Intermediate Plumbing Unit 2

Content Area: **CTE**
Course(s):
Time Period: **November**
Length: **MP 2 (45 Days)**
Status: **Published**

Unit Title:

Plumbing Tools, Materials, and Basic Math

Unit Overview:

Unit 2 Overview: Plumbing Tools, Materials, and Basic Math

In this unit, students will build on their plumbing knowledge by learning about the essential tools and materials used in the trade, as well as the math skills needed for accurate plumbing work. Over the next 45 days, they'll explore how to identify and use both basic and advanced tools, understand the different types of materials in plumbing, and know when and why each is used. These skills are critical for working efficiently and safely in the field.

Students will also focus on plumbing math, learning how to make precise calculations for things like cutting and sizing pipes and measuring water, sewer, and gas pipe systems. They'll practice reading blueprints and understanding plumbing symbols to help them plan and execute projects. The unit wraps up with hands-on activities where students will put their knowledge into action by using tools and interpreting blueprints. By the end of the unit, students will understand how math, tools, and materials come together to ensure high-quality plumbing work.

Essential Questions:

1. What tools and materials are essential for plumbing work?

2. How is math applied in plumbing?

3. Why is precision important in selecting and using tools?

Enduring Understandings:

1. Tools and materials must be used correctly for efficiency and safety.

2. Plumbing math ensures accurate cuts, measurements, system designs, and installations.

3. Precision in tool usage minimizes errors and enhances quality.

Standards/Indicators/Student Learning Objectives (SLOs):

9.3.12.AC	Architecture & Construction
9.3.12.AC.1	Use vocabulary, symbols and formulas common to architecture and construction.
9.3.12.AC.2	Use architecture and construction skills to create and manage a project.
9.3.12.AC.3	Comply with regulations and applicable codes to establish and manage a legal and safe workplace.
9.3.12.AC.4	Evaluate the nature and scope of the Architecture & Construction Career Cluster and the role of architecture and construction in society and the economy.
9.3.12.AC.5	Describe the roles, responsibilities, and relationships found in the architecture and construction trades and professions, including labor/management relationships.
9.3.12.AC-CST	Construction
9.3.12.AC-CST.3	Implement testing and inspection procedures to ensure successful completion of a construction project.
9.3.12.AC-CST.5	Apply practices and procedures required to maintain jobsite safety.
9.3.12.AC-CST.9	Safely use and maintain appropriate tools, machinery, equipment and resources to accomplish construction project goals.
9.3.12.AC-DES	Design/Pre-Construction
9.3.12.AC-DES.2	Use effective communication skills and strategies (listening, speaking, reading, writing and graphic communications) to work with clients and colleagues.
9.3.12.AC-DES.8	Apply standards, applications and restrictions pertaining to the selection and use of construction materials, components and assemblies in the project design.
9.3.12.AC-MO	Maintenance/Operations
9.3.12.AC-MO.1	Recognize and employ universal construction signs and symbols to function safely in the workplace.
9.3.12.AC-MO.2	Use troubleshooting procedures when solving a maintenance problem in buildings.

Lesson Titles:

1. Introduction to Plumbing Tools: Identifying Basic and Advanced Equipment.

2. Proper Use and Maintenance of Plumbing Tools

3. Exploring Plumbing Materials: Types and Applications

4. Selecting the Right Materials for the Job: A Practical Guide

5. Understanding Plumbing Math: Measuring and Calculating Pipe Lengths

6. Sizing Pipes for Water and Gas Systems: A Step-by-Step Approach

7. Introduction to Blueprint Reading: Understanding Plumbing Symbols

8. Interpreting Residential and Commercial Blueprints for Plumbing Systems

9. Hands-On Practice: Using Tools to Complete Blueprint-Based Projects

10. Review and Apply: Combining Tools, Materials, and Math in Real-World Scenarios

Career Readiness, Life Literacies, & Key Skills:

ARCH.9-12.9.4.12.B.4	Perform math operations, such as estimating and distributing materials and supplies, to complete classroom/workplace tasks.
ARCH.9-12.9.4.12.B.5	Apply principles of physics, as they relate to worksite/jobsite situations, to work with materials and load applications.
ARCH.9-12.9.4.12.B.24	Employ technological tools to expedite workflow.
ARCH.9-12.9.4.12.B.40	Demonstrate knowledge of personal and jobsite safety rules and regulations to maintain safe and healthful working conditions and environments.
ARCH.9-12.9.4.12.B.41	Demonstrate knowledge of employee rights and responsibilities and employers' obligations to maintain workplace safety and health.
TECH.9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g.,

	1.1.12prof.CR3a).
TECH.9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
TECH.9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).
	With a growth mindset, failure is an important part of success.
	Innovative ideas or innovation can lead to career opportunities.

Inter-Disciplinary Connections:

1. Math

- Application of algebra and geometry to calculate pipe lengths, volumes, and angles.
- Measurement conversions between metric and imperial systems.
- Problem-solving and precision in pipe sizing and system design.

2. Science

- Principles of fluid dynamics, pressure, and flow rates in plumbing systems.
- Material science related to selecting pipes and fittings (e.g., understanding the properties of PVC, copper, and steel).

3. Career and Technical Education (CTE)

- Emphasis on safety protocols for tool handling and material usage.
- Skill-building in hands-on applications for real-world plumbing projects.
- Career readiness skills include understanding workplace expectations and integrating tools and materials in trade settings.

4. English Language Arts (ELA)

- Interpreting technical documents, including manuals and blueprints.
- Communicating findings and project proposals through clear verbal and written descriptions.
- Vocabulary building with technical plumbing terms and symbols.

5. Visual Arts

- Blueprint creation, including spatial awareness and design layout.
- Use of visual aids to plan and represent plumbing systems.

6. History/Social Studies

- Exploring the historical development of plumbing tools and materials.
- Analyzing the impact of plumbing systems on urban development and public health.

Summative Assessment:

High-Stakes Assessments:

- Comprehensive Exams: Final exams covering a broad range of course material can assess students' understanding of key concepts and principles.
- Capstone Project Presentations: Formal presentations showcase students' project management skills, decision-making, and communication abilities.

Performance-Based Assessments:

- Project Portfolio Reviews: A portfolio compiled throughout the program can demonstrate a student's growth, technical skills, and problem-solving abilities in various areas of the plumbing trade.
- Simulated Project Management Tasks: Students could be presented with a realistic construction scenario where they must apply their knowledge and skills to develop solutions or make critical decisions.

Industry-Standard Certifications:

- Encouraging students to pursue industry certifications relevant to plumbing can demonstrate their commitment to the field and mastery of specific skills.

Considerations for Choosing Summative Assessments:

- Alignment with Learning Outcomes: Ensure the chosen assessments directly measure the program's overall learning objectives and desired competencies.
- Depth vs. Breadth: Balance the need to assess a broad range of knowledge with in-depth exploration of critical skills.
- Authenticity: Choose assessments that reflect real-world scenarios and tasks a plumber encounters.
- Multiple Measures: Utilize a combination of assessments to provide a holistic picture of student learning.
- Faculty Collaboration: Ensure consistency and fairness in assessments across different courses within the program.

Additional Tips:

- Develop clear rubrics outlining specific criteria for evaluating performance on each summative assessment.
- Provide students ample opportunities to practice and refine their skills before summative assessments.
- Offer feedback on summative assessments to help students identify areas for improvement and guide their future learning.

- Alternate Assessment
- Benchmark
- Group Project Assessment
- Individual Project Assessment
- Marking Period Assessment
- Module Section Assessment

Resources & Materials:

Plumbing Level 1 Book NCCER Fifth Edition

Google Classroom

Promethean Board

Canva

Kahoot

https://www.youtube.com/

CBS Plumbing Trade

https://www.cbsnews.com/video/plying-their-trades/#

Run Time 7:20

Toilet

How The Toilet Changed History

Run Time 7:15

Toilet Parts: What They Are and Common Fixes (DIY) | Family Handyman.

Workplace Hazards Video Run Time

Top 6 Workplace Hazards Identified

Run Time 8:11

PPE Video

PPE - Safety Training Video Course - SafetyInfo.com

Run Time 10:49

NJ Master Plumbers Information

New Jersey Plumbing License Requirements

NJ Plumbing Wages

Plumber salary in New Jersey

Plumbing Trade Video

6 Lessons I Learned as a Plumbing Apprentice

Time 9:03

Plumbing Trade Video

Plumbers Can SPECIALISE In Many Area... Here Are The Different Types!

Run Time 8:23

Mike Rowe On The Trades

https://youtu.be/3h_pp8CHEQ0

Run Time 8:25

PPE

Plumbing PPE Plumbers Must NEVER Work Without!

Run Time 9:04

FATAL Plumbing Mistakes EVERY Plumber Needs To Know About!

Run Time 8:09

NJ One Call

New Jersey One Call

Power Tools

Let's learn about a couple of plumbing power tools - Plumbing Power Tools

Run Time 12:34

Types Of Hot/Cold Water Pipes And Fittings

PEX vs COPPER vs CPVC plumbing pipes

Run Time 16:55

Plastic Pipe

Gluing PVC Pipe & ABS Pipe [How To]

Run Time 8:16

Plastic Pipe

10 MISTAKES When Working With Plastic Pipes (PVC, CPVC & ABS) | GOT2LEARN

Run Time 8:26

IPS

When to Use Pipe dope, Teflon Tape, Neither or Both for Threaded Connection

Run Time 3:54

IPS

How to Use a Pipe Wrench

Run Time 4:31

IPS

RIDGID 300 Compact Threading Machine

Run Time 18:26

OSHA

Top OSHA 10 OSHA Violations of 2023 | And how to prevent similar citations.

Run Time 8:51

Ladder Safety

Run Time 4:33

Personal Protective Equipment Milwaukee

Old vs. new growth trees and the wood products they make

Instructional Strategies, Learning Activities, and Levels of Blooms/DOK:

Instructional Strategies

1. Direct Instruction

- Example: Demonstrating the use of advanced plumbing tools and proper safety procedures.
- Bloom's Level/DOK: Remembering, Understanding (Level 1).

2. Guided Practice

- Example: Facilitating hands-on activities where students practice measuring and cutting pipes using various tools under supervision.
- Bloom's Level/DOK: Applying (Level 2).

3. Problem-Based Learning

- Example: Assigning a project where students design a simple plumbing system, select appropriate materials, and calculate pipe sizes.
- Bloom's Level/DOK: Analyzing, Evaluating (Level 3).

4. Collaborative Learning

- Example: Group activity to interpret a plumbing blueprint and identify tools and materials needed for the project.
- Bloom's Level/DOK: Applying, Analyzing (Level 2/3).

5. Socratic Seminar

- Example: Discussing why precision in tool selection and plumbing math is crucial to system efficiency and safety.
- Bloom's Level/DOK: Evaluating, Creating (Level 4).

Learning Activities

1. Tool Identification Workshop

- Students categorize and demonstrate the use of basic and advanced plumbing tools.
- Bloom's Level/DOK: Remembering, Applying (Level 1/2).

2. Material Application Scenarios

- Students match specific plumbing materials to real-world applications, explaining their choices.
- Bloom's Level/DOK: Understanding, Analyzing (Level 2/3).

3. Math Lab: Pipe Sizing

- Solving math problems related to water and gas pipe sizing using formulas and tables.
- Bloom's Level/DOK: Applying, Analyzing (Level 2/3).

4. Blueprint Exploration

- Reading and interpreting plumbing blueprints, focusing on symbols and measurements.
- Bloom's Level/DOK: Analyzing, Applying (Level 3).

5. Safety Protocol Drill

- Practicing safety techniques, including PPE usage and handling tools/materials safely.
- Bloom's Level/DOK: Applying (Level 2).

Levels of Bloom's Taxonomy/DOK Alignment

1. Remembering (Level 1)

- Identifying tools and materials.

2. Understanding (Level 1/2)

- Explaining the purposes of plumbing tools and materials.

3. Applying (Level 2)

- Performing calculations for pipe sizing and blueprint measurements.

4. Analyzing (Level 3)

- Comparing material properties and selecting appropriate tools for specific tasks.

5. Evaluating (Level 4)

- Assessing the efficiency of selected materials and tools in a system design.

Formative Assessment:

In-Class Activities:

- Quick Quizzes: Short, unannounced quizzes at the beginning or end of class can assess comprehension of key concepts from previous lessons or gauge readiness for new material..
- Think-Pair-Share: Encourage individual reflection followed by partnered discussions and sharing key takeaways with the class. This promotes active learning and identifies common misconceptions.
- Minute Papers: Have students write a one-minute summary of the main points learned or lingering questions they have. This helps identify areas needing clarification.

Classroom Discussions & Activities:

- Open-ended Questions: Encourage students to think critically and elaborate on their understanding by posing open-ended questions throughout lessons.
- Case Studies & Problem-solving: Present real-world plumbing scenarios or problems for students to analyze and propose solutions. This assesses critical thinking and application of knowledge.
- Role-playing Activities: Simulate real-world situations like project meetings or client interactions to practice communication, negotiation, and problem-solving skills.

Peer-Based Assessment:

- Peer Reviews: Students can review each other's work, providing constructive feedback on project plans, presentations, or technical drawings. This fosters collaboration and self-assessment skills.
- Group Work & Discussions: Collaborative activities encourage students to explain concepts to one another, solidifying their understanding and identifying areas where they can learn from peers.

Technology-Assisted Assessments:

- Online Quizzes & Polls: Utilize online platforms for short quizzes, polls, or concept checks to gauge student understanding in real-time and adjust instruction accordingly.

- Anticipatory Set
- Exit Tickets
- Hands-On Activities (Individual & Groups)
- Hands-On Observations (Individual and Group)
- Questioning, Scenarios, and Problem-Solving (Open Ended and Multiple Choice)
- Warm-Up

Modifications

ELL Modifications:

- Choice of test format (multiple-choice, essay, true-false)
- Continue practicing vocabulary
- Provide study guides prior to tests
- Read directions to the student
- Read test passages aloud (for comprehension assessment)
- Vary test formats

G&T Modifications:

- Alternate assignments/enrichment assignments
- Enrichment projects
- Extension activities
- Higher-level cooperative learning activities
- Pairing direct instruction with coaching to promote self-directed learning
- Provide higher-order questioning and discussion opportunities
- Provide texts at a higher reading level
- Tiered assignments
- Tiered centers

At Risk Modifications

The possible list of modifications/accommodations identified for Special Education students can be utilized for At-Risk students. Teachers should utilize ongoing methods to provide instruction, assess student needs, and utilize modifications specific to the needs of individual students. In addition, the following may be considered:

- Additional time for assignments
- Adjusted assignment timelines
- Agenda book and checklists
- Answers to be dictated
- Assistance in maintaining uncluttered space
- Books on tape
- Concrete examples
- Extra visual and verbal cues and prompts
- Follow a routine/schedule
- Graphic organizers
- Have students restate information
- No penalty for spelling errors or sloppy handwriting

- Peer or scribe note-taking
- Personalized examples
- Preferential seating
- Provision of notes or outlines
- Reduction of distractions
- Review of directions
- Review sessions
- Space for movement or breaks
- Support auditory presentations with visuals
- Teach time management skills
- Use of a study carrel
- Use of mnemonics
- Varied reinforcement procedures
- Work in progress check

IEP & 504 Modifications:

*All teachers of students with special needs must review each student's IEP. Teachers must then select the appropriate modifications and/or accommodations necessary to enable the student to appropriately progress in the general curriculum.

Possible Modifications/Accommodations: (See listed items below):

- Allow for redos/retakes
- Assign fewer problems at one time (e.g., assign only odds or evens)
- Differentiated center-based small group instruction
- Extra time on assessments
- Highlight key directions
- If a manipulative is used during instruction, allow its use on a test
- Opportunities for cooperative partner work
- Provide reteach pages if necessary
- Provide several ways to solve a problem if possible
- Provide visual aids and anchor charts
- Test in alternative site
- Tiered lessons and assignments
- Use of a graphic organizer
- Use of concrete materials and objects (manipulatives)
- Use of word processor

Technology Materials and Standards

TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.1.12.C	Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.