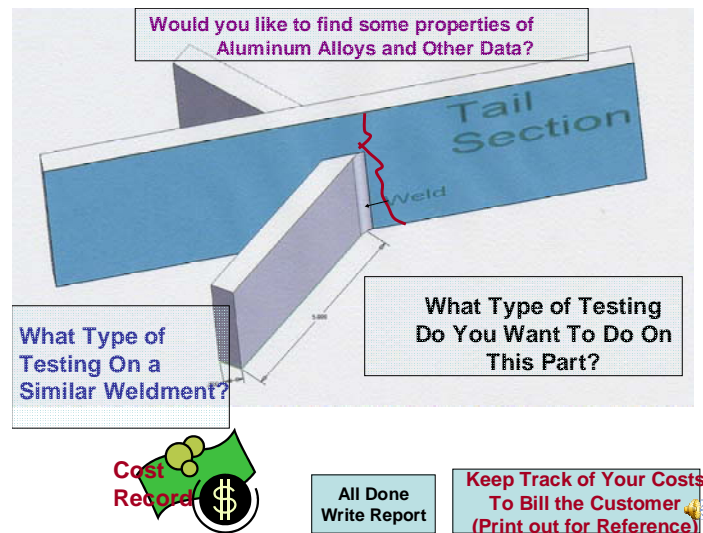


**Q:** How do you get students excited about learning basic principals of chemistry, physics, and materials science?

**A:** Easy. Just crash an airplane in your classroom.  
Then turn them loose.



## “Introduction to Materials Joining”

An interactive, simulation-based learning module for high school and community college students



Developed as part of a National Science Foundation (NSF) grant initiative by Lorain County Community College and The Ohio State University. Reference NSF ATE project numbers 0302792 and 0302803.

# Integrating Knowledge Through Technology Application: A Modular Approach to Learning

Problem solving. Analytical skills. Cost-benefit analyses. And technical savvy – in their own specialization and beyond.

These are the skills your students need to both enter and advance in today's technology careers. But until now, high schools and community colleges simply couldn't afford the lab facilities – or the specialized instructors – to integrate such instruction into their technical curricula.

“Introduction to Materials Joining” is an interactive series of simulation-based problems that allow you to integrate the fundamental principals of chemistry, physics, and materials science your students need to transform their jobs into careers.

Each unit presents a real-world problem that encourages students to make decisions based within the perspectives of BOTH technology and business. And just as importantly: students will see the direct impact of those decisions on the final quality of their solution, as well as on its cost.

## FEATURES

- Delivery flexibility: in a traditional classroom and laboratory setting; in a computer lab using CD-Rom technology; or via the Internet / asynchronous delivery.
- Low to no-cost equipment requirements: can be delivered on a school's existing computer units with little or no modification. While welding equipment and a lab setting add to the experience, they are NOT necessary for successful, effective course delivery.
- Ready to augment your pre-engineering or pre-engineering technology programs: curriculum is already being used in Ohio as an elective course in one particular national program.
- Integrated Assessment: built in at the end of each module, regardless of the delivery method.
- Fully interactive simulation: captures student interest and imagination through real-life simulations. Decisionmaking is required from both technical and business perspectives. Feedback on decisions is immediate.



To receive certification to teach “Introduction to Materials Joining,” instructors must complete a 2-week summer workshop.

Each instructor completing certification will receive all course materials and CD-ROMs at no charge as part of the workshop.

Contact Ken Smith, Lorain County Community College, for workshop dates and registration information: 440-366-7027; [ksmith@lorainccc.edu](mailto:ksmith@lorainccc.edu)

## Module Topics

- **Arc welding** – SMAW, GTAW, GMAW, and other processes.
- **Non-arc welding** – resistance, oxy-fuel, solid state, high energy density, plastics, adhesive, and underwater joining techniques
- **Welding physics** - heat input, energy sources, arc characteristics, wire melting, and arc dynamics
- **Heat flow** – heat flow basics, heat transfer, and temperature profiles
- **Metallurgy** - phases of matter, crystal structure, phase changes and diagrams, microstructures, material strengthening methods
- **Metallurgy** - weld regions, fusion zones, heat affected zones, HAZ structural changes, and cold cracking
- **Design** – mechanical properties, fatigue, hardness, creep, joint design, codes and standards, and distortion
- **Testing** – weld quality, discontinuity, destructive testing, nondestructive evaluation, visual inspection, magnetic particle, radiographic, eddy current, acoustic emission
- **Safety** – personal protection, work area safety, fumes gasses and toxic materials, gas storage, fire safety, electrical safety, and x-ray/laser safety.

