

BUILDING 21st CENTURY MANUFACTURING TALENT

Raising the Bar: Enhancing the ASM Teachers Materials Curriculum

An Education & Workforce Development Initiative for LIFT... Lightweight Innovations for Tomorrow



THE PROBLEM: LACK OF MATERIALS SCIENCE EDUCATION IN THE CLASSROOM

The foundation for all advanced manufacturing jobs is materials science education. Without it, students lack a fundamental awareness of the properties of materials and the science, technology, engineering, and mathematics [STEM] knowledge relating materials to advanced manufacturing.

Unfortunately, in many schools, fundamental STEM building blocks are either nonexistent or lack meaningful and up-to-date information. In too many cases, concepts are presented without connecting them to real world applications, leaving students to wonder "so what?" instead of "how could I?"

To help bring manufacturing back onshore and position the U.S. as the global leader in lightweight materials manufacturing, worker training must begin with ensuring that fundamentals are taught in the classroom.

INTRODUCTION TO ASM-LIFT TEACHER MATERIALS CAMPS

In 2015, LIFT partnered with the ASM Materials Education Foundation to develop lightweight metals and materials core curriculum modules to include in ASM's Materials Camps to empower middle school and high school teachers to better promote STEM career pathways, specifically regarding lightweight metals manufacturing. LIFT also began supporting the expansion of camps to new locations. The camps have been exceptionally successful in helping teachers develop an understanding of lightweight metals manufacturing concepts that could be incorporated into their classrooms.

ALIGNMENT TO LIFT WORKFORCE & EDUCATION GOALS



Ensure students gain STEM foundational skills



Attract more young people to manufacturing careers



Teach the teachers

BUILDING ON PAST SUCCESS

This year, LIFT and ASM will expand the program to reach beyond the teacher camps and bring more materials science education directly into the classroom via development of world-class curriculum and lab teaching materials including:

- Five short videos and examples from industry members introducing lightweight metals engineering challenges and innovative solutions, such as how to minimize mass while meeting crash test standards. The examples will help students directly relate to real life challenges and examples of the creative materials, processes, and design alternatives devised by industry.
- A classroom module program with lab activities that introduces materials and process engineering fundamentals necessary to work on problems posed by the classroom videos and/or the capstone project's problem.
- A capstone project suitable for integration with a high school level materials engineering curriculum.

With these additions available in the class, students will **learn** foundational STEM skills, work to **solve** engineering problems in a practical and hands-on manner, and through the high school capstone project **be better prepared** for the senior design project requirement of most university engineering curricula.

This LIFT-ASM partnership will give teachers access to low cost supplies and real world examples for more rapid deployment of materials science information. This initiative can be aligned with today's curriculum requirements of the Next Generation Science Standards (NGSS) and Common Core Standards, as well as LIFT's focus areas.

EXPANDING THE CURRICULUM

Enhancing the 2015 program in 2016:



Value of lightweighting (focus on math and using units)



Essential properties of materials (focus on density, stiffness, and strength)



Hands-on demonstrations of strengthening mechanisms in metals, polymers, and glasses including cold working, solid state phase transformations (heat treating), cross linking, and changing chemistry to raise the glass transition temperature.



Mass reduction strategies through a capstone project integrating materials selection, component design, and processing.



For more information, please see lift.technology or contact LIFT Education & Workforce Director, Emily DeRocco at ederocco@lift.technology.