

Tools of the Trade: Hands-On Learning for 3 Trade Skills Careers

Hands-on teaching tools, career information, and free posters
for trade skills career preparation.



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Skilled trade careers are in high demand, making it important for students to explore these occupations. We created this guide to help Career & Technical Education instructors offer students hands-on learning and career exploration in jobs as welders, electricians, and machinists. Use the information, recommended tools, and free posters to teach students about these three careers.

Each poster featured in the guide was created from information in Realityworks' trade skills products' curricula. Our products combine hands-on training tools with curriculum, student assessments, and other supporting material. Learn more about our products at <https://www.realityworks.com/product-category/trade-skills/>

Guide Contents:



Career Outlook and Requirements



Recommended Hands-On Tools



Benefits of Hands-On Learning



Free Soft Skills Scenarios



Creating Your Own Scenarios



Free Posters



Trade Skills Teaching Resources

Career Outlook and Requirements

Today's students need to understand [why they're learning what you're teaching](#)¹ and how it applies to their life. Before diving into the fun skills training, it can help to teach students a little bit about the careers they're preparing for. Here is some basic information about careers as welders, electricians, and machinists:



- **Job Outlook**²: 42,600 openings for welders are estimated each year, on average
- **Median Pay**: \$48,940 per year
- **Education**: High school diploma or equivalent, combined with technical and on-the-job training
- **Skills**³: Quality control analysis, monitoring, arm-hand steadiness, finger dexterity, problem sensitivity
- **Job Tasks**: Use safety equipment and safe work habits, inspect workpieces for flaws and measure them with straightedges or templates to make sure they meet specifications, weld components in various positions



- **Job Outlook**⁴: Estimated to grow 6 percent, faster than the average for all professions
- **Median Pay**: \$61,590 per year
- **Education**: Apprenticeship, some attend a technical school; most states require electricians to be licensed
- **Skills**⁵: Troubleshooting, repairing, active listening, critical thinking, speaking
- **Job Tasks**: Make drawings or follow blueprints to verify where wiring is, place conduit and pipes inside specified partitions, work from ladders or scaffolds to install electrical wiring



- **Job Outlook**⁶: 38,200 openings for machinists are estimated each year, on average
- **Median Pay**: \$53,180 per year
- **Education**: High school diploma; typically trained on the job; some learn through training or apprenticeship programs, vocational schools, or community and technical colleges
- **Skills**⁷: Operation and control, critical thinking, monitoring, operations monitoring, active listening
- **Job Tasks**: Determine dimensions or tolerances, machine parts to specifications, measure or examine completed units to check for faults

¹The evolution of educational innovation. (n.d.). www.umassglobal.edu. <https://www.umassglobal.edu/news-and-events/blog/the-evolution-of-educational-innovation>

²Bureau of Labor Statistics, U.S. Department of Labor, Occupational Outlook Handbook, Welders, Cutters, Solderers, and Brazers, at <https://www.bls.gov/ooh/production/welders-cutters-solderers-and-brazers.htm> (visited August 03, 2024).

³Welders, Cutters, Solderers, and Brazers. (n.d.). <https://www.onetonline.org/link/summary/51-4121.00>

⁴Bureau of Labor Statistics, U.S. Department of Labor, Occupational Outlook Handbook, Electricians, at <https://www.bls.gov/ooh/construction-and-extraction/electricians.htm> (visited August 03, 2024).

⁵Electricians. (n.d.). <https://www.onetonline.org/link/summary/47-2111.00>

⁶Bureau of Labor Statistics, U.S. Department of Labor, Occupational Outlook Handbook, Machinists and Tool and Die Makers, at <https://www.bls.gov/ooh/production/machinists-and-tool-and-die-makers.htm> (visited August 08, 2024).

⁷Machinists. (n.d.). <https://www.onetonline.org/link/summary/51-4041.00>

Recommended Hands-On Tools



Electrical Wiring Kit

Introduce students to the basics of electrical wiring in a safe, shock-free environment with this all-in-one kit, which uses a battery-operated assessment kit to test light and outlet socket wiring.



Measurement Math Training Kit

Measurement math basics are important to a variety of trade skills careers, including machinists and welders. With its five sets of manipulatives and seven lessons, this kit can help introduce students to more than 250 different measurements.



guideWELD® VR welding simulator

Enable students to refine basic welding skills, learn proper welding techniques, and explore welding career paths while saving on costly consumables.



Career Scenario Cards

While technical skills are important for career readiness, soft skills are vital and can help students in any job they find themselves in. These pathway/occupation-specific workplace scenario cards cover real-world situations in welding, electrician, and manufacturing careers.

Benefits of Hands-on Learning

Integrate Realism into Lessons

Hands-on learning enables teachers to bring real-world scenarios, activities, and events into the learning environment to create long-lasting, meaningful understanding, especially when onsite industry visits are not feasible.



Engage Students

Students can do more than sit and listen while working with hands-on tools; they can collaborate and make connections, creating a more engaging and authentic learning experience.

Drive Critical Thinking and Reflection Activities

Students gain new levels of understanding by observing, applying critical thinking skills, and creating their own interpretations of what they learned.

Reach Visual Learners Through Demonstrations

Whether online or in-person, demonstrations can aid in students' visual understanding of concepts, processes, and lessons. With 65 percent of students identifying as visual learners, this is an important component of the learning process.



Shared Learning Supports Soft Skills

Students apply listening, problem solving, communication, and other soft skills when participating in learning by seeing and doing.



Free Soft Skills Scenarios

We saw in the “Career Outlook and Requirements” section of this guide that skills like listening and speaking are important for trades careers. Here are a few scenarios you can use in your classroom today! You can use them as brief ice-breaker activities, choosing specific scenarios to read to the class, or journaling activities.



Presentation Skills

Scenario: There are two shifts at the company you work for. You are asked to present to the other shift how you have made cleanup and quality standards a priority during your shift. The first shift stall workers don't seem to pull their weight when it comes to cleaning up the welding booth. It's common to come in and find the floor not swept, tools not put away, and the electrode empty.

You will present to both shifts but, knowing that you don't want to point out any single shift, you decide to do presentation slides of “best practices” for keeping the shop clean. How should you explain and present this to your coworkers?

Points of view to consider:

- You
- First shift workers
- Manager

Key questions:

- What should you put in your presentation slides to give clear expectations of both shifts?
- What pushback might you receive from your presentation?
- What's the best way to present your thoughts (pictures, activities, etc.)?
- How can this presentation be used to help future new hires?

Activity from
Realityworks'
Welding
Career
Scenario
Cards



Listening

Scenario: Kelly, an elderly widow who lives alone, calls the company you work for to hire an electrician. She wants to add a few outlets in her house. You arrive at Kelly's home, and it's your last appointment at the end of a long day. Kelly points out the general areas she'd like the outlets to be in and requests that they be no lower than 20 inches from the floor because it's hard for her to bend down.

You grab the needed supplies from your truck and quickly get to work. You measure and cut 12 inches from the floor, the standard height for wall outlet boxes. As you finish wiring, Kelly comes to check on your progress. When she sees the outlets, she seems unhappy. She asks to speak with your manager before paying.

Activity from
Realityworks'
Electrician
Career
Scenario
Cards

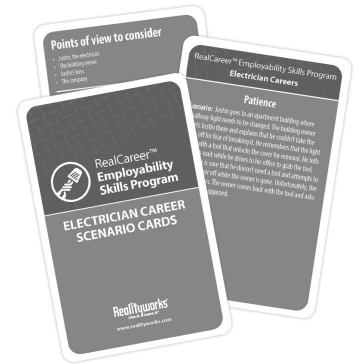
Free Soft Skills Scenarios Continued

Points of view to consider:

- Kelly, the customer
- You
- Manager

Key questions:

- How should you have handled the situation differently?
- Do you think this incident could influence your company's reputation? How?
- What can your manager do to rectify the situation with Kelly?
- How would you feel if you were paying for a service that wasn't done the way you asked?
- What steps can your manager take to make sure an incident like this doesn't happen again?



Listening

Scenario: "Did you get this morning's email about changing the tooling on the machining line?" Kendra, your coworker, asks.

"Sure did!" you respond. "Can you please set up Station 3 for milling the new 8-bolt pattern?"

"No problem," Kendra says.

Kendra completes the setup and has you check when she's done. You examine her work to find that she set up an outdated pattern on the machine. She must not have noticed that the new pattern was updated last week. When you referred to the pattern as "new," she was thinking of a different version than the one you had in mind.

In this situation, communication broke down and produced incorrect results.

Points of view to consider:

- You
- Kendra, your coworker
- Your company

Key questions:

- In this situation, the communicated words were correct, but the underlying assumptions were not the same between the two people. What could you have done differently to ensure the correct pattern was used?
- Suppose your coworker did not have you check the pattern before running the line for the day. What impacts could your failure to communicate clearly have had on the company?
- What improvements could you suggest to management to help address this type of communication challenge in the future (EG policies, training, reference material, etc.)?



Creating Your Own Scenarios

Getting started with scenarios can seem like a daunting task. You likely have many questions as you begin crafting your scenarios.



Common Questions

Here are some answers to a couple questions educators have as they brainstorm ideas.

What Elements Should I Include in My Scenarios?

Context

Every good scenario needs the right amount of context. Context adds the details the students need to understand the scenario. Providing the right amount of context in scenarios is a balancing act. If you don't have enough, students won't understand what is being asked of them. If you have too much, students will get lost in the details. To ensure your scenario has the right amount of context, ask one of your fellow teachers to work through your scenario and provide feedback.

Decision-Making Points and Clear Learning Outcomes

It's important that the scenario requires the students to make decisions. Without this piece, the scenario is ineffective, and students will lose interest. Clear learning outcomes are also needed to keep your class/students moving in the right direction and ensure your scenario aligns with the goals of your program.

When Should I Use Scenarios?

You should use scenarios after foundational knowledge is established. Students need a basic understanding of your scenario topic before they can fully understand its context. Scenarios are best used when you want to test your students' decision-making skills. They give students practice verbalizing why they make certain choices and allow you to reinforce the right decisions as well as redirect when needed.

Creating Your Own Scenarios

5 Tips for Creating Scenarios

Good scenarios are relevant and engaging. Keep scenarios short to allow for debriefing and discussion afterwards.



- 1 Define intended outcomes.** Students need to understand their role, be able to communicate, and use critical thinking skills. If key steps are missed, you might need to stop the scenario for adjustments. You want problem-solving skills to happen at the right time.
- 2 Make a critical action checklist.** Make a list of key scenario components so students understand the critical actions needed for the scenario.
- 3 Define the details.** Determine when the scenario will start, formulate key points, and assign roles. Decide at what point the scenario will end. Collect all hands-on equipment and supplies for scenarios, include best practices information, and make it as realistic as possible.
- 4 Build case narratives.** Be sure to use real-life scenarios or even past student examples as it will help facilitate real, memorable experiences.
- 5 Keep instructor notes.** Maintain a list of tips you want to remember for next time. Noteworthy items can include suggestions for students in the room or thoughts on what to do differently for struggling versus advanced students.



Free Posters

Getting started with scenarios can seem like a daunting task. You likely have many questions as you begin crafting your scenarios.

Weld Safety

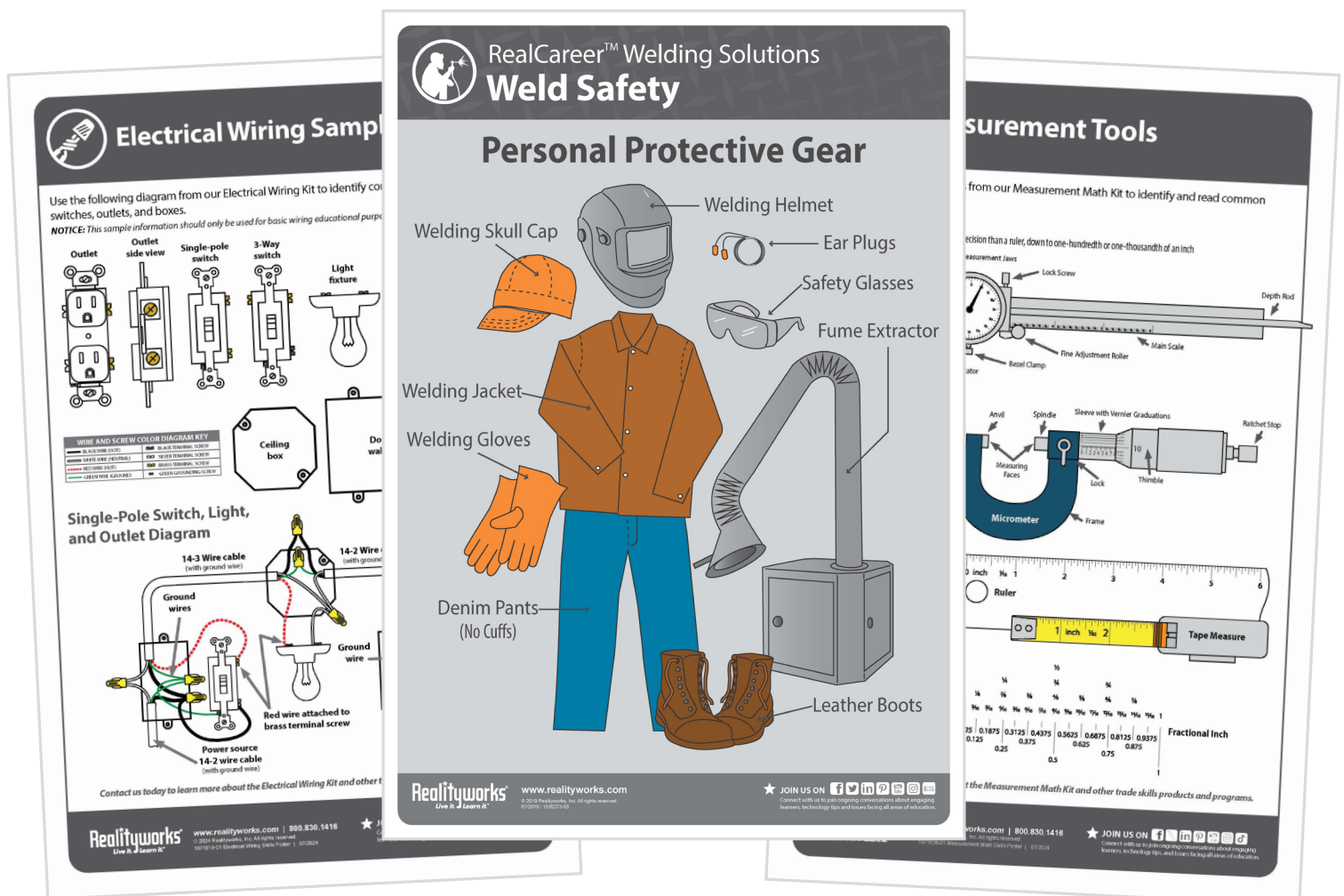
This poster illustrates the personal protective equipment required to weld safely. It was created with information from our [Weld Defects Classroom Kit](#).

Electrical Wiring Sample Diagram

This poster covers common wiring fixtures, switches, outlets, and more. It was created with information from our [Electrical Wiring Kit](#).

All About Calipers

This poster introduces various types of calipers and their parts. It was created with information from our [Measurement Math Training Kit's](#) curriculum.



Posters included on the following pages

Trade Skills Teaching Resources from Realityworks

If you're looking for additional resources for addressing trade skills concepts in your classroom, consider these:

Free classroom posters:

Use our downloadable posters and infographics to generate discussions about a variety of career topics, including welding and trade skills.

Get your posters by visiting www.realityworks.com/resources/realityworks-interactive-posters

Trade skills solutions implementation:

Use the resources on this page to learn how our 21st Century trade skills training tools are engaging students, attracting them to trade skills programs, and helping them discover careers.

Learn more by visiting www.realityworks.com/trade-skills-implementation-page

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Career Opportunities in Maintenance and Operations

Careers in maintenance/operations involve managing and repairing machinery and facilities to ensure smooth and efficient operation. These roles include unloading, inspecting, and positioning new equipment; determining optimal machine placement; assembling, installing, and repairing machinery; performing preventive maintenance; diagnosing and correcting minor issues; and maintaining the overall structure of facilities. Key industries include refineries, power plants, chemical plants, and mills.¹

Career spotlight:
General Maintenance and Repair Worker^{2,3}

- **Responsibilities:** Fix and maintain machines, mechanical equipment, and buildings
- **Education:** High school diploma or equivalent
- **Training:** On-the-job training, starting with simple tasks and learning from skilled workers
- **Median Annual Wage:** \$46,700 (May 2023)

Starting salary for a General Maintenance and Repair Worker:
\$26,130

High-end salary for a Maintenance Manager:
\$131,908

More Career Opportunities

Design/Pre-Construction Pathway: Architect, Civil Engineer, Environmental Engineer, Interior Designer, Landscape Architect, and more.

Construction Pathway: Carpenter, Electrician, Plumber, HVAC Technician, Painter, Roofer, and more.

Maintenance/Operations Pathway: Demolition Engineer, Hazardous Materials Remover, Highway Maintenance Worker, Hydro Testing Technician, Preservationist, Reliability Engineer, Restoration Technician, Thermal Control Technician, Wastewater Maintenance

Essential Skills and Education³

High School Preparation
Focus on physics and mathematics, plus courses in vocational training related to mechanics and industrial maintenance

Post-Secondary Education
Associate degree or certification in industrial maintenance or related fields, with specialized training programs available at many junior colleges and vocational schools.

General Skills
Mechanical aptitude, problem-solving, communication, flexibility, and time management.

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WELDING CAREERS

Welding is used in thousands of manufacturing activities including the construction of buildings, bridges and other structures.¹

Welders play a vital role in a variety of industries, from the military and aerospace to energy and construction. The growth of infrastructure projects like the rebuilding of bridges and highways is adding to demand for skilled welders, making this a lucrative career choice for those interested in pursuing it.²

Average Salary:
\$47,010³

As with most skilled trades jobs, safety and communication are vital.¹

The welding profession offers a variety of working conditions — some jobs require outdoor work and some indoor work; most jobs are full-time but some may require more than 40 hours per week.¹

Schooling Needed: High school diploma or equivalent

Responsibilities¹:

- Studying blueprints
- Calculating dimensions
- Inspecting structures
- Using over 100 different welding processes

4 Steps to Jump-start Your Welding Career

- 1 EDUCATE YOURSELF**
Education is essential. Start by seeking out courses at local educational institutions; research welding safety and techniques.²
- 2 FIND PRACTICE OPPORTUNITIES**
Practice makes progress! Consider investing in your own welding machine, or look for entry-level courses where practice on live welders or virtual reality trainers, like Realityworks' GuidedELP™ VR welding simulator, are offered.
- 3 INTERVIEW PROFESSIONALS**
A great way to determine whether a potential career is right for you is by interviewing individuals who have the job you want. Find local industries that employ welders and call to request an interview. Most professionals are happy to share their knowledge.
- 4 INVEST IN YOUR WELDING EDUCATION**
Technical training may be offered through secondary technical courses or programs at post-secondary institutions, community colleges or even private welding, soldering and brazing schools. The US Armed Forces also offer welding-related training courses. You might consider studying blueprint reading, shop mathematics, mechanical drawing and even electricity.⁴



Free career exploration lesson plans: Use these lesson plans to engage your students in topics related to our hands-on learning aids, like high-demand career exploration, soft skill development, STEM concepts, and more. Get your lesson plans by visiting www.realityworks.com/resources/free-lesson-plans

For pricing and ordering information, visit www.realityworks.com/product-category/trade-skills