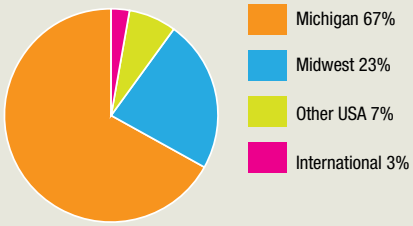
DEMOGRAPHIC INFORMATION

Total participants: 1,068

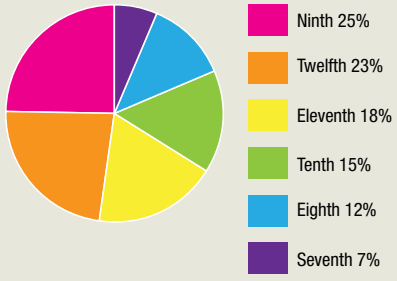
ETHNICITY



GEOGRAPHIC DISTRIBUTION



GRADE, FALL 2012



Women in

During the Women in Engineering program, 149 participants explored different areas of engineering and their applications, learned about a wide array of careers in engineering through focused presentations, and developed team skills through Destination Imagination simulations. The young women also met female role models who work in engineering fields, investigated the many ways an engineer can directly impact the quality of people's lives, and learned how to be successful in undergraduate engineering programs.

At the same time, they became acquainted with college life and extracurricular activities on campus, met other young women with similar backgrounds and interests, and built networks and friendships while enjoying a variety of recreational activities in the natural setting of Michigan's Upper Peninsula.

97.95% of participants would recommend Women in Engineering to others.

84.25% of participants felt more likely to have a career in engineering after attending Women in Engineering.

89.11% of participants considered themselves very informed regarding the variety of career options available in engineering.

91.72% of participants felt more encouraged to attend college after completing the program.

Engineering Sessions

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

- Building a motor
- Designing a bridge and testing its strength
- Operating a continuous chemical reactor
- Designing a computer-controlled reaction
- Thermomechanical processing of shape memory wire
- Using an atomic force microscope to explore the strength of nanoparticles

Engineering

ENGINEERING GROUP PROJECTS

- Combining a pencil and a custom fabricated circuit board to create a resistive theremin that could turn drawings into sound
- Constructing a virtual world and experiencing it in a virtual reality lab
- Building a boat and testing how it floats using material science

"I will remember how WIE inspired me to study engineering. It allowed me to believe engineering is an option for me."

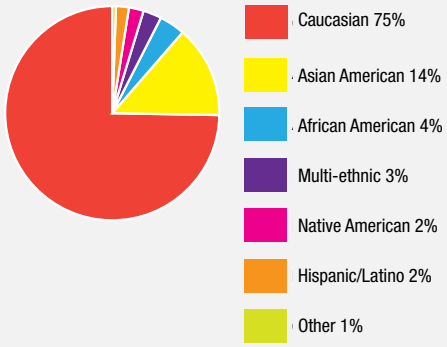
"Girls need to be told that it's OK to be crazy smart, and we shouldn't compromise ourselves into easy jobs but challenge ourselves. WIE is the perfect place to learn that! Be awesome!"

"It was a great experience for [my daughter]. She is very strong in math and sciences. I have been pushing her toward the engineering fields, and she has been reluctant. When she came home she said, 'Well I think it's time to get my nerd on!' She loved every aspect of the camp. Thanks!"

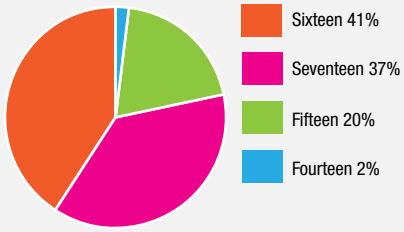
DEMOGRAPHIC INFORMATION

Total participants: 149

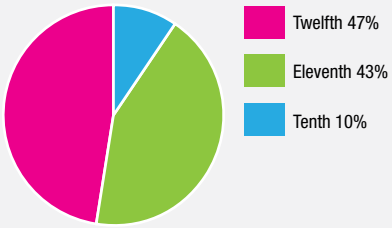
ETHNICITY



AGE, FALL 2012



GRADE, FALL 2012



Engineering Scholars

During the Engineering Scholars Program, 144 participants explored engineering careers in areas like mechanical, computer, environmental, electrical, chemical, biomedical, civil, geological, and materials.

They also got inside information from role models working in engineering fields and learned to work in teams to tackle group projects. They learned about the college application process and received tips for succeeding in university engineering programs. The students also experienced college life—staying in a residence hall, exploring campus, and meeting others with similar interests. Finally, they enjoyed team competitions, a variety show, and tons of outdoor activities in Michigan's beautiful Keweenaw Peninsula.

Engineering Sessions

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

- Building a motor
- Designing a bridge and testing its strength
- Operating a continuous chemical reactor
- Designing a computer-controlled reaction
- Thermomechanical processing of shape memory wire
- Using an atomic force microscope to explore the strength of nanoparticles

98.56% of participants would recommend the Engineering Scholars Program to others.

95.68% of participants felt more likely to have a future career in engineering after participating in the program.

86.43% of participants felt very informed about the options available in engineering after completing the program.

83.29% of participants said their group projects helped with their understanding of engineering applications.

90% of participants planned to attend college already, with the other 10% feeling more encouraged to attend college after completing the program.

Program

ENGINEERING GROUP PROJECTS

- Saponification: making soap
- Blacksmithing
- Prosthetic leg: using biomedical engineering while on a budget
- Remotely operating and testing an underwater vehicle in the Keweenaw Waterway
- Holography in medicine: looking at 3D images used in diagnostic medicine

"ESP is an amazing program that has helped me become less confused on my future college/career outlook. I think that it is safe to say that ESP has turned me into an engineer."

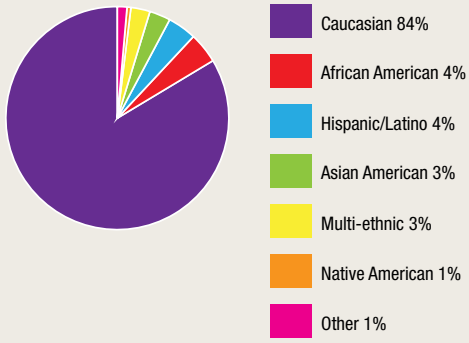
"Thanks to you, I now have an in-depth view of many of the fields of engineering that will help guide my college and business-world experience. I feel that I am now ready to make an informed choice that will impact the rest of my life, and I sincerely thank you for that."

"[Our son] told us so many things, I couldn't name just one. But the biggest thing that warmed my heart was to see how happy he was when I came to get him. He didn't want to leave, and honestly that speaks volumes! Thank you for giving my son such a wonderful experience!"

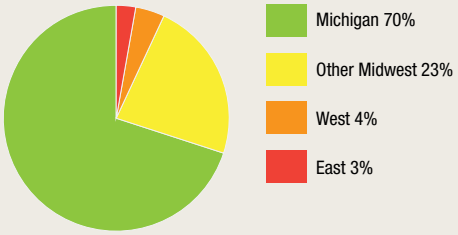
DEMOGRAPHIC INFORMATION

Total participants: 144

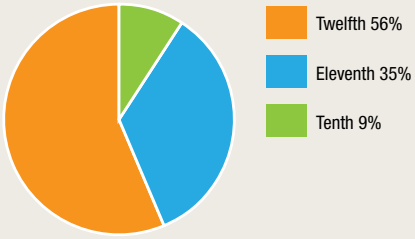
ETHNICITY



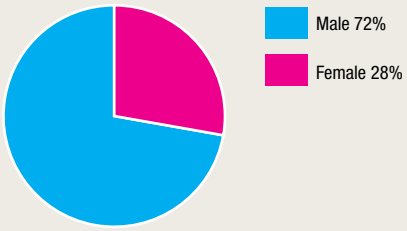
REGIONAL DISTRICTION



GRADE, FALL 2012



GENDER



NATIONAL SUMMER Transportation

During the National Summer Transportation Institute, twenty-nine participants used hands-on activities to explore different areas of transportation, including planes, trains, automobiles, and ships; learned from role models working in transportation fields about topics such as bridge design, airport construction, and snow roads across Antarctica; and discovered team skills and applied transportation knowledge during group projects.

They also went on field trips to local attractions, such as the Eagle River Bridge, Portage Lake Lift Bridge, and Isle Royale; went on a weekend-long excursion to Sault Ste. Marie and St. Ignace to tour the Sault Locks, International Bridge, and Mackinac Bridge; became acquainted with college life and extracurricular activities on campus; and met other talented teens with similar backgrounds and interests.

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

- **100%** — Math
- **100%** — Science
- **100%** — Technology
- **60%** — Transportation
- **35%** — Design
- **31%** — Shop

80% of participants felt more likely to have a future career in the transportation industry after participating in the program. Only **31.03%** had planned on involving transportation in their careers before the program began.

93.33% of participants felt more encouraged to attend college after completing the program.

100% of participants agree that the transportation industry has contributed greatly to solving world problems.

100% of participants rated the hands-on activities as above average. Many noted the activities as their favorite part of NSTI.

93.33% of students now feel very informed about the different career options available in the transportation industry.

Institute

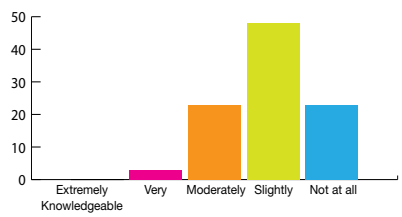
TRANSPORTATION GROUP PROJECTS

- Exploring transportation
- Bridge design and airport construction
- Working as teams and discovering transportation
- Week-long excursions and field trips

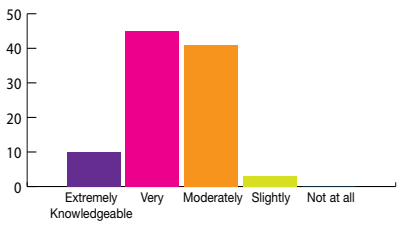
"We are family. Although we all came from different backgrounds, during the two weeks we became extremely close. These people are like brothers and sisters to me. Many years down the road, we won't remember what we wore or what we ate at camp, but we will remember the once-in-a-lifetime experiences and the people we had them with."

"This is a great program for students to be acclimated to living on campus, attending class, career options, college major options, and meeting new people."

Pre-test: Current level of knowledge about different fields in the transportation industry



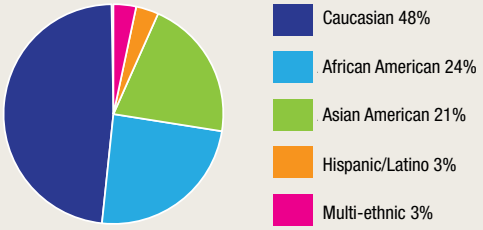
Post-test: Current level of knowledge about different fields in the transportation industry



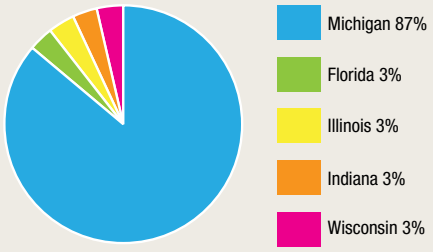
DEMOGRAPHIC INFORMATION

Total participants: 29

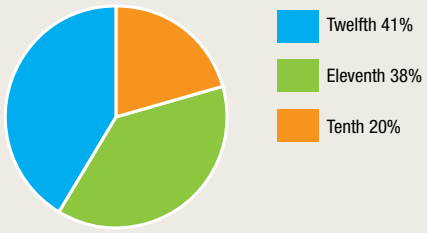
ETHNICITY



STATE



GRADE, FALL 2012



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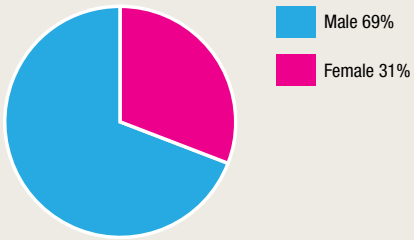
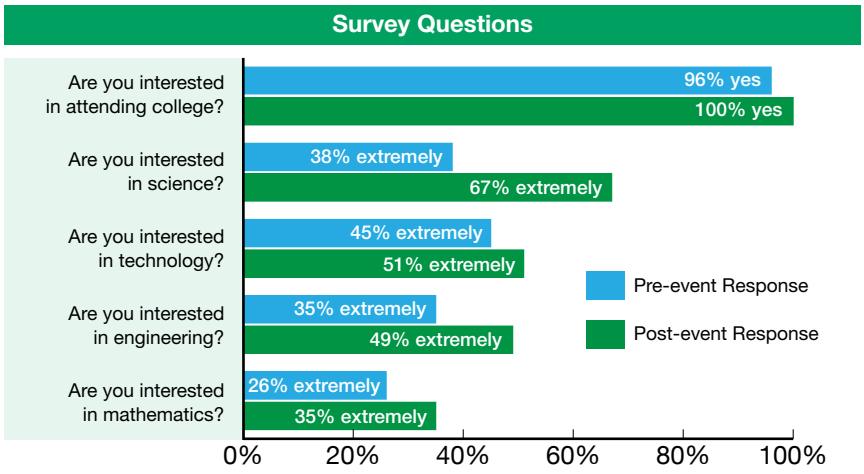


MIND

The Mind Trekkers road show is Michigan Tech's newest K–12 outreach initiative. Bringing the excitement of science, technology, engineering, and mathematics (STEM) directly to young students, Mind Trekkers attends expos and events throughout the region and across the nation to showcase engaging, hands-on experiments and activities. Mind Trekkers serves as an active 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 a STEM education.

MIND TREKKERS SURVEY RESULTS

Mind Trekkers showed once again at the Sheboygan Science and Engineering Festival that hands-on demonstrations and connections to the world around students drives interest in STEM fields. More than 4,000 middle and high school students attended, and participants were given a pre- and post-event survey on their interest in college and in the STEM fields. The results speak for themselves.



TREKKERS

FUTURE EVENTS FOR MIND TREKKERS (2014)

- New Orleans, Louisiana—Chevron STEMZONE @ NBA All-Star Jam Session, February 13–16
- Munising, Michigan—March 18
- Iron River, Michigan—March 20
- Newark, Delaware—The Independence School STEM FEST, April 24
- Washington, DC—USA SEF, April 25–27
- Ludington/Harrison/Alpena, Michigan—AT&T Roadshow, May 5–7
- Plymouth, Wisconsin—Sheboygan SEF, May 9–10
- Knoxville, Tennessee—Destination Imagination Global Finals, May 21–24
- Virginia, Minnesota—Iron Range STEM Showcase, October 3–4
- University Center, Michigan—Great Lakes Bay SEF, October 10–11
- Gull Lake, Michigan—Gull Lake SEF, November 7–8

(Note: SEF=Science and Engineering Festival)

Traveling Events for Mind Trekkers (2012–13)

- YES! Expo, Ford Field, Detroit, November 1—19,632 attendees
- Einstein Science Fair, Shopko Center, Green Bay, January 10—2,500 attendees
- Kaleidoscope, Northern Michigan University, Marquette, March 2—1,200 attendees
- College of Lake County, Grayslake, Illinois, April 12—1,640 attendees
- Northeast Wisconsin Technical College, Green Bay, and Bemis/UW-Fox Valley, Appleton, April 18–20—5,700 attendees
- Lake Superior State University, GEAR UP, Sault Ste. Marie, May 9—1,100 attendees
- Destination Imagination, Knoxville, Tennessee, May 21–22—16,000 attendees
- Boy Scout Jamboree: Mount Hope, West Virginia, July 15–22—36,000 attendees
- Bay Area Science Festival, San Francisco, November 2—30,000 attendees

Mind Trekkers on Campus and in the Community

2012–13

- Houghton County Fair
- Orientation Week and K-Day
- Preschool Fun Days
- Touch the Future
- Keweenaw Bay Indian Community—Baraga
- Michigan STEM Partnership—Michigan Tech

2014

- Preschool Cabin Carnival, February 22—Houghton
- State Farm SEF, May 16—Houghton
- Michigan Tech Orientation Events, August 24–30—Michigan Tech

MIND TREKKERS

The Mind Trekkers student organization, founded in 2011, 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.

MINDTREKKERS.MTU.EDU

PROMOTING

Officials from government and education on every level repeat the same mantra: the 21st century demands a workforce with a strong background in STEM (science, technology, engineering, and mathematics). The best way to increase STEM interest and competence is by reaching youth in their formative years, engaging their sense of wonder at what these fields offer them. Summer Youth Programs and Mind Trekkers provide that spark for high school and middle school students, respectively, and 2013 yielded even more data showing the effectiveness of the Pre-College Innovative Outreach Institute in its mission.

Michigan Tech's outreach includes these other successful programs, on and off campus.

The Isle Royale Institute

Contact Ken Vrana, 906-487-4335, kjvrana@mtu.edu

Located in the School of Forest Resources and Environmental Science, the institute assisted in the design and sponsorship of the following youth-related pilot programs.

- *Expedition Isle Royale* with seven 8th graders from Houghton and Keweenaw Counties (a youth travel camp in collaboration with Youth Programs).
- *Families in a Wilderness*—home-school environmental education course.
- Two week-long *Family Camps* were held at Isle Royale National Park in July 2013 with a total of 49 participants (at least one parent or guardian for each youth participant).

Bioathlon

Contact Jeff Lewin, 906-487-3435, jclewin@mtu.edu

In its twenty-fifth year, Bioathlon is a hands-on annual competition for sophomore-level students. Western and Central UP schools send teams of four students and teachers/chaperones for the daylong competition. The top three teams are acknowledged with awards. During the competition, the teachers attend faculty or staff-led sessions to learn activities and concepts that can be brought back to the classroom. Last year, sixteen schools and teachers with sixty-four sophomores came to campus.

STEM

> *"Some of the best parts of Bioathlon were definitely the hands-on problems. The competition isn't just theory, it's also practice, and that is something that exposes kids to what a career in a science field is truly like. I particularly liked the field ID and biochemistry problems. I like academic competitions of any kind because they remind me that learning is never time wasted or a useless experience. The facts and tidbits can always be used and applied in some way, shape, or form. Thank you."*

A Daylong Visit to the Department of Biological Sciences

Contact Jeff Lewin, 906-487-3435, jclewin@mtu.edu

Local and regional schools send classes, ranging from freshmen to seniors, to learn how biology is important in their lives, attend their first college-level lecture, learn about career opportunities, participate in hands-on laboratories, and get introduced to college living by eating in the residence hall dining room. Last year, eight schools totaling 175 students experienced Michigan Tech.

Engineering Ambassadors

Contact Michele Miller, 906-487-3025, mhmiller@mtu.edu

Part of a national network of Engineering Ambassadors programs, it has two goals: outreach to middle and high schools about engineering, and communication training and professional development of engineering students. A typical classroom visit starts off with a short presentation by a pair of ambassadors followed by a hands-on activity. Before visiting a school, the ambassadors receive training on preparing and making effective presentations. In the past year, fourteen ambassadors have visited nine classes at four area schools.

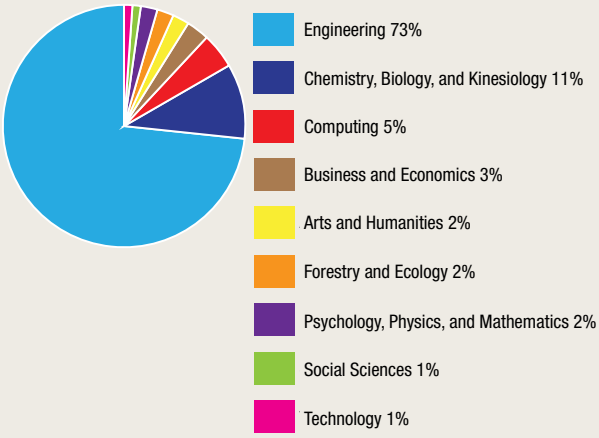
Fall 2012: 2 ambassadors, 15 students

Spring 2013: 8 ambassadors, 63 students

Fall 2013: 6 ambassadors, 70 students

YP alumni enroll at Michigan Tech, many in a STEM field.

MAJORS



YP ALUMNI AT MICHIGAN TECH

Total YP alumni at Michigan Tech, Fall 2013: **499**;
25% increase in 3 years

7.1% of Michigan Tech student body;
7% increase over 2012

Females **222**; **4.7%** increase over 2012

93% enrolled in STEM field;
2% increase over 2012

Thanks to our sponsors for making last year a great one.

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Dave Brule
Dow Chemical
Dow Corning
Federal Highway Administration
General Motors Foundation
Kohler
USA Science and Engineering Festival

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