Center for Pre-College Outreach

Annual Report.**2012**

Michigan Tech

Michigan Technological University

www.mtu.edu/precollege

Center for Pre-College Outreach

Annual Report.**2012**

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We are proud to present to you the 2012 Michigan Technological University Center for Pre-College Outreach Annual Report.

"My name is Pana and I have just finished Women in Engineering at Michigan Technological University. During my week here, I have learned so much about engineering and the fields involved in engineering. Before coming here I thought engineering was something very broad that involved a lot of machinery. I learned that it's not; there are many things involved in engineering not just machinery. There's math, many theories, concepts, and fun. Aside from learning about engineering I also got a taste of college life—spending a week here has given me an insight to what college would be like. I really hope WIE continues so that many young women like myself get to experience such a fabulous opportunity."

In 2006, Dr. Robert H. Tai, a professor at University of Virginia's School of Education in Charlottesville, published a study in the journal *Science*. His study tracked thousands of students involved in the National Educational Longitudinal Study. His results found that students achieving average grades in their middle school years who expressed interest in science were two to three times more likely to complete degrees in science or engineering fields, compared to students who had very good grades during their middle school years but had not expressed interest in science. This lack of interest in science is what we call the 'attraction gap' and is a determining factor in a student's future academic and career success.

Michigan Technological University's Center for Pre-College Outreach is constantly creating, executing, and reengineering programming for elementary, middle, and high school students to help bridge this 'attraction gap.' These efforts are conducted collaboratively with faculty, staff, and other innovative outreach professionals both on and off our campus. The success of our efforts is vital to ensure the inspiration and engagement of our youth in their cradle-to-career educational journey.

This report provides you with a glimpse of our efforts, data illustrating successes and challenges, and acknowledgements of the partners that share and support these impactful initiatives. We thank you for taking time to review our efforts and encourage you to consider how you can become part of the effort to close the 'attraction gap' that stands in the way of our youth achieving their true potential.

Sincerely,

Stephen Patchin
Director, Center for Pre-College Outreach
Michigan Technological University

Summer Youth Programs

YOUTH PROGRAMS EVALUATION HIGHLIGHTS

In 2012, participants had the opportunity to choose from more than fifty different explorations. Our most popular courses included forensic science and CSI, general engineering, chemical engineering, video game programming, and backpacking on Isle Royale. Other explorations, such as blacksmithing, remain popular year to year.

"I learned a lot of valuable information that I will use for the rest of my life, like teamwork, innovation, and engineering principles. This camp gave me a real-life college opportunity and now I know a little of what college is like."

Michael (Compton, CA)

"They were able to take things outside the classroom, letting us learn and explore all of Houghton's beauty. The staff was encouraging and fun. My instructor challenged me and supported me throughout the class."

Zoe (Traverse City, MI)

"Without this program I would never have thought of pursuing an engineering degree. When I come to Tech, I hope to be a counselor for the WIE program and change the lives of girls by encouraging them to be engineers."

Jessica (Minneapolis, MN)

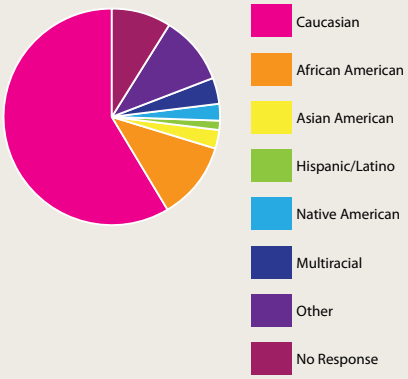
"During the program I have not only been provided with an opportunity to learn so much about engineering, but also to meet so many people who share common interests. SYP has affected my life by providing me with so much knowledge that will help me make my future decisions so much easier."

Hannah (Crystal Falls, MI)

DEMOGRAPHIC INFORMATION

Total participants: 1,068

ETHNICITY



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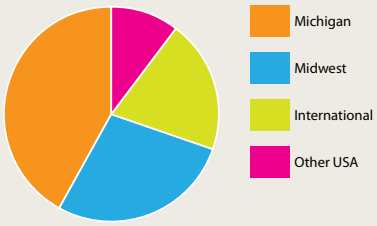
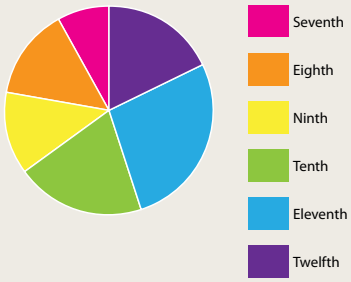


GRADE, FALL 2012



Women in Engineering

An intensive weeklong investigation and discovery of disciplines, knowledge, and careers in engineering for young women.

PROGRAM CONTENT

During Women in Engineering (WIE), at Michigan Tech, a total of **149** participants:

- Explored different areas of engineering and its applications
- Learned about a wide array of careers in engineering through focused presentations
- Honed and developed team skills through Destination Imagination simulations
- Met female role models who work in engineering fields
- Investigated the many ways an engineer can directly impact the quality of people's lives
- Learned how to be successful in undergraduate engineering programs
- Became acquainted with college life and extracurricular activities on campus
- Met other young women with similar backgrounds and interests
- Built networks and friendships while enjoying a variety of recreational activities in the natural setting of Michigan's Upper Peninsula

EVALUATION HIGHLIGHTS

Based on participant evaluations, students especially enjoyed the hands-on group projects and activity portions of their engineering sessions. Favorite projects included processing hot metal into objects, sand-casting a name plate, learning about sports engineering, making soap from raw materials, exploring renewable energy with wind turbines, and designing a building to withstand an earthquake.

- 92.41% of participants would recommend Women in Engineering to others.
- 86.71% of participants felt more likely to have a career in engineering after attending Women in Engineering.
- 69.45% of participants considered themselves "Very Knowledgeable" regarding the fields of engineering after attending the program.
- 90.21% of participants felt more encouraged to attend college after completing the program.

Most memorable experiences included the engineering projects and instructors, meeting other girls interested in engineering, evening activities, and going on field trips to places in the area.

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

ENGINEERING SESSIONS

Projects in the nine engineering sessions included:

- Building a motor
- Designing a bridge and testing its strength
- Operating a continuous chemical reactor
- Designing a computer-controlled reaction
- Recreating natural disasters and studying the part that natural components play in their severity
- Thermo mechanical processing of shape memory wire
- Using an Atomic Force Microscope to explore the strength of nanoparticles

"This was great for me because, as a senior, I'm running out of time to decide on a career. Without this program, I probably would have spent unnecessary time in college switching majors. We got to participate in a lot of fun group projects throughout the week that let us learn while having fun."

Megan (Appleton, WI)

"This week I got to attend nine different engineering sessions and learn all about them. I also got to see a glimpse of what my future may be like in pursuing this degree. Discovering my favorite engineering field enables me to choose courses in high school that will best prepare me for college."

Rachel (Bloomington, IN)

"This week at Michigan Tech consisted of fun and exciting activities that taught me many new things. I learned what causes volcanoes, how a liquid extractor works, and the force it takes to crush a can of Pepsi! In all of the engineering sessions you learn without even realizing it!"

Hailee (Millington, MI)

"I am hoping to study environmental engineering in college. I dream of traveling the world and working on sustainable projects that will keep the planet and people safe and clean. It is because of the Michigan Tech Women in Engineering program that I finalized these decisions for my future. I have learned to be more open to new ideas and I have strengthened my leadership skills because of this program."

Christine (Long Island, NY)

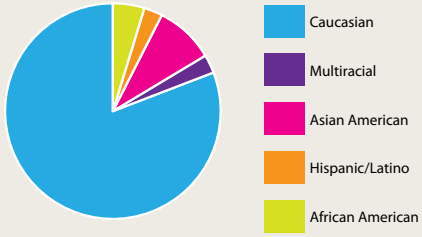
"Spending the week at Michigan Tech was easily the most exciting and informative camp/program I've been to in my life. The sessions that explained and gave insight to all the different fields of engineering assisted me in narrowing my interests while exposing me to new and exciting facts."

Sierra (Chattanooga, TN)

DEMOGRAPHIC INFORMATION

Total participants: 149

ETHNICITY



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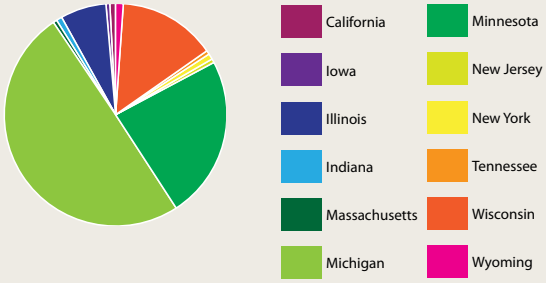
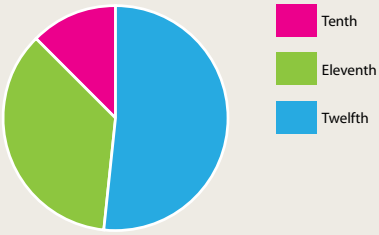


GRADE, FALL 2012



Engineering Scholars Program

An intensive weeklong investigation and discovery of disciplines, knowledge, and careers in engineering.

PROGRAM CONTENT

During the Engineering Scholars Program (ESP) at Michigan Tech, a total of **141** participants:

- Explored different areas of engineering and its applications
- Learned about a wide array of careers in engineering through focused presentations
- Developed and honed team skills through Destination Imagination challenges
- Investigated the many ways an engineer can directly influence the quality of people's lives
- Learned how to be successful in undergraduate engineering programs
- Became acquainted with college life and extracurricular activities on campus
- Met other young students with similar backgrounds and interests
- Built networks and friendships while enjoying a variety of recreational activities in the natural setting of Michigan's Upper Peninsula

ENGINEERING GROUP PROJECTS

Engineering group projects students took part in included:

- Saponification (making soap)
- Combining a pencil and circuit board to create a Theremin that could turn drawings into sound
- Blacksmithing using material science
- Constructing a prosthetic leg using biomedical engineering while on a budget
- Building a remotely operated underwater vehicle and testing it in the Portage Canal
- An in-depth look at 3-D high-resolution images used in diagnostic medicine

ENGINEERING SESSIONS

Projects in the nine engineering sessions included:

- Building a motor
- Designing a bridge and testing its strength
- Operating a continuous chemical reactor
- Designing a computer-controlled reaction
- Recreating natural disasters and studying the part that natural components play in their severity
- Thermo mechanical processing of shape memory wire
- Using an Atomic Force Microscope to explore the strength of a nanoparticle

EVALUATION HIGHLIGHTS

Based on participant evaluations, students especially enjoyed the hands-on group projects and activity portion of their engineering sessions. Favorite projects included processing hot metal into objects, making a boat out of fiberglass, creating a holographic image, and creating human interfaces for computers and phones.

- 98.53% of participants felt informed about the options available in engineering after completing the program.
- 93.33% of participants would recommend the Engineering Scholars Program to others.
- 94.77% of participants said their group projects helped with their understanding of engineering applications.
- 88.32% of participants felt more likely to have a future career in engineering after participating in the program.
- 85.82% of participants felt more encouraged to attend college after completing the program.

Most memorable experiences included building remotely operated vehicles, making new friends who were interested in similar topics, working together during the Destination Imagination simulations, learning how to solder in group projects, and going on department tours.

"Before coming, I really didn't have an idea of what I wanted to do. But after this experience, I feel I have a better grasp on what exactly I am interested in. I learned a lot about engineering and it was awesome to experience a week on Tech's campus."

Abigail (Felch, MI)

"In ESP I learned what it really means to be an engineer. It means working as a team, working hard, and trying new things."

Colin (South Lyon, MI)

"Something surprising that I learned was how much work it is to filter water to make it clean. This will affect me because I now plan on joining the club at my school that helps bring clean drinking water to people in Africa. "

Carissa (Boca Raton, FL)

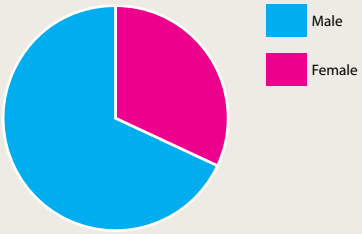
"It might sound strange but the ESP program taught me how to make friends. I usually don't open up and try to meet new people but this week was different. I met new people and just decided to go with it. I was who I am and it worked out. The most challenging part of this program was leaving."

Brandon (Sterling Heights, MI)

DEMOGRAPHIC INFORMATION

Total participants: 141

GENDER



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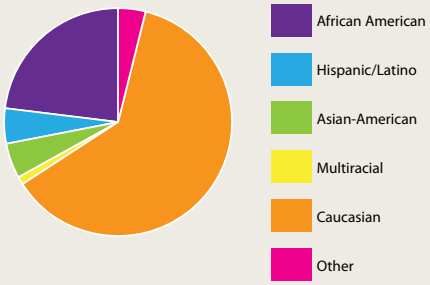

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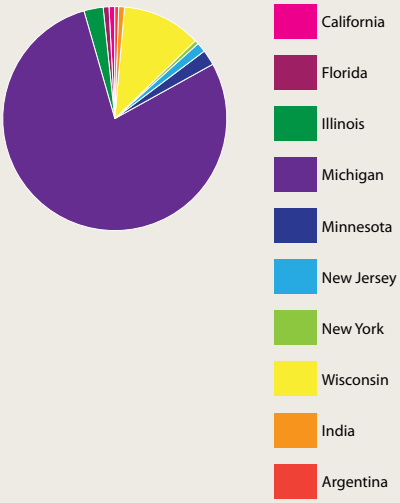

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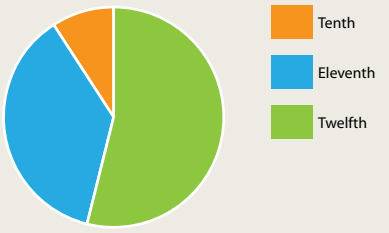


National Summer Transportation Institute

An intensive two-week investigation designed to create awareness, stimulate interest, and take full advantage of the opportunities in the transportation industry.

PROGRAM CONTENT

During the National Summer Transportation Institute (NSTI) at Michigan Tech, 30 participants:

- Used hands-on activities to explore different areas of transportation, including air, rail, road, and sea
- Learned from role models working in transportation fields about topics such as bridge design, airport construction, and snow roads across Antarctica
- Discovered team skills and applied transportation knowledge during group projects
- Went on field trips to local attractions, such as the Eagle River bridge, Portage Lift Bridge, and Isle Royale
- Went on a weekend-long excursion to Sault Ste. Marie, MI, and St. Ignace, MI, to tour the Soo locks, the International Bridge, and the Mackinac Bridge
- Became acquainted with college life and extracurricular activities on campus
- Met other talented teens with similar backgrounds and interests

EVALUATION HIGHLIGHTS

Based on participant surveys, students especially enjoyed the hands-on group projects and field trip portion of the program. Highlights of the program included how great the field trips were, making new and diverse friends, and getting to experience college life first-hand.

- 76.67% of participants felt more likely to have a future career in the transportation industry after participating in the program. Only 25% had planned on involving transportation in their careers before the program began.
- 92.59% of participants felt more encouraged to attend college after completing the program.
- 87.11% of participants agreed that the transportation industry has greatly contributed to solving problems in the world.
- 96.15% of participants rated the hands-on activities as above average. Many noted the activities as their favorite part of NSTI.
- 67.74% of students now feel very informed about the different career options available in the transportation industry.

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

- 96.15%—Math
- 92.31%—Science
- 84.62%—Technology
- 69.23%—Transportation
- 65.38%—Design

"I learned so much this week, especially about civil engineering and bridges! This program really showed me how important engineers are for so many things. This was an amazing opportunity!"

Carissa (Boca Raton, FL)

"[This week] we had engineers talk to us about bridge design and construction, and then we went to actual bridges to see the application in the real world. We used what we learned to build our own balsa wood bridges, trying to hold the most weight while using the least materials. Overall, NSTI was a very enjoyable experience that opened my eyes to the opportunities in studying engineering."

Jorge (Bloomington, MN)

"I learned that transportation is very important for everyone and without it the world would be difficult. These two weeks we built a bridge out of wood, which was awesome. I got to see that college life is super fun. Because of this I had a summer of a lifetime."

Geovanny (Chicago, IL)

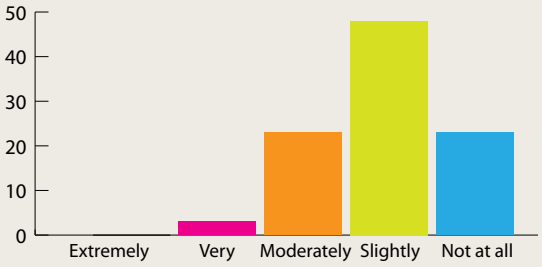
THIS PROGRAM WAS MADE POSSIBLE BY:

MDOT Michigan Department of Transportation

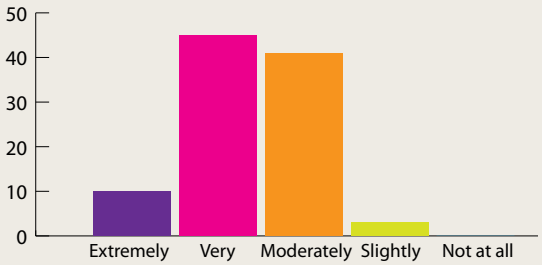
U.S. Department of Transportation
Federal Highway Administration

University Transportation Center
Materials in Sustainable Transportation Infrastructure
Michigan Tech Transportation Institute • Michigan Technological University

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



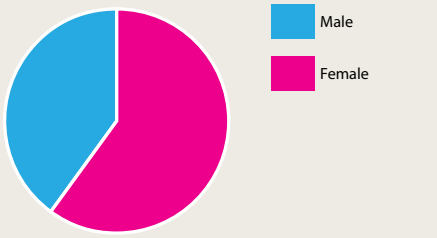
Post-test: Current level of knowledge about different fields in the transportation industry:



DEMOGRAPHIC INFORMATION

Total participants: 30

GENDER



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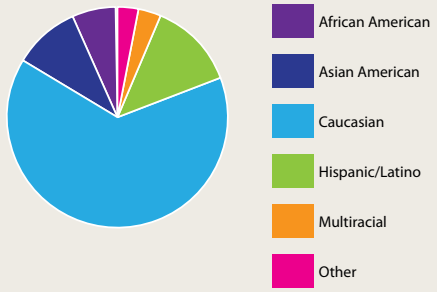

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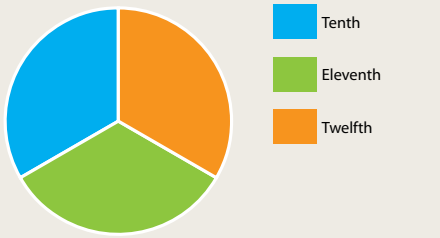

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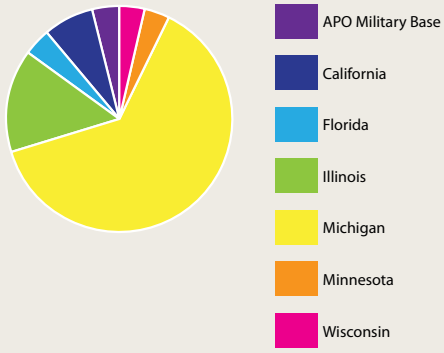


Mind Trekkers

The Mind Trekkers road show is Michigan Tech's newest K-12 outreach initiative. With the goal of 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 engaging in 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 EVENTS IN 2011/2012 ACADEMIC YEAR AND SUMMER 2012

Mind Trekkers took part in on-campus events including:

- Western UP Science Fair
- Stand-a-thon
- Kids Carnival
- Pre-School Cabin Fever Carnival
- Spirit of the Harvest Powwow

Mind Trekkers took part in off-campus events including:

- Houghton County Fair Mind Trekkers Science and Engineering Festival
  Aug 2011—2,000+ participants
- Great Lakes Invitational Hockey Tournament
  Detroit, MI, December 2011—5,000+ participants
- Einstein Science Fair at Shopko Center
  Green Bay, WI, Jan 2012—3,000+ participants
- Mind Trekkers Science and Engineering Festivals
  Southwestern Michigan College
  Dowagiac, MI, Feb 2012—300+ participants
- Oak Ridge Associated Universities (ORAU) Annual Conference
  Oak Ridge, TN, March 2012—500+ participants
- Kohler Sheboygan Science and Engineering Festival
  Sheboygan, WI, April 2012—4,000+ participants
- USA Science and Engineering Festival
  Washington, D.C., April 2012—200,000+ participants
- Iron Mountain Science and Engineering Festival
  Iron Mountain, MI, May 2012—1,500+ participants
- Mind Trekkers/LSSU Exploration Sensation
  Sault Ste. Marie, MI, May 2012—1,700+ participants
- Destination Imagination 2012 Global Finals
  Knoxville, TN, May 2012—18,000+ participants
- Girl Scouts 100th Anniversary Regional Jamboree at Lambeau Field
  Green Bay, WI, June 2012—5,000+ participants
- UP State Fair Youth Day Featuring Mind Trekkers
  Escanaba, MI, August 2012—1,000+ participants
- Houghton County Fair Mind Trekkers Science and Engineering Festival
  August 2012—3,000+ participants

What is being planned for the 2012-2013 Academic year and beyond?

This does not include on-campus events.

- Einstein Science Fair at Shopko Center
  Green Bay, WI, Jan 2013—3,000+ anticipated
- Mind Trekkers Science and Engineering Festivals
  Southwestern Michigan College
  Dowagiac, MI, March 2013—1,000+ anticipated
- Bemis Fox Valley Science and Engineering Festival
  Appleton, WI, April 2013—5,000+ anticipated
- College of Lake County Science and Engineering Festival
  Grayslake, IL, April 2013—5,000+ anticipated
- Mind Trekkers/LSSU Exploration Sensation
  Sault Ste. Marie, MI, May 2013—1,700+ anticipated
- Mind Trekkers @ Northeastern Wisconsin Technical College
  Green Bay, WI, May 2013—1,800+ anticipated
- Destination Imagination Global Finals
  Knoxville, TN, May 2013—18,000+ anticipated
- Technology Quest at the National Boy Scout Jamboree
  West Virginia, July/August 2013—40,000+ anticipated over the eight days of the event

Others in the discussion stage:

- Great Lakes Bay Region Science and Engineering Festival
  Saginaw, MI, Spring/Fall 2013—30,000+ anticipated
- Google RISE Mind Trekkers Science and Engineering Festivals
  Ludington, Alpena, Marquette, MI, Fall 2013—6,000+ anticipated

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

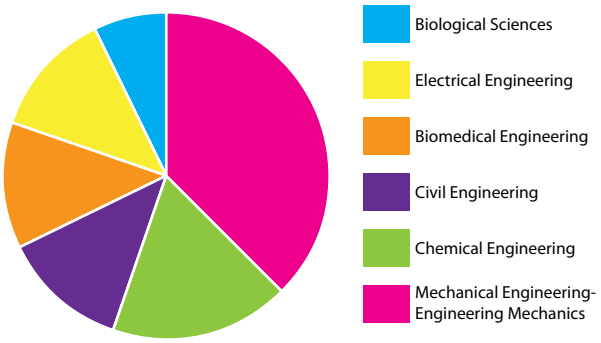
Promoting STEM

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 2012 yielded even more data showing the effectiveness of the Center in its mission.

SUMMER YOUTH PROGRAMS

Michigan Tech's Summer Youth Programs have proven a consistent source of future college students, excited and prepared to engage in science, technology, engineering, and mathematics. With over 90 percent of SYP alumni now at Tech in STEM fields, Summer Youth Programs is a model for inspiring the leaders of tomorrow who are so in demand today. Through our partnerships with corporations and agencies, we are bringing the excitement of a technological career to thousands of young students every year.

Percent of SYP alumni at Michigan Tech enrolled in STEM field: **91%**



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 Over 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.

Survey Question	Pre-Event Response	Post-Event Response
Are you interested in attending college?	96 percent *yes*	100 percent *yes*
Are you interested in science?	38 percent *extremely*	67 percent *extremely*
Are you interested in technology?	45 percent *extremely*	51 percent *extremely*
Are you interested in engineering?	35 percent *extremely*	49 percent *extremely*
Are you interested in mathematics?	26 percent *extremely*	35 percent *extremely*

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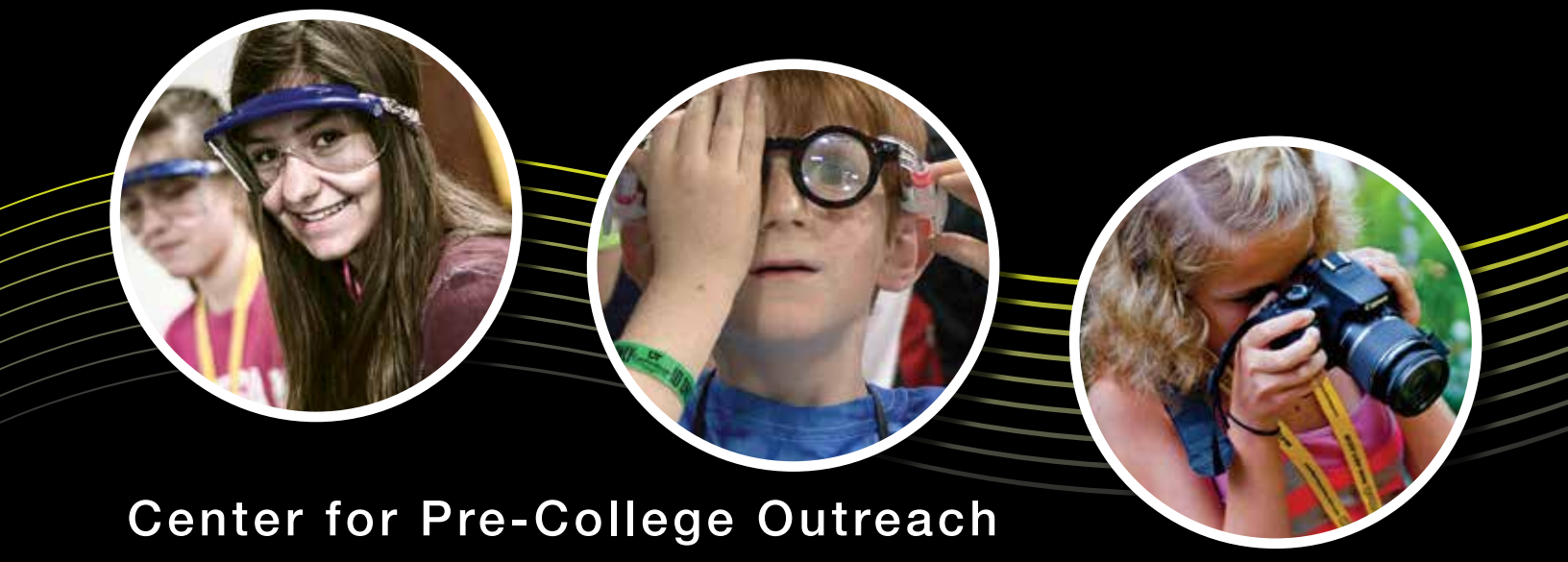

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