Who We Are

The ASM Materials Education Foundation provides for the advancement of scientific and engineering knowledge through its support of education and research. The Foundation provides exciting opportunities for young people, encouraging them to pursue careers in materials, science, and engineering.
Mission Statement

To excite young people in materials, science, and engineering careers.
Vision Statement

A workforce skilled in Science, Technology, Engineering and Mathematics (STEM) through hands-on, discovery-based learning.
Research documents a decline in high school student math/science aptitude, reasoning ability and career interest in applied science.

We believe students must first become excited about science, before they can become interested in STEM or science and engineering as a potential career choice.
“Schools often lack teachers who know how to teach science and mathematics effectively, and who know and love their subject well enough to inspire their students. Many teachers lack adequate support, including appropriate professional development as well as interesting and intriguing curricula.”

Critical Thinking

Why Is It So Hard to Teach?
Considerable educational research supports the notion that many students learn most effectively when challenged in hands-on practical learning environments.
Getting Students Interested

✓ Students have natural curiosity about materials around them (Materials offer perfect context to engage otherwise disinterested students)

✓ Showing the link between Materials and Science (Physics/Chemistry) provides relevancy, stirs interest and creates an incentive to learn Science
ASM Materials Camp® Student Camps are for high school students with strong abilities in math and science who have completed their sophomore or junior years. There's a lot to do at ASM Materials Camps, and best of all, it’s free.
ASM Materials Camp®
Student Camps

Stirring interest & creating the incentive to learn

Hands-on / Discovery-based
Relevancy / Engaging
Role Models (Engineers-Volunteers)

FUN and Memorable!
Student Camp
Lab Activities (Examples)

✓ Metallography
✓ SEM / X-ray Diffraction
✓ Atomic Force Microscopy
✓ Investment & Sand Castings
✓ Molten Glass Processing
✓ Annealing/Heat Treating
✓ Blacksmithing
✓ Nanofabrication
✓ Chem Flame Testing
✓ Impact Testers
✓ Non-destructive Testing:
  • Radiography
  • Dye Penetrant Inspection
  • Magnetic Particle Inspection

Industrial Tours / Jobs (Examples)

✓ Applied Process (HT)
✓ Bell Group (Jewelry C.)
✓ Boeing
✓ Boston Scientific
✓ Climax Research Lab
✓ Carpenter Steel
✓ DS Containers
✓ Ford Casting Plant
✓ GM (Electromotive Div.)
✓ Goodrich (Landing Gear Div.)
✓ Northrop Grumman
“Thank you for organizing the camp program and for the opportunity to participate. It was a very cool learning experience and I thoroughly enjoyed it. The exposure to failure analysis testing expanded my interest in materials engineering. The experience solidified my plan to study materials engineering in college.”
ASM Materials Camp® Teachers Camps are thought provoking, idea generating workshops. Teachers learn how to make core science principles more relevant to students. Teacher Camps make teaching science and math more fun for little or no cost.
TARGET MARKET

Materials Camps serve:

• Students entering their junior or senior year in high school
• High School Teachers: Science, Chemistry and Physical Science, Engineering, and Industrial/Career and Technical Education
• Middle School Physical Science Teachers
• Pre-Service Science Teachers
• Art, Math, and Community College Teachers as space allows
ASM Materials Camp® Growth

ASM Materials Camp®
Locations Total Thru Plan 2016: Students: 319; Teachers: 381
Participants Total Thru Plan 2016: Students: 13,356; Teachers: 8,915

Student Materials Camp
2016 - 26 Student Camps
2016 – 1092 Participants
Thru 2016 - 319 Camp Locations
Thru 2016 – 13,356 Participants

Teacher Materials Camp
2016 - 43 Teacher Camps
2016 – 931 Participants
Thru 2016 - 381 Camp Locations
Thru 2016 – 8,915 Participants
Teaching the Teachers: ASM Science Camp

https://youtu.be/zlW55Ltl69c
Materials Science and Technology

- understanding and using the materials in our daily lives
- study of the materials in our lives and how they can be changed or manipulated
- the study of available materials and the search for new ones
- describes the understanding of solids that emerges from the combined viewpoints of chemistry, physics, and engineering

- 4 aspects:
  - synthesis and processing
  - structure and composition
  - properties
  - performance

- involves the generation and application of knowledge relating the composition, structure, and processing of materials to their properties and uses

- materials engineering deals with the synthesis and use of knowledge (structure, properties, processing, and behavior) in order to develop, prepare, modify, and apply materials to specific needs
Solids

Topics

- Importance of materials
- Four categories of solids
- Simple chemistry made easy
- Chemical bonding
- Periodic Table of Elements Oxidation-reduction
Metals

Topics

• History of metals and use
• Properties of metals
• Mechanical properties
• Effects of heat treating
• Types of alloys; alloying techniques
• Phase diagrams
• Testing metals
• Manufacturing processes
Ceramics / Glass

Topics

• Ceramics are crystalline solids
• Ionic and covalent bonds
• Glass properties are different: amorphous structure
• Manufacturing processes
Polymers

Topics

- Classification of polymers
- Altering chemically or with additives
- Recycling concerns
- Chemical changes through cross-linking
- Synthetic polymers & chemistry involved
- Historical developments
- Manufacturing processes
Composites

Topics

• Types of composites and categories
• Strength –to-weight ratios
• Strength measuring, testing, altering
• Wood and concrete: traditional composites
• Fiber reinforced composites
• Graphite and Kevlar fibers
Blowing a Glass Bubble

1. Cut a piece of 6mm tubing about 30cm long
2. Fire polish one end of the tubing and allow to cool
3. Heat the end that has not been fire polished until soft. Then use a pair of pliers to seal the end or push it against a ceramic tile. It is also possible to allow the end to close on its own with enough heating.
4. Heat the tubing about 1cm above the sealed end until it is soft. Quickly remove the tubing from the heat and blow into the cool end while rotating the tube. Some prefer to leave the glass in the flame while blowing.
5. Repeat step 4 until you have a bubble with a diameter about twice that of the tubing. As the glass walls of the bubble get thinner use less air pressure to avoid bursting the bubble.
6. Clean up
“I've attended several PD workshops - by far this was the BEST training I've ever attended. I gained so much knowledge and by the end of the week I felt empowered, enlightened, and motivated! I feel totally prepared to begin the new school year!” -- Philadelphia Teachers Camp
Impact / Results

Student Camp data:
• **84%** of students alumni entered college in science fields
• **66%** of those enrolled in engineering
• **41%** of engineering enrollment were in materials science

Teacher Materials Camp participants reported unanimously they were:
• More confident in explaining complicated subjects
• Gained new ideas and approaches to instruction
• MST concepts will be used directly in their classroom
How ASM MEF is Making a Difference

The Foundation has made a difference in the lives of 11,114 students via the Materials Camp Students program. These hands-on demos and tools have proven to have a positive impact on students by inspiring them to pursue science and engineering careers.

6,896 Teachers have completed the Materials Camp Teachers Camp since the 1st camp was launched in 2002. Over 85% of teachers camp alumni are now utilizing “hands-on” materials concepts in their chemistry and physics classes. These teachers are convinced that such concepts will benefit students and inspire them to learn science.

“This camp was wonderful. I now have new ideas to use in my classroom. I had never heard of a materials engineering degree. This is something I can talk about with my students.” – Teacher Camp participant

David Bahr, Professor and Head of the Materials Engineering Department at Purdue University has seen a 100% increase in the number of students majoring in the Materials Science Engineering program over the past several years. “We saw students coming from high schools we'd never seen in MSE before. Turned out the new students all were from high schools where teachers had attended ASM Materials Camps. The lag between a teacher at the camp and a student at the university was on the order of 3 or 4 years.”
Thank you
# Materials Camp® Volunteer Duties

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<thead>
<tr>
<th>Student</th>
<th>Teacher</th>
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<tbody>
<tr>
<td>Recruitment of students</td>
<td>Recruitment of STEM teachers</td>
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<tr>
<td>Develop application</td>
<td>Point of contact for Master Teachers</td>
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<td>Collect &amp; screen applications</td>
<td>Coordinate w/ Foundation</td>
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<tr>
<td>Point of contact for participants &amp; families</td>
<td>Secure guest speakers</td>
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<td>Secure guest speakers</td>
<td>Organize closing ceremony</td>
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<tr>
<td>Organize closing ceremony</td>
<td>Coordinate with school/university</td>
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<tr>
<td>Secure chaperones</td>
<td>Secure materials</td>
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<tr>
<td>Coordinate with school/university</td>
<td>Arrange Tours</td>
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<tr>
<td>Select/Develop curriculum</td>
<td>Make food arrangements</td>
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<tr>
<td>Secure materials</td>
<td>Set aside 7 days for camp</td>
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<tr>
<td>Arrange tours</td>
<td>Fundraise</td>
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<td>Make food arrangements</td>
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<tr>
<td>Set aside 5 days for camp</td>
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<td>Fundraise</td>
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