

Basic Trade Skills Concepts: 5 Free Lessons For Any Introductory Trade Skills Class

Use the lessons and ideas in this guide to introduce students to fundamental trade skills, including measurement math basics, electrical wiring principals, welding safety concepts, PPE and soft skills.



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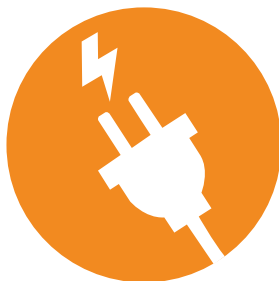
Skilled trade careers are in high demand, and opportunities for success in these careers abound. We created this guide to help Career & Technical Education instructors explore skills related to welding, manufacturing and other skilled trades. Use these lessons and other content to address common concepts in trades careers, explore job opportunities and teach fundamental skills. Information is also provided on how Realityworks' own programs and resources can complement your trade skills courses.

Each lesson featured in the guide is from one of Realityworks' trade skills products. 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:



Measurement Basics



Electrical Principals



Welding Safety & PPE



**Skilled Trades Career
Exploration**



**Soft Skill
Development**



**Trades Skills
Teaching Resources**

Measurement Basics

This lesson covers the basic measurement skills needed to be successful in various skilled trades careers.

Materials Needed:

Download our free infographic, "Measurement Math: How to Measure" by visiting our website: <https://www.realityworks.com/resources/realityworks-interactive-posters-downloads/>

Facilitation Steps:

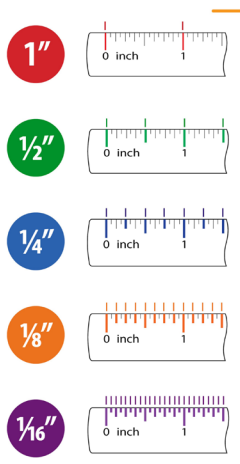
1. Hand out a copy or hang a copy of the "Measurement Math: How to Measure" infographic
2. Explain the difference of each system:
There are two measurement systems currently being used in the world. As stated in the opening activity, every country except for three currently use the metric system.
In order for U.S. citizens to trade and work with other countries throughout the world, it is important to understand the basics of each type of measurement and how to convert from one system to another.
3. Explain common readings for both Metric and Standard:
Here are some typical standard readings for length, weight, and capacity. As you can see, this is much more difficult than a basic 10-unit system, and it is understandable that so many countries abandoned this system of measurement for the metric system.



Lesson from
Measurement
Math Training
Kit

Shown: Lesson example on a tablet screen

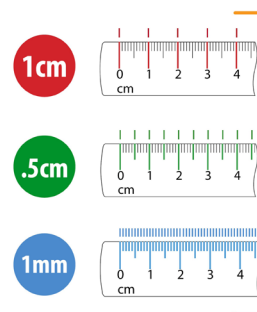
Standard (Customary)



Using a Standard Ruler

Standard rulers typically measure distances down $\frac{1}{16}$ of an inch, although some versions have marks down to $\frac{1}{32}$ or $\frac{1}{64}$ of an inch. Rulers are generally 6, 12, or 36 inches long.

Metric (SI of International System)



Using a Metric Ruler

Metric rulers typically measure distances in centimeters and millimeters. Each centimeter is broken down into ten sections called millimeters.



Length

1 foot (ft) = 12 inches (in)
1 yard (yd) = 3 feet (ft)
1 mile (mi) = 5,280 feet (ft)
1 mile (mi) = 1,760 yards (yd)

Volume

1 cup (c) = 8 fluid ounces (fl oz)
1 pint (pt) = 2 cups (c)
1 quart (qt) = 2 pints (pt)
1 gallon (gal) = 4 quarts (qt)

Length

1 centimeter (cm) = 10 millimeters (mm)
1 meter (m) = 100 centimeters (cm)
1 kilometer (km) = 1,000 meters (m)

Volume

1 liter (L) = 1,000 milliliters (mL)
1 liter (L) = 10 deciliters (dL)
1 milliliter (mL) = 1 cubic centimeter (cm³)

Electrical Principals

This lesson introduces topics related to core electrical principles relevant to electrical wiring, including current, voltage, series and parallel circuits, and power.

Materials Needed:

Computer with internet access

Facilitation Steps:

1. Have participants find a partner or work alone to answer the following questions. Allow use of the internet to find answers if possible.
 - a. What is electricity?
 - b. Who discovered electricity?
 - c. What was the first invention that used electricity?
2. Give participants approximately five minutes to find answers to these questions.
3. Call the group back together and ask participants to share their answers.



Answers (may vary):

a. Electricity is a form of energy resulting from the existence of charged particles (such as electrons or protons), either statically as an accumulation of charge or dynamically as a current

b. Benjamin Franklin is widely credited with the discovery of electricity. However, the truth about the discovery of electricity is a bit more complex. It actually goes back more than two thousand years.

In about 600 BC, the ancient Greeks discovered that rubbing fur on amber (fossilized tree resin) caused an attraction between the two – and so what the Greeks discovered was actually static electricity. Additionally, researchers and archaeologists in the 1930s discovered pots with sheets of copper inside that they believe may have been ancient batteries meant to produce light at ancient Roman sites. Similar devices were found in archaeological digs near Baghdad meaning ancient Persians may have also used an early form of batteries.¹

c. In 1821, the first electric motor was invented by Michael Faraday. In 1826, Georg Ohm defined the relationship between power, voltage, current and resistance in “Ohms Law.” In 1831, Michael Faraday proved that electricity can be induced (made) by changes in an electromagnetic field using his invention: the induction ring.²

Lesson from
RealCareer™
Electrical
Wiring Kit



¹ Georg Ohm. Retrieved July 02, 2021, from <https://www.britannica.com/biography/Georg-Ohm>

² History of Electricity (n.d.). Retrieved August 04, 2016, from <http://instituteeforenergyresearch.org/history-electricity/>

Welding Safety and Personal Protective Equipment

This lesson introduces the various bodily hazards in welding and the Personal Protection Equipment (PPE) required by OSHA to help avoid injury. Use this lesson to introduce students to the equipment needed to weld safely.

Materials Needed:

Computer with internet access

Facilitation Steps:

1. Review with students what PPE is and why OSHA requires it be used:

a. OSHA standard 29 CFR 1910.132 requires that:

- PPE be used whenever hazards are present
- PPE must be of safe design and construction for its purpose
- PPE must be in good condition and fit properly
- Defective and damaged PPE cannot be used

b. PPE Protects:

- Eyes and Face
- Head
- Hearing
- Feet
- Hands
- Body

Lesson from
guideWELD®
VR welding
simulator



2. Hand out and review the “Welding Safety: Personal Protective Equipment Fact Sheet” (located at the end of the guide)

Welding Safety: Personal Protective Equipment (PPE)

Hazard Assessment		
Hazard Type	Examples of Hazard	Common Related Tasks
Impact	Flying objects like large chips, fragments, particles, sand, and dirt.	Chipping, grinding, machining, masonry work, woodworking, sawing, drilling, chiseling, powered fastening, and sanding.
Heat	Anything emitting extreme heat.	Furnace operations pouring, casting, hot dripping, and welding.
Chemicals	Splash, fumes, vapors, and irritating mists.	Acid and chemical handling, degreasing, plating, and working with blood.
Dust	Harmful dust.	Woodworking, buffing, and general dusty conditions.
Optical Radiation	Radiant energy, glare, and intense light.	Welding, torch-cutting, brazing, soldering, and laser work.

Types of Eye and Face PPE must comply with ANSI Z87.1:

- Safety glasses with side shields
- Goggles
- Face shields
- Welding hoods
- Cutting goggles

Safety Glasses and Goggles

- Must be worn in the welding lab at all times
- If you wear glasses, you must wear goggles over them, or buy special glasses that meet ANSI Z87.1 standards

Face Shields

- Extra protection for eyes
- Safety glasses need to be worn under face shields
- Protects the face from grinding sparks, dust, and chemical hazards (NOT impact)

Skull Cap or Welding Hat

- Welders are exposed to flying sparks that can burn your hair and skull
- Skull caps and welding hats will protect your head from sparks

PPE Protects:

- Eyes and Face
- Head
- Hearing
- Feet
- Hands
- Body

Eye and Face Hazards:

- Flying particles: dust, dirt, metal or wood chips from chipping, grinding, sawing, hammering
- Chemical splashes: corrosive substances, hot liquids, solvents or other hazardous solutions
- Objects swinging into eye or face: chains, tools or ropes
- Light radiation: welding, lasers, other radiant light, heat, glare, sparks, splash and flying particles

Welding Helmets and Cutting Goggles

- Must use the proper filter lens
- Arc welding: 10-11
- Oxy fuel cutting: 5
- Plasma cutting: 5-9

Earplugs and Earmuffs

- Grinding, machining, and some welding operations can create enough noise to damage hearing

Foot Hazards

- Falling or rolling objects
- Sharp objects/objects piercing the sole
- Exposure to electrical hazards
- Molten metal or sparks splashing on feet
- Hot surfaces
- Slippery or wet surfaces

Shoe Precautions

- NEVER wear open toe shoes while welding because molten metal sparks and arc rays can burn exposed skin
- Tennis shoes are NOT recommended while welding because molten metal can easily burn through the top of the shoe and burn the foot

Safety Shoes for Welding

- Steel toe safety shoes
- Safety shoes that are nonconductive with heat resistant soles

Hand Hazards

- Cuts or lacerations
- Abrasions
- Punctures
- Thermal burns
- Harmful temperature extremes
- Potentially injurious light radiation (arc rays)

Welding Gloves

- Leather gauntlet-style, flame-retardant welding gloves are ideal for welding.
- Be sure to keep welding gloves dry; wet gloves can cause electrical shock or steam burn while welding.

Body Hazards

- Temperature extremes
- Potentially injurious light radiation (arc rays)
- Hot splashes from molten metals
- Impacts from tools, machinery and materials
- Hazardous chemicals
- Contact with potentially infectious materials like blood

Types of PPE for the Body

- Clothing made of wool
- Clothing made of 100% cotton
- Clothing that has a tag identifying it as flame-retardant
- Leather welding jackets
- Flame-retardant welding jackets
- Leather welding aprons
- Welding sleeves
- Heavy 100% cotton denim jeans
- Leather chaps
- 100% cotton socks
- Flame-retardant, 100% cotton bibs or overalls

Clothing Precautions

- No cuffs in clothing
 - Molten metal will fall into cuffs and catch fire
- Steel toes need to extend over the top of safety shoes
- Never weld in clothes with holes or frayed material
 - Frayed material catches fire quickly
- No pockets in the front of shirts
 - Molten metal will fall into front pockets and catch fire
- Always check the tags of your clothes
 - No clothing made of synthetic (man-made) fibers, or synthetic blends
 - Synthetic material is any material other than wool or cotton
- Synthetic material will melt when making contact with molten metal, and can melt to the skin, causing serious burns
- Clothing should be free from grease, oil, or other combustible chemicals or materials
- Reduce exposure to oxygen
 - Exposure to oxygen can saturate clothing with oxygen, making the clothing combustible

Skin Precautions

- Make sure all skin is covered by flame-retardant, treated material, leather, wool or 100% cotton
- Any exposed skin will be burned by arc rays

Skilled Trades Career Exploration

This lesson will cover high-demand careers in the skilled trade areas.

Materials Needed:

Download our free trade skills career exploration lesson plans. The 6 lessons in this curriculum address careers in building trades, like carpenters; careers in mechanical trades, such as automobile mechanics; and careers in industrial trades, like ironworkers.

<https://www.realityworks.com/resources/free-lesson-plans/>

Lesson One – Careers in Building Trades: Carpenter

Lesson Overview

In this lesson, students will be introduced to the career of carpentry within building trades.

Lesson Objectives

After completing this lesson, participants will be able to:

- Identify career opportunities available to carpenters
- Articulate the educational requirements, typical job duties, occupational outlook, and becoming a carpenter

Lesson at a Glance

Activity	Materials	Preparation	Approximate class time
FOCUS	• <i>What Makes a Good Carpenter</i> handout	1. Print/photocopy <i>What Makes a Good Carpenter</i> handout (one per pair)	10 minutes
LEARN	• <i>Job Description Project</i> instructions • <i>Job Postings</i> handout	1. Print/photocopy the <i>Job Description Project</i> instructions and <i>Job Postings</i> handout (one for each participant)	30-90 minutes
REVIEW	• <i>Carpentry Skills Self-Assessment</i> handout • <i>Careers Relating to Carpentry</i> handout • Questions for the panel (optional)	1. Print/photocopy the <i>Carpentry Skills Self-Assessment and Careers Relating to Carpentry</i> handout (one for each participant) 2. Contact local professionals, inviting them to participate in the panel discussion 3. Set up the room with panel seating in the front and audience facing the panel	5-10 minutes (optional activity 60-90 minutes)

Curriculum
Sneak Peak
of Lesson 1

Continue this lesson, and access 5 more lessons, by downloading the complete curriculum from our website:

<https://www.realityworks.com/resources/free-lesson-plans/>

Soft Skills Any Skilled Trades Professional Needs

This lesson will introduce students to high-demand soft skills needed in any trade skills career.

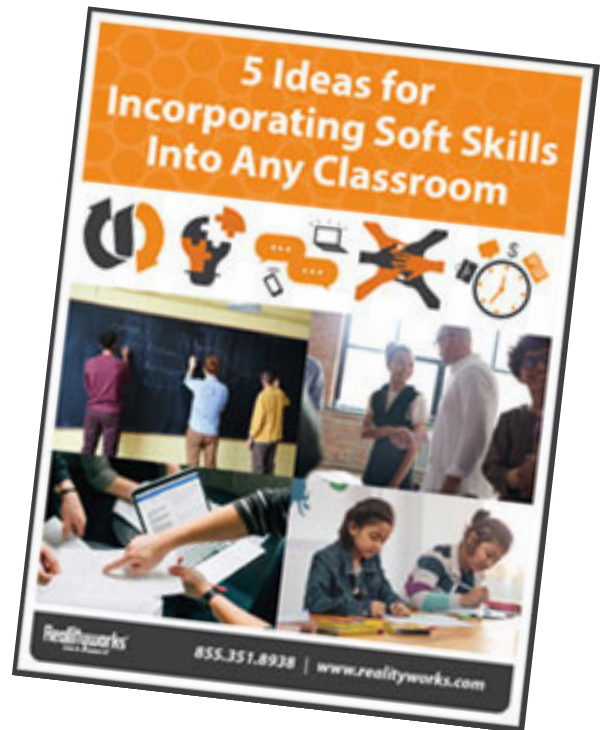
Materials Needed:

"5 Ideas for Incorporating Soft Skills Into Any Classroom" guide: <https://www.realityworks.com/soft-skills-implementation/>

Facilitation Steps:

1. Download our free guide, "5 Ideas for Incorporating Soft Skills Into Any Classroom"
2. Choose the soft skills teaching method that works for you. Do you have an entire class period? Consider role-playing or collaborative work. Do you only have 15 minutes or less? Consider making an intentional assignment tweak.

Bonus: Our soft skills guide contains 5 downloadable posters that address the top 5 soft skills today's employers need.



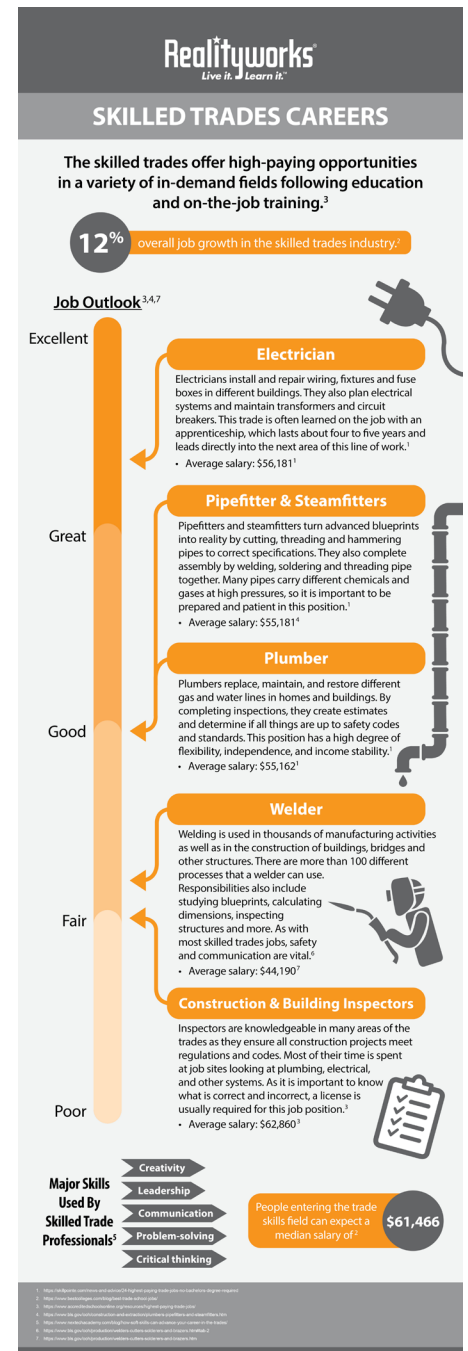
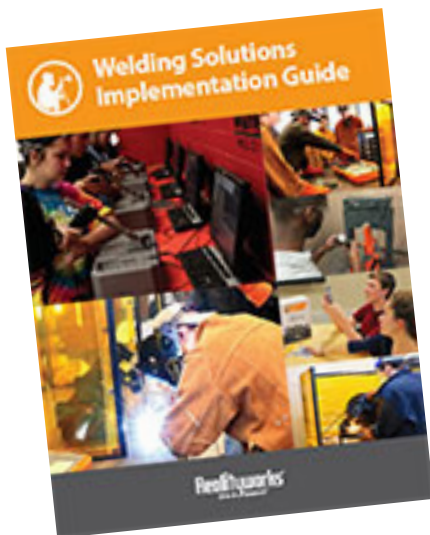
Trades Skills Teaching Resources from Realityworks

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.
<https://www.realityworks.com/resources/realityworks-interactive-posters-downloads/>
- **Welding solutions implementation:** Use the resources on this page to learn how our 21st Century welding training tools are engaging students, attracting them to welding programs and helping them discover trade skills careers.
<https://www.realityworks.com/welding-solutions-implementation/>
- **Case study: Welding Education in the 21st Century:** Read this case study to learn what instructors across the country are doing to engage their students in welding and manufacturing careers.
<https://www.realityworks.com/welding-solutions-implementation/>
- **More 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.

<https://www.realityworks.com/resources/free-lesson-plans/>



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

Welding Safety:

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<u>Chemicals</u>	Splash, fumes, vapors, and irritating mists.	Acid and chemical handling, degreasing, plating, and working with blood.
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- Objects swinging into eye or face: chains, tools or ropes
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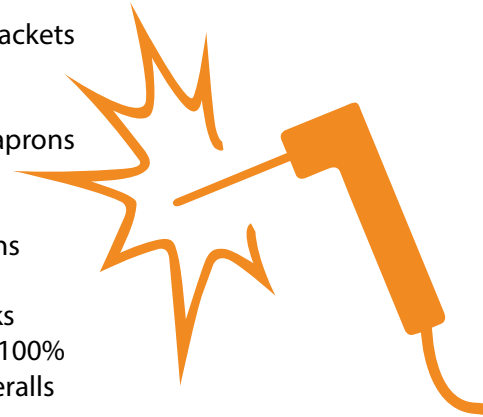
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