



# WORKING HANDS WORKING MINDS



**A Vocational Education Curriculum Developed by YouthBuild USA**

## **UNIT 3**

# **Tools, Trades and Technology in Construction**



**by Anne Meisenzahl and David Greene  
Edited by Keisha Edwards**



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# Acknowledgements

*Working Hands, Working Minds* is a work in progress. The authors have experimented over the years with a variety of strategies for bringing education, community building, and societal issues into an occupational framework. We are eager to work with other teachers and learn from them as they experiment with new ways to engage, involve, and challenge young people who are working to create a better future for themselves and others. This curriculum is based upon our belief that meaningful learning is contextual, intuitive, and connected to community issues.

This curriculum began with YouthBuild teachers. All three authors are now working, or have worked in the past, in a local YouthBuild program. We received tremendous support from many people in many youth-serving organizations, and we received very helpful and specific feedback all along the way. At Banana Kelly Community Improvement Association, we received many helpful suggestions from Getz Obstfeld, Matthew Horwitz, Phil Mass, Michael Murray, and Andy Padian. At Youth Action Program and Homes, Sonia Bu, Dorothy Stoneman, Richard Green, Sam White, and Shakor Aljuwani were very encouraging. At the Young Adult Learning Academy, Peter Kleinbard gave us support, feedback, and access to resources.

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Finally, we want to give a special appreciation to the hundreds of young people we worked with over the years. They gave us guidance, made us laugh, and challenged our assumptions. Their contributions are immeasurable.

**Anne Meisenzahl, David Greene, and Keisha Edwards**

# Special Thanks

**YouthBuild USA** is proud to present this fine curriculum for use by YouthBuild programs. Anne Meisenzahl and David Greene, the primary authors of this curriculum, deserve enormous respect and gratitude for their creative and persistent work. They were both teachers in the first two YouthBuild programs in New York City during the mid-1980s. Anne taught at Banana Kelly Community Improvement Association in the South Bronx, and David Green taught at Youth Action Program in East Harlem. As teachers they discovered there was no appropriate vocational education curriculum in existence and they embarked on what turned out to be a 16-year trek to produce something truly useful for future YouthBuild teachers. Their incredible determination to find the time, the funds, and the expert consultation to give this gift to their fellow teachers, and to their students, is the highest form of dedication to a vision and to service. We thank them.



Dorothy Stoneman  
President, YouthBuild USA

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# Guide for Facilitators

## ***What is YouthBuild and Who Participates?***

YouthBuild is a highly successful and well-respected program for out-of-school young adults that places equal emphasis on community development, job training, career development, and education. The program is nationally recognized for its ability to enable young adults to create success for themselves while making a significant contribution to society. As of June 2000, there are approximately 145 YouthBuild programs operating in 43 states.

Started in 1978 as the Youth Action Program with support from the U.S. Department of Housing and Urban Development (HUD), YouthBuild provides young adults an immediately productive role in their community. As they engage in the development and renovation of low-income housing, they contribute to their communities, they learn about the responsibilities of work, they learn academic skills required for a high school diploma or a GED, they acquire job skills in the construction trades, and they learn skills of leadership and social action.

Is YouthBuild an alternative school? A charter school? An employability program for out-of-school youth? A social movement? A chance for “at-risk” young adults to learn the skills required for success? A state-of-the-art example of contextual learning? The essence of school-to-work? It’s all of the above, and more — everyone who has experienced YouthBuild will add to the above description. Every YouthBuild program creates its own flavor and personality. With support and technical assistance from the national YouthBuild USA staff, young adults across the country are using the construction of low-income housing as the context through which they learn the skills to be productive, independent, contributing, and satisfied members of their communities.

The HUD legislation defines YouthBuild students as follows:

- Participants must be between 16 and 24 years old.
- At least 75 percent must have dropped out of high school.
- At least 75 percent must be low income or from a low-income family.
- One hundred percent (100 percent) must have “educational needs.”

## ***The Working Hands, Working Minds Curriculum: What It Is and Isn't***

"Because our students come to us with little or no experience with regular work, citizenship, or stable family life, we start with the experience of work, from which we draw out the academic lessons."

JOHN BRISCOE  
VISIONS YOUTHWORKS, PA

*Working Hands, Working Minds* is an integrated construction curriculum. It was designed for academic instructors and construction trainers to use collaboratively.

In all YouthBuild programs, learning is an active process that involves interpreting new information, connecting it in some way to one's prior knowledge, and applying it appropriately. Traditional instruction focuses on discrete skills and isolated facts; it makes minimal connection to anything beyond the classroom or text. It does not advance authentic learning. Integrated and interdisciplinary curriculum, on the other hand, reflects real learning in the real world.

The YouthBuild Integrated Construction Curriculum, *Working Hands, Working Minds*, motivates students by engaging them in real-world problems and projects. Using the teacher as their guide, students investigate authentic community problems. They decide how they are going to proceed and what strategies to use. They develop the skills they need to take responsibility for their own learning. Students also share their individual talents and expertise as they work on projects as collaborative team members. They learn by talking over ideas with others, explaining their answers, and listening to other viewpoints.

In *Working Hands, Working Minds*, students explore topics and themes that are relevant and rich in possibilities. They are involved in activities that are practical and have clear value in a particular field. Instead of students showing what they know by taking a test that targets their weaknesses, they demonstrate their understanding in the context of meaningful activities that support their strengths and abilities.

*Working Hands, Working Minds* consists of the following five units:

1. Health and Safety
2. Housing and Community
3. Construction-Related Math and Measurement
4. Tools, Trades, and Technology in Construction
5. Teamwork and Leadership in Construction

It would be reasonable to ask why these five units were chosen to be the first phase of *Working Hands, Working Minds*. In many training programs, the two components — academics and construction — are separate and distinct from one another. *Working Hands, Working Minds* closes that gap. This curriculum is designed to help YouthBuild instructors and trainers integrate academics, construction, and leadership development. It fosters reading, writing, and mathematics learning through the context of construction; skill training is directly linked to community responsibility and social analysis.

Each of the five units is an introduction, and only an introduction, to the topic. Each unit presents what we believe to be the essential ingredients of the topics, those ingredients that are essential to a YouthBuild student's learning. In the future, we plan to produce an intermediate and an advanced version of every one of these units for those young adults who have an extended YouthBuild experience, at this time, however, it is important for the users of the curriculum to realize that these lessons represent a critical foundation and, we hope, a springboard for other related learning experiences.

We encourage program staff to use the curriculum as a recipe. Although *Working Hands, Working Minds* was developed by many people, it does not represent rigid operating instructions. Usually the first time you cook a recipe, you follow the directions. But the next time you cook the recipe, you might add one thing and take out another. Just as a good recipe is a guide for you to create the dish you want to serve your diners, this is a flexible curriculum with many opportunities to give it your own flavor and personality.

It is critical to remember that learning happens everywhere at YouthBuild — at the construction sites in the community, in the academic and vocational classrooms, during community meetings, and while doing community service. All of YouthBuild is education. Therefore, this curriculum is a vehicle for program staff to integrate what they teach, why they teach it, and how they teach it.

These five units of *Working Hands, Working Minds* do not teach the technical vocational skills of the construction trades, such as framing, masonry, finish carpentry, plumbing, etc. Rather, these units teach a set of transferable skills that are critical for and applicable in any of the construction trades. In fact, many of the skills taught in these units, such as teamwork, basic writing and communication, critical thinking, and problem solving, are transferable to careers in nearly any occupational area.

## ***Working Hands, Working Minds: Blueprint for Success***

*Working Hands, Working Minds* is a curriculum that reflects current research and practice related to contextual teaching and learning. What is contextual learning? In a contextual learning environment, textbooks, lectures, and traditional tests are no longer the primary teaching tools. Rather, they are supplemental to a learning process in which students apply and experience what is being taught by addressing real problems and needs associated with their roles and responsibilities as family members, citizens, students, and workers. In a YouthBuild program, students are at the center of their learning, and construction of low-income housing is the context.

According to current research there are six key elements of contextual learning (Owens, Tom; Dunham, Dan and Wang, Changhua, "Toward a Theory of Contextual Teaching and Learning," *Washington State Preservice Teacher Education Consortium for Contextual Teaching and Learning*, 1999)<sup>1</sup>:

1. Meaningful learning
2. Application of knowledge
3. Higher order thinking
4. Standards-based
5. Cultures-focused
6. Authentic assessment

Related to those elements of contextual learning, the *Working Hands, Working Minds* blueprint has been drawn to:

- Engage youth in real conversation about issues relevant to their lives.
- Help youth articulate their dreams, goals, experiences, skills, and talents.
- Encourage youth to plan and participate in change in their own lives and their communities.
- Challenge youth to step out of their comfort zone and put themselves in the driver's seat of their own learning.
- Push youth to think critically about program standards and employability standards as they assess their own strengths and weaknesses.
- Engage youth in hands-on activities with a meaningful balance of theory and practice in a safe environment.
- Engage youth in meaningful reflection about each lesson, thus teaching that reflection is a valuable process in our lives.

<sup>1</sup> Reprinted with permission from the Northwest Regional Educational Laboratory.

- Instruct youth in the development of portfolios so they can document and articulate their knowledge and skills.
- Help youth make connections between the classroom, the worksite, and life beyond YouthBuild.
- Immerse youth in culturally relevant perspectives.

Just as the occupants of a building do not need to think about the architectural blueprints every day, YouthBuild staff do not need to recite these principles of contextual learning; however, in a program that operates without them, learning will not be meaningful.

Described below are some examples of how these principles play out in *Working Hands, Working Minds*.

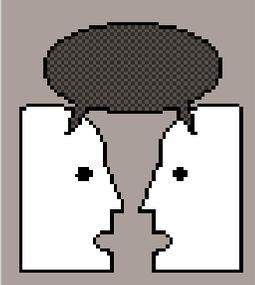
### **Teaching from Real Life Experiences**

Skills introduced in *Working Hands, Working Minds* are taught in the context of low-income housing construction. The skills are introduced in reference to real community and social problems that need to be solved, in conjunction with real tasks that need to be accomplished. For example, when students build a porch on a low-income apartment unit, the curriculum addresses the reading, writing, and math skills needed to accomplish that task. In a lesson that teaches about first aid and how to respond to emergencies, related reading, writing, and communication skills are emphasized. Specific academic skills are identified in the GED description later in this section.

As young people work in and contribute to their communities, they assume ownership and they invest into the community. Their work is real, their work is urgent, and their work is valued. It is through these real life experiences that YouthBuild young adults flourish and create their own success.

### **Fostering Teamwork**

Teamwork skills are among the most critical for success in any job in any career; construction sites are a perfect context for teaching these skills. Teamwork and cooperation are embedded throughout the curriculum. Students working together in teams learn a fundamental lesson: we are stronger when we help each other and share our skills than if we ignore or compete against one another. As students learn group skills necessary for work, their communication skills are enhanced and they develop confidence in solving problems. They learn to trust each other and respect differences. They participate actively and learn to work both cooperatively and independently.



We are stronger when we help each other and share our skills than if we ignore or compete against one another.

In this curriculum, many activities involve the use of small groups and teamwork. The following questions should be taken into consideration regarding the use of small groups:

- What are the reading and verbal abilities of students in the groups?
- How are students' maturity levels similar and/or different regarding teamwork skills? How will you structure the activities to increase the skill levels of all the students?
- Will anyone feel left out or left behind? How will students be able to assist one another?
- How many students are in the class and how will small groups be structured?
- What are the group management issues?
- What skills do the instructors have?
- Will staff training be available, if needed?

### **Encouraging Problem Solving and Critical Thinking**

Problem posing and problem solving are key components of *Working Hands*, *Working Minds*. All lessons incorporate opportunities for generating questions, solving problems, and reflecting on the process. Students are given opportunities to use their own experiences as a source of information on how to complete tasks and reach goals. The lessons in the curriculum are designed to facilitate critical analysis and reflection by creating opportunities for students to act on and experiment with the problems and solutions they have posed. The curriculum makes explicit the connection between these problems, community development, and the literacy skills needed to support reflection and action.

### **Developing Skills of Social Analysis**

In *Working Hands*, *Working Minds*, the social realities of housing, community, and urban development are addressed through the construction and renovation of low-income housing. Students have opportunities to research and appraise related social issues and to develop strategies for creating change. By participating in the process of renovating buildings or constructing new homes, students are making important social contributions. In this curriculum, through research, reading, writing, and math activities, students become more conscious of their socially useful role.

## **The Importance of the General Equivalency Diploma (GED)**

Obtaining either a high school diploma or a General Equivalency Diploma (GED) is an important goal for YouthBuild students. The GED examination certifies that a learner performs academically at a level that is equivalent to a high school education.

Although for many years the GED has been nationally recognized as an equivalent to the high school diploma, some people believe it does not represent equal rigor and preparation for postsecondary courses. Most of the studies comparing the outcomes of GED and high school graduates indicate that, although getting a GED does not offer the same set of comprehensive experiences that a high school education/diploma would provide, it does allow individuals to enter the job market and postsecondary education at similar rates. In other words, the GED definitely provides an avenue for young people to pursue job opportunities and postsecondary education.

YouthBuild students who are close to graduating from high school and lack only a few high school credits are encouraged to obtain their diploma either through partnership with the local school system or through the YouthBuild program itself. However, for many YouthBuild students, the GED provides the most efficient and reasonable pathway to high school competition. The GED is recognized by employers and postsecondary institutions as proof that the individual has achieved a level of competency that will benefit them on the job and in future educational endeavors.

The major academic and GED skills emphasized in the first five units of *Working Hands, Working Minds* include:

### **Reading and Writing**

- Recognize and infer cause and effect
- Predict outcomes
- Apply information to new situations
- Recognize, recall, summarize, and express main ideas
- Recall detail
- Recognize sequence
- Organize ideas
- Write an essay
- Use the library, encyclopedia, table of contents, and index of a book
- Read and write poetry

### **Math**

- Define standard units of measurement
- Convert length and time measurements

- Solve measurement problems
- Add, subtract, multiply, and divide numbers using inches, feet, and yards
- Use fractions and percentages to solve problems
- Use standard measurement tools, such as ruler, tape measure or yardstick
- Estimate and draft a budget
- Solve area problems using square foot and perimeter
- Explore angles and triangles as used in construction

The New GED Test to be used in 2002, will provide students with calculators during part of the Math Section of the Test. Students will be expected to be able to use these calculators effectively to answer questions. We recommend that staff access training and learning materials to facilitate the development of this new skill requirement for the General Equivalency Diploma.

These skills are interspersed throughout many of the lessons in all of the units. Students have multiple opportunities to practice using the skills both in the classroom and on the construction sites. As the students learn these skills in the context of doing construction, they understand that the skills are transferable to many other areas of their lives.

### **Employability and Career Development**

YouthBuild helps young adults acquire the skills required to succeed in any job, in any industry, in any community. In 1991 the U.S. Department of Labor's Secretary's Commission on Achieving Necessary Skills (SCANS) gathered information from business owners, public employees, union officials, and workers in all types of jobs from entry level to top management. The conclusions were unanimous:

“New workers must be creative and responsible problem solvers and have the skills and attitudes on which employers can build. Traditional jobs are changing and new jobs are created every day. High paying but unskilled jobs are disappearing. Employers and employees share the belief that all workplaces must ‘work smarter.’”

(From *What Work Requires of Schools, A SCANS Report for AMERICA 2000*, 1991)

Most youth employment programs, as well as nearly every state education agency, have adopted the SCANS competencies as those skills that all people need to become productive, independent, contributing, and satisfied members of society. *Working Hands, Working Minds* consciously and directly addresses the following SCANS competencies and foundation skills:



photo: Martin Dixon

- **Identify, organize, plan, and allocate resources:** time, money, material and facilities, and human resources
- **Work with others:** teamwork, teach others, serve clients and customers, leadership, and work with diversity
- **Acquire and use information:** find and assess information, organize and communicate information, and use computers to process information
- **Understand complex inter-relationships:** understand, improve and design systems, correct performance
- **Work with a variety of technologies:** apply technology to a task, maintain and troubleshoot equipment
- **Basic skills:** reading, writing, math, listening, speaking
- **Thinking skills:** creative thinking, decision making, problem solving, knowing how to learn, reasoning
- **Personal qualities:** responsibility, self-esteem, sociability, self-management, integrity/honesty

As YouthBuild students successfully complete the *Working Hands, Working Minds* lessons, they demonstrate increasingly high levels of achievement of the SCANS competencies that are critical to construction or any other industry they may choose to pursue. Through the learning activities and portfolio entries, YouthBuild students have many opportunities to document their skills for use on a resume, letter of application, or job interview.

In order to help students prepare for the realities of the world of work, many lessons involve visiting local workplaces, gathering information about career opportunities, and interviewing workers. Not only do these activities acquaint students with the literacy skills needed to do particular jobs, but they also learn about the physical environment, teamwork, and communication skills required by different jobs.

*Working Hands, Working Minds* is about career exploration. By researching the types of jobs available in the construction trades, students gain a broader understanding of the options available to them, and develop a realistic sense of what skills and training they will need for jobs that interest them.

### Assessment

YouthBuild thrives in the new era of educational assessment. The traditional paper-and-pencil testing mode of assessment is losing prominence. A few notes about the “old methods” will add to our understanding of the new. It used to be that achievement tests were used to sort and separate learners into those who went on to college and those who didn’t. Traditionally, teachers

taught and students were tested to determine if they learned what they were supposed to; this created a wall between teachers and students. The '70s brought statewide testing, the '80s and '90s brought national standards and centralized assessments.

The more realistic theory of assessment is that testing alone is insufficient. Assessment must be used to inform the instructional process and the learning process, and the teacher and the student should use assessment information equally. Here are a few assumptions about authentic assessment:

- Meaningful learning and meaningful assessment go hand-in-hand; one won't happen without the other.
- Good assessment comes from a clear vision of expected outcomes; the standards and criteria for excellence are clear and understood by both the learner and the instructor.
- Good assessment actively involves the learner; there is a conscious emphasis on reflection and ownership of learning.
- Assessment has many purposes, strategies, and products; it is multidimensional, much more than a test-at-the-end strategy.
- Assessment should not be a time-eater; it should save time. It should make the job of teaching easier and more effective.
- There is ongoing positive interaction between all learners, including the instructor.

The assessment process in *Working Hands, Working Minds* is as authentic as possible. It is based on the “use it or lose it” theory of knowledge. Every lesson in all five units ends with Creative Extensions and Project-Based Learning Activities so that students can demonstrate their understanding of what they have learned. Both of these components of the lessons are structured opportunities for students to apply what they have learned. Embedded in the lessons are numerous opportunities for both individual and group reflection.

The final lesson in each unit is a formal assessment of learning that measures young peoples' ability to apply and personalize the information they have acquired. Assessment activities in each unit might include writing a response to a question such as, “How have your attitudes, beliefs, and ideas changed as a result of this unit?” Or students might complete a safety self-assessment and compare it to one completed by their construction trainer.

Throughout each unit, students collect work products/samples to put in a portfolio. As the culmination of the student's work in the unit, the portfolio serves the following purposes:

- It is a student-centered assessment tool. Students make judgments about the quality of their work and learning and what needs to be improved.

- It enables teachers to review collected work and make judgments about students' growth over time.
- It has the potential to boost students' self-confidence about their skills because it offers a concrete illustration of these skills.
- It is a potential tool to help students “show what they know” to a prospective employer, internship host, or educational institution.

Although different YouthBuild programs make different uses of portfolios, in its simplest form a portfolio serves as an assessment tool for instructors, a self-assessment tool for students, and the raw material to use for a career presentation portfolio.

### ***Working Hands, Working Minds: The Foundation***

First, a note about learning readiness. Learning readiness is defined as the ability of a learner to engage in the instructional program with effective learning and study skill habits. YouthBuild students must be able to take notes, do homework, take examinations, read and digest material, write effective prose, problem solve, and think critically — all habits that are conducive to life-long learning. In addition, YouthBuild students need to learn how to ask questions, think about their learning, and assess how they are doing with the material that is presented to them. Study groups are often used to support effective learning and study habits.

*Working Hands, Working Minds* was conceived as a way to introduce individuals to the world of construction and its relationships to academic achievement, e.g., reading, writing, and mathematics. It provides classroom teachers, counselors, and construction managers with a set of lessons to integrate academics with construction skills. Because *Working Hands, Working Minds* requires YouthBuild students to learn and practice effective study skills, learning readiness is an important consideration when delivering the curriculum.

Learning readiness is a key to successfully completing the GED program, learning construction skills, and being prepared to enter the job market or post secondary education. *Working Hands, Working Minds* was designed to take this into consideration in both content and process.

*Working Hands, Working Minds* was designed to be easy to use, easy to adapt, and easy to integrate with other program curricula. Therefore, each unit has a similar format and each lesson has the same design. Described below is the structure of the units and the lessons in each unit.

"We try to make our students feel okay about who they are. There was a time when it wasn't okay to be Indian. There is a whole movement now to preserve our cultural identity, and our young people are becoming a part of that."

DENNIS FOX,  
YOUTHBUILD FORT BERTHOLD, ND

Each unit has an overview, which includes:

- A brief *summary* of each lesson.
- A *competency checklist* that outlines the skills (both academic and construction) students should be able to perform upon successful completion of the lessons in the unit.
- A *portfolio assessment checklist* that outlines the materials students could include in their portfolios.

Each lesson in each unit uses the following format:

- **Aim:** The purpose of the lesson and what students will do/learn.
- **Key Terms and Concepts:** A list of vocabulary words that can be introduced in relation to specific lessons.
- **Time:** Approximately how long the lesson should take.
- **Things to Consider:** What an instructor might need to do or think about before starting to teach the lesson, such as how to present a sensitive topic, finding a guest speaker, arranging for access to computers for Internet research, or preparing for career interviews.
- **Materials, Tools and Resources:** A list of all the handouts and any materials that are needed to teach the lesson, such as flipchart paper, student journals, or newspapers.
- **Steps for Activities:** A lightly scripted step-by-step guide for the instructor.
- **Wrap-Up:** Reflection on the lesson, thinking about how to apply what was learned both to the YouthBuild program and to one's personal life.
- **Creative Extensions:** Suggestions about ways to adapt certain activities in the lesson; ideas for embellishing the lesson; simple applications or ways to practice what was learned in the classroom.
- **Project-Based Learning Activities:** Ideas for extending the lesson with a group or individual project that requires students to take leadership to plan, carry out their activities, and reflect on what they did and learned. Projects should all have a community component in which students connect with other people or organizations; some have career connections. These activities are ideas for program staff to start from, not fully scripted guides for each project idea.
- **Handouts:** All handouts required to complete the lesson are at the end of the lesson; others are in the supplemental Tools and Resources section at the end of the unit.

Following the lessons in each unit are two final sections:

- **Tools and Resources** section lists print, Internet, and video resources that might be helpful for enrichment activities or for the facilitator.

- **Supplemental Handouts** suggest optional activities, creative extensions, and project-based learning activities.

“We do vocational education on the site two mornings a week. We are in a room in a garage that is set up like a classroom. It has a desk, tables and a blackboard...I also teach vocational education in the classroom two sessions a week. We have a good blackboard, textbooks, and a VCR. We combine reading and writing, vocabulary development, demonstration, and hands-on practice...I’m also planning to deal with the history of construction careers, barriers to employment for women, real estate, financing and community development, because these topics make construction come alive, students can see the relevance of it.”

Rebecca Etchison, YouthBuild Dayton

## Making the Curriculum Work for Your Program

*Working Hands, Working Minds* is appropriate for any program that strives to teach construction skills in the context of community development and social action.

The curriculum is applicable to any performance-based and competency-based education programs. It can be integrated into programs that use Individual Education Plans (IEPs) or Academic Development Plans (ADPs) in which students have individual plans geared to their particular learning needs. It can be used in conjunction with other curricula; it can supplement high school equivalency (GED) or high school diploma curricula. Programs can adapt the curriculum to meet their needs by selecting lessons relevant to their program’s competencies.

*Working Hands, Working Minds* is designed to be used by a team of staff (teachers, counselors, construction managers, and other instructional staff) working together to coordinate the learning process. Programs should make their own decisions about which lessons will be taught, who will teach which lessons of each unit, and which lessons will be taught as a team. Instructors should meet regularly to plan and debrief.

Groups might consider the following questions as they plan the use of the curriculum:

- Where will instruction take place?
- Who will teach which lessons?
- How will the program maximize the integration of worksite and classroom instruction?
- When will instructional staff meet to plan, coordinate instruction, and debrief?

"I'm also planning to deal with the history of construction careers, barriers to employment for women, real estate, financing, and community development because these topics make construction come alive; students can see the relevance of it."

REBECCA ETCHISON  
YOUTHBUILD DAYTON

- How much of the time will be spent team-teaching and how much will be separate?

Depending on the staffing structure and the skills and background of the staff, programs can use *Working Hands, Working Minds* in numerous ways, ranging from a traditional approach (in which components remain distinct) to a fully integrated approach. Three of these approaches are described below.

### 1. Separate but Equal Approach

In this traditional model, academic teachers, worksite instructors, and vocational instructors work and teach separately, but reinforce each other's separate domains and support each other's work. Instructors and teachers choose separate lessons from the curriculum to teach in their distinct components, but do not actually teach together. Because of the shared theme of the lessons, students may, on their own, make the intellectual connection between them, but the connection is not overtly emphasized by the instructors.

### 2. Content Exchange Approach

In this approach, academic teachers and vocational instructors meet initially to discuss how to divide the lessons and when lessons might best be taught in order to support each other's content area. They meet regularly to discuss how the curriculum can be expanded to demonstrate the interrelatedness of the content. For example, when students learn vocabulary, they use words related to construction; after learning how to frame a wall on the construction site, students might describe the process in a writing exercise in the classroom.

Vocational instructors might recommend creative extensions or project-based learning activities to be coordinated by the teacher; academic teachers might suggest materials and methods for teaching measurement skills on the worksite.

### 3. Team Teaching Approach

When "teaming," worksite instructors, academic teachers, and vocational instructors work together to choose lessons, develop additional instructional materials, present material, and assess student progress. In this highly cooperative approach, instructors demonstrate to students the way in which their respective fields are related. The academic teacher might go to the worksite to teach the math skills needed to measure the perimeter of a lot to determine board feet of fencing needed, or to teach the reading skills needed to understand the directions for operating a power tool. Likewise, worksite and vocational instructors might go into the classroom to teach proper names and operating instructions of tools to be used on the construction site. Academic and vocational teachers decide which lessons can be taught together and with which activities they can assist each other.

On a frequent basis, all of the instructional partners meet to assess the collaboration process and to discuss continuous improvement of the process.

### Using the Key Terms and Concepts

At the beginning of each lesson you will find a list of vocabulary words from the lesson that may require clarification and dialogue. Listed here are a few ideas for teaching the key words and concepts.

- **Before each lesson, write the words on the board and ask students what they think the words mean.** Have a short group discussion to come to consensus on definition; if consensus is not reached, wait until the term or concept appears in the lesson and then revisit the discussion.
- **Before beginning the lesson, you could have students individually write down what they think the terms mean.** Then, at the end of the lesson, ask students to revisit their definitions and revise, as necessary. Give students a chance to compare their definitions and come to a common definition.
- **Students can compile glossaries of key terms** and continue to add words to it from each lesson. In addition to writing definitions, they could divide words into syllables to aid spelling, identify parts of speech, and use words in sentences.
- **Short quizzes** can be given at the end of a lesson so students can assess their own comprehension of the key terms and concepts.
- **A homework assignment** could be for students to teach one or more of the key terms or concepts to a family member or friend.
- **Using computers**, students can create YouthBuild dictionaries with definitions of the key terms and concepts.

The last lesson in each unit is a good time to briefly review the vocabulary from the unit and assess comprehension.

- **You could be traditional** and give a test.
- **You could be dramatic** and ask for a skit using some of the key terms.
- **You could be playful** and engage students in a charades or game activity.
- **You could be humorous** and let students draw cartoons with captions or write jokes using the vocabulary words.

### Creative Extensions

Everyone teaches differently and all learners have their own unique interests and needs. We know that there is no “one right way” to teach, and the more teachers modify these lessons to make them their own, the more effective they will be. Therefore we have included two or three ideas for modifying or

enriching the lesson. These ideas are optional of course, and are meant to be short, creative, typically classroom-based extensions and modifications of the lesson. The overall purpose, however, is to offer students alternative strategies to learn and opportunities to apply what they learned in a wide variety of ways.

One simple example of a creative extension in the math unit is to have students write their own construction-related word problems using the skills they learned in the lesson. A more complex creative extension in the math unit has students explore how the architect Frank Lloyd Wright used angles and geometrical shapes to enhance the aesthetic beauty and functionality of his buildings. Many creative extensions are, in fact, applications of learning that can be used as an assessment of how well the students learned the subject matter.

While the overall purpose is application of knowledge gained, these creative extensions should also be motivating and personalized. For example, the one about Frank Lloyd Wright could be changed so that a student or group of students select their own architect to study. If you wanted to personalize or localize the project even further, you could focus on local architects.

The creative extensions are meant to be just that — creative activities that extend, embellish, or enrich the lesson.

### **Project-Based Learning**

Every day more research appears on the rationale for, and the value of, project-based learning. It is a teaching and learning strategy that puts students “in the driver’s seat of their own learning.” YouthBuild is intrinsically conducive to project-based learning because of the very nature of the construction projects.

What is a project? Coupling the current research and practice on project-based learning with the YouthBuild philosophy, a good YouthBuild project is a cohesive set of learning activities with the following characteristics:

- A project is derived from an issue or idea that has authentic meaning for the student(s), the community, and the program.
- Rather than focusing on one subject area, projects are interdisciplinary and integrate a variety of content areas.
- A project takes more than a week to complete; it is a series of activities that hang together with a beginning, a middle, and an end.
- Students, teachers, and in many cases, community members, collaborate in the planning, execution, and assessment of the project.
- A project requires the use of both community and classroom resources.
- Projects require students to use critical thinking and problem-solving skills, and many of the GED skills and employability (SCANS) skills described earlier in this Guide for Facilitators.

- Projects encourage teamwork and leadership as students take on different roles and assist each other in the learning process.
- A project should ideally result in a product, presentation, portfolio, or demonstration of knowledge.
- Project-based learning demands that both students and teachers assume new roles.
- The teacher is the facilitator, not the leader.
- The teacher learns along with the students rather than being an expert.
- The teacher gives up some authority as the students demonstrate leadership.
- The teacher is a coach, cheerleader, and a model.
- The teacher must be patient, willing to let students make mistakes in a safe environment, and ready to support students through the bumps in the road.

One of the nicest pieces written recently on project-based learning is from a toolkit titled *Connected Learning Communities Toolkit for Reinventing High School* (Jobs for the Future) by Adria Steinberg of Jobs for the Future. Divided into six categories, the author identifies these criteria for designing projects:

#### **Authenticity**

- Project emanates from a problem or question that has meaning to the student.
- Problem or question is one that might actually be tackled by an adult at work or in the community.
- Students create or produce something that has personal and/or social value, beyond the school setting.

#### **Academic Rigor**

- Students acquire and apply knowledge central to one or more discipline or content area.
- Students use methods of inquiry central to one or more disciplines (e.g., to think like a scientist).
- Students develop higher-order thinking skills and habits of mind (e.g., searching for evidence, taking different perspectives).

#### **Applied Learning**

- Students solve a semi structured problem (e.g. designing a product, improving a system, or organizing an event) that is grounded in a context of life and work beyond the school walls.
- Students acquire and use competencies expected in high-performance work organizations (e.g., teamwork, problem solving).
- Work requires students to develop organizational and self-management skills.

*“All students don’t learn the same. Learning should be tailored around students so that it doesn’t force them to learn in one way. Learning should not be limited to the classroom. The whole world is a classroom. Take them out in the world and teach them.”*

ROBERT BELL,  
YOUTHBUILD PHILADELPHIA

### **Active Exploration**

- Students spend significant amounts of time doing field-based work.
- Students engage in real investigations using a variety of methods, media, and sources.
- Students communicate what they learn through presentations.

### **Adult Connections**

- Students meet and observe adults with relevant expertise and experience.
- Students work closely with at least one adult.
- Adults collaborate on the design and assessment of student work.

### **Assessment**

- Students reflect regularly on their learning, using clear project criteria that they have helped to set.
- Adults from outside the classroom help students develop a sense of the real-world standards for this type of work.
- There are opportunities for regular assessment of student work through a range of methods, including exhibitions and portfolios.

The project-based learning activities at the end of each lesson are merely ideas; doing a project in its ideal form is no simple matter. As you begin to build on some of the project ideas in the lessons, it is good to start small, make it doable, and build in success for the participants.

### **Time**

The time indication for each lesson is an estimation, not a statement of fact. The time it takes to complete each lesson is dependent on the following factors: the intent of the facilitator, past experiences of the students, interest of the students, how verbal and conversational the students are, and how your program is structured.

*“All students don’t learn the same. Learning should be tailored around students so that it doesn’t force them to learn in one way. Learning should not be limited to the classroom. The whole world is a classroom. Take them out in the world and teach them. Strategies? I use everything around me to make it work. Newspapers, videos, guest speakers, ‘regular people,’ families, the elderly, the young, the entire community.”*

**Robert Bell, YouthBuild Philadelphia**

## Tips for Instructors

“Facilitate” means “to make easier.” Think about yourself as a facilitator — someone who helps people learn rather than someone who imposes learning upon them. Facilitating suggests the idea of a collaborative relationship between the instructor and students. A facilitator is a:

- Coach
- Listener
- Trainer
- Learner
- Manager of a group process

What follows are some good practices for facilitating, adapted from *Strengthening Mentoring Programs: The National Mentoring Center Training Curriculum* (Office of Juvenile Justice and Delinquency Prevention; Northwest Regional Education Laboratory, Public/Private Ventures, 2000)<sup>2</sup>.

### Before Each Lesson

#### Know the curriculum thoroughly

- As necessary, customize activities, handouts, and overheads so they best address characteristics of your program and your specific group of students.
- Think about how you will facilitate the session, and be prepared to make on-the-spot adjustments. If, for example, you find you need to spend more time on one activity, you might need to shorten another.

#### Make your learning environment conducive to group interaction.

- Avoid a traditional classroom set-up. Depending on the size of your group, have tables large enough for all the students to sit around, write and converse.
- If small groups are going to be meeting as part of the lesson, make sure the area is large enough so that small groups can meet without distracting each other.

#### Have everything ready.

- Copy handouts and prepare overheads.
- Gather any required materials and equipment: newsprint, markers, masking tape, an overhead projector (and extension cord, if necessary), and anything else you might need for the lesson.

<sup>2</sup> Reprinted with permission from the Northwest Regional Education Laboratory.

Keep this point in mind: people remember about 10 percent of what they hear, 40 percent of what they hear and see, and 80 percent of what they discover for themselves.

## During Each Lesson

### Create a comfortable learning environment.

- Create an atmosphere where participants are taken seriously and where they can also laugh. People are usually most open to new ideas when they are enjoying themselves and feel comfortable enough to risk making mistakes.

### Pace the lesson appropriately.

- Encourage the exchange of ideas and information, while also keeping activities on track. Move things quickly enough to keep students from being bored, but slowly enough to make sure they absorb what is being discussed.
- Allow time throughout the session for students to ask questions and assist one another with seeking answers.

### Model good listening, feedback, and problem-solving skills.

- Listen carefully and respectfully. Acknowledge what the young people say even if you don't agree. People need to feel they are being listened to and their ideas and concerns are recognized as worthy contributions.
- Respond by guiding, not judging. Repeat and address key points.
- Help students develop collaborative problem-solving skills. Involve them in answering other participants' question, and have them work together to arrive at solutions.

### Think about how people learn best.

- Keep this point in mind: people remember about 20 percent of what they hear, 40 percent of what they hear and see, and 80 percent of what they discover for themselves.
- Use overheads and newsprint to help students see and remember. Newsprint is also a useful tool for group thinking and problem solving. Summarize major discussion points on newsprint. Post it on the walls around the room so you and your group can keep referring back to, and expanding upon, earlier ideas and contributions.
- Use the three effective strategies for facilitators — brainstorming, group work, and role plays — that are described below.
- Build in success. People learn best when they experience success frequently. Structure activities so students have a sense of accomplishment by the end.

### Be yourself

- Know your limitations. If you don't know the answer to a question, that's okay. You don't need to know all the answers. Learning is a collaborative process and you are a partner with your students in that endeavor.
- Maintain your sense of humor.

## After Each Lesson

### Get feedback from students.

- Prepare an evaluation form that asks for feedback on both the process and the content of the lesson. Distribute it at the end of the session, and ask students to complete it before they leave.
- Use their comments and opinions to plan and tailor your next lessons.

### Reflect on what worked well and what did not.

- Don't use the feedback forms to judge yourself. Instead, use the information to help you think through what went well from the students' point of view, what you need to modify about the content, and what facilitation skills you should work on.
- Along with students' feedback, give yourself feedback on the lesson. Think about the situations when students seemed involved, bored, stimulated, confused, angry, or amused. Based on your self-observations, make necessary adjustments in lesson content and your facilitation strategies.

## Three Strategies for Effective Facilitation

While facilitating these lessons, you will want to take advantage of three important strategies: brainstorming, group work, and role plays.

### 1. Brainstorming

Brainstorming is an excellent way to generate ideas, and it is an effective technique for getting all students involved and contributing. This is especially true at the beginning of a lesson when you are trying to get everyone focused on the same subject.

When facilitating brainstorming activities, keep these points in mind:

- The purpose of brainstorming is to encourage all students to offer their thoughts and opinions in a nonjudgmental atmosphere.
- As students offer ideas, record them — all of them — on newsprint.
- Brainstorming is a free exchange of ideas on a topic; it is important to accept everyone's contribution.

### 2. Group Work

During many activities, organizing the whole group into small groups of four to six students will encourage participation, involvement, and collaborative problem solving.



photo: Earl Dotter

In some cases, assign, or have group members assign to themselves, these specific roles:

- **The leader** (like a facilitator) takes responsibility for helping the group complete its task. He or she helps group members work together and encourages everyone to participate in positive ways.
- **The recorder** writes down ideas from a brainstorming and anything else that needs to be recorded.
- **The reporter** presents the small group's ideas and conclusions back to the whole group. Sometimes you might want to combine the recorder and reporter roles.

Make sure that over the course of several sessions student roles vary and that everyone has an opportunity to be the “leader.” Make sure participants understand that, whatever other roles they may have, everyone in the group works together to complete the group task. Everyone suggests ideas, gives opinions, agrees or disagrees with others, asks questions, and offers solutions.

### 3. Role plays

When preparing to facilitate role plays, keep these points in mind:

- Role plays are informal dramatizations through which students can try out ways they might handle a potential situation and increase their insight into someone else's feelings, values, or attitudes.
- If the lesson includes suggested scenarios and characterizations for the role plays, you should modify these, where possible, to reflect actual situations that have arisen or are likely to arise in your particular program.
- Always allow time after the role plays for students to discuss their own and others' “performances” and to talk about what they learned from the activity.
- Many people initially feel uncomfortable doing role plays. However, once they have some practice with them, they usually enjoy the experience and see that role plays can increase confidence, comfort, and self-esteem.

### What If Life Happens?

Nothing in life goes perfectly all the time, and facilitating an integrated curriculum is no exception. Despite all your planning and skillful facilitation, things can (and sometimes will) become unexpectedly challenging. Below are suggestions for handling some of those awkward situations.

#### What if you notice that students' eyes are glazing over?

- Ask yourself if you're talking too much without giving the students a chance to contribute. Get the participants engaged by structuring it so they have to do the thinking.

- Do a reality check. Are you addressing the needs students have presented?
- Do another reality check. Do you all need a break? Perhaps you could pass out Hershey's Kisses!
- Inject some humor fast.

**What if you don't have enough students for the small group work you have planned?**

- Use pairs instead.
- Change the activity to a whole group activity, and seat the the group in a circle.

**What if there's a heated discussion that is moving the group off track and taking up too much time?**

- First let students know that you value their interest and enthusiasm.
- You can say, "Let's stay with this discussion for two more minutes." Then, after two minutes, sum up what's been said and move on.
- Refer back to the aim of the lesson and say "We need to move on so let's have two or three final comments on the topic."
- Let the students suggest an alternate time and process to pursue the discussion so you can move ahead with the lesson.

**What if you realize you're going to run out of time before you've accomplished your goals?**

- One option is to move quickly through the rest of the lesson. Cover everything, even though the coverage will not be as deep.
- Another option is to stop the activities a little earlier than planned and have a longer wrap-up session where you talk about the topics you didn't get to. Relate those topics to the lesson's goals.

Finally, be flexible, be creative, be honest, be a learner, be ready for anything, and, most important of all, have fun with *Working Hands, Working Minds*.

# Overview of Tools and Technology

- Lesson 1 — What Is a Tool?  
Students examine the concept of tools and imagine how tools were first developed. They determine basic needs and brainstorm how tools might help them meet those needs in a survival situation.
- Lesson 2 — How Tools Have Changed  
Students learn how tools have changed throughout history and assess the impact they have had on our lives. They research specific information about a mechanical or technological innovation and present their findings to the class.
- Lesson 3 — Nature and Technology  
Students explore how humans have created tools to exercise control over nature and discuss how culture affects the way we treat our environment. They weigh the advantages and disadvantages of tools and machines used in the construction trades and write about alternatives to harmful tools and methods.
- Lesson 4 — Tools, Tools, and More Tools: Safety First  
Students demonstrate an understanding of the basic safety rules for rough carpentry and design safety posters to be used on the worksite.
- Lesson 5 — Hand Tools and Power Tools Used in Carpentry  
Students learn to identify and correctly use basic carpentry framing tools.
- Lesson 6 — The Future of Tools in Construction  
Students interview vocational instructors at local community or technical colleges about the role of advanced technology in the trades.
- Lesson 7 — Workplace Technology Exploration  
Students conduct investigations of workplaces and the changes taking place in tools and technology. They explore the skills needed to adjust to new tools and technologies.
- Lesson 8 — Adaptability in the Face of Change  
Students will discuss the importance of adapting to coming periods of technological change. They will do job market research to find examples of technological change

- Lesson 9 — Final Assessment: Portfolio

This lesson is designed to help both teachers and students assess the students' skills, attitudes, and understanding of the history and future of tools and technology. Students collect and present material they have produced throughout the unit.

### Competency Checklist for Tools and Technology

Upon satisfactory completion of this unit, students will be able to:

- Define “tool.”
- Explain basic human needs and describe how tools meet those needs.
- Research specific information about a mechanical or technological innovation and present findings to the class.
- List tools that humans have created to control nature and evaluate the effects of these inventions.
- Demonstrate cause and effect relationships between safety, accidents, and injuries.
- Identify and correctly use 14 common carpentry tools.
- Interview an instructor about the role of technology in the trades.
- Observe a workplace where tools and technology are being used.
- Reflect in writing about the role of computers in construction.
- Explain how the nature of work is always changing and why being adaptable is a beneficial behavior.
- Envision and describe in writing a preferred future and list the skills necessary for their vision.

### Portfolio Assessment Checklist

Upon completion of the unit, students should have the following items in their portfolios:

- Presentation of tool research (Lesson 2)
- Journal entry (Lesson 3)
- Journal entry (Lesson 4)
- Safety posters (Lesson 4)
- Interview (Lesson 6)
- Observation notes (Lesson 7)
- Journal entry (Lesson 8)

LESSON

# 1



## What Is a Tool?

### Aim

Students will examine the concept of tool and imagine how tools were developed. They will determine basic human needs and brainstorm how tools might help meet those needs in a survival situation. In this lesson, they will:

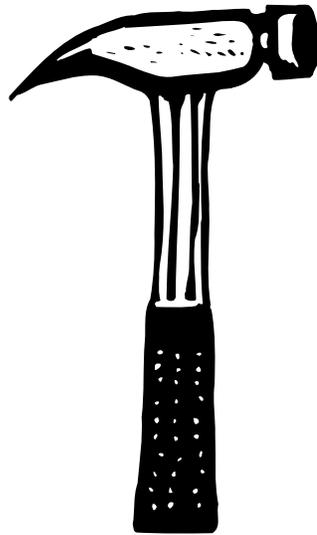
- Define "tool"
- Understand how and why tools are created
- List basic human needs
- Explain methods for meeting those needs

## Time

1 hour

## Things to Consider

**To prepare for the lesson**, check out the video, *2001: A Space Odyssey*, and watch the first 10 minutes or so to determine exactly how much of it you want to use to introduce the students to an imaginary, visual history of the discovery of a tool.



## Materials, Tools, and Resources

- *2001: A Space Odyssey* by Stanley Kubrick (video)
- Television set and VCR
- Handout: What Would You Need?
- Various objects: stick, rock, sea shell, leaf

## Key Terms

- Tool
- Invention

## Steps for Activity



When is a stone  
a stone and when  
is it a tool?

1. Show the first 10 minutes of the video, *2001: A Space Odyssey* as an introduction to this lesson. In the film, ape-like creatures are playing around with a pile of bones, picking them out, throwing them, and jumping on them. Suddenly one of the creatures realizes the relationship between the bone in his/her hand and the effect caused by striking other bones. At that moment the creature realizes the bone is “useful.” A tool (or a weapon) has been born.
2. Ask students how the bone might be useful to the ape. What can you do with a bone that you can’t do with your hands or teeth?
3. Hand out various objects and ask students to imagine all the things they could do with these objects. For example, what can you do with a board or a shell or a stone? How could these be useful? Let students handle the objects and imagine.
4. Tell students that in this lesson they will consider what makes an object a tool and they will postulate how tools came to be invented and why.
5. Ask students: When is a stone a stone and when is it a tool? Note their comments on the board and then ask them to create a definition for a tool. Use this definition from *The American Heritage Dictionary* to augment theirs if necessary:  

“A tool is anything used in the performance of a job or operation.”
6. Have students write their definition of tools in their journals.
7. Ask the students if they think humans are the only creatures on earth to use tools. It used to be said that tool use distinguished humans from other animals, but we now know that is not true. Can students think of examples of non-humans using tools? For example, sea otters use stones to crack open shellfish and some apes enjoy a meal of termites by using grass to extract termites from their nests.
8. You might share the following information if your students seem interested: Aside from humans, chimpanzees do more things with objects than all other mammals combined. This is probably because they have hands with opposable thumbs. But even more significant is that chimpanzees are bipedal, which leaves their hands free to grasp and carry objects. Chimpanzees use sticks and stones to fight and it is thought that early humans did the same. In humans, weapons replaced teeth as a superior way of fighting.

**9.** Write the following statement on the board or flip-chart:

“Necessity is the mother of invention.”

Promote student discussion using the following prompts:

- What does this expression mean?
- Can anyone describe a time when, out of need, you created something new?
- What is an example of a modern invention that was created in response to a need?
- Think about the modern tools you use on the construction site. What prompted these tools to be invented or improved? Which of these tools were used before these modern times?

**10.** Ask students: What are our basic needs for human survival? Answers might include shelter, food, clothing, heat. Tell students they will now consider how tools help humans survive. Divide students into small groups. Distribute the handout “What Would You Need?” Give students 15 to 20 minutes to complete the handout.

**11.** Have each group share their answers with the class.

## Wrap Up

To help students reflect on the lesson, ask questions such as:

- What did you learn about the creation of tools that surprised you?
- What is something one of the other groups came up with that your group did not think of?
- From our class discussions, can you explain why and how tools were invented?

## Creative Extensions

- Students could visit a historical society or tool museum and identify all the tools that were used in construction. They could take notes and photograph or draw pictures of the tools. Students could then present this information in an article or make an antique tool display for others in their program to see.
- Students might research one of the following: animals that use tools; tools from other cultures; tools used by specific professions such as masons, sculptors, and dentists. Encourage students to arrange their research into a colorful format for public display.

## Project-Based Learning Activities

- Arrange for students to visit a senior center in your community to interview a group of older people about what tools they find most useful at this time in their lives. What new tools would they like the students to make that would help them with daily tasks? Students could compile the information to share with the class.
- As a follow-up to the above, an individual student or small group could work together to sketch one of the tools suggested by the older people, make mechanical drawings, and visit an industrial designer to explore how ideas get turned into usable products.
- What tools would students like to have in their own lives now or in the future? Have students draw and create prototypes or models of their inventions.
- Have students research the tools used by people with specific needs. For example, what tools does a blind person or a person in a wheelchair use? Students could volunteer to work with disabled children on a building project where specialized tools would need to be used or created.

## Handout 1

### What Would You Need?

Picture yourself on a deserted island or in prehistoric times without any manmade items. Brainstorm answers to the following questions and write them below each question.

How would you protect yourself?

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How would you shelter yourself?

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How would you feed yourself?

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What materials would you need to find? What tools would you need to make to survive?

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LESSON

# 2



Photo: Earl Dotter

## How Tools Have Changed

### Aim

Students will learn how tools have changed throughout history and assess the impact they have had on our lives. In this lesson, they will:

- Consider the advantages and disadvantages of tool innovations and mechanical inventions
- Research specific information about a mechanical or technological innovation
- Present findings to the larger group

## Things to Consider

**In this activity**, students are asked to research the history of particular tools or inventions. Students will need access to encyclopedias, textbooks, the Internet, and other reference materials in the classroom. Or you could plan a trip to the library to allow students to use the reference materials there.

## Materials, Tools, and Resources

- Handout: The Development of Tools and Technology: Advantages and Disadvantages
- Handout: Tools and Technology: Historical Research Guide

## Time

1 hour, plus  
additional time  
for presentations



## Key Terms

- Technology
- Tool
- Innovation
- Invention

## Steps for Activity

- 1.** Tell the students they will be looking at how tools have changed over time.
- 2.** Divide the students into groups of two or three, distribute “The Development of Tools and Technology: Advantages and Disadvantages,” and give the students time to complete the activity. Bring them together as a class to discuss their conclusions. Ask what advantages tools have brought to individuals and human communities. What disadvantages?
- 3.** Tell students they will be researching the development of a specific tool or technological innovation and the impact it has had on history. They will creatively present their findings to the class. Lead a discussion about tool innovations by asking the following questions:
  - Think about the way life was 100 years ago compared to today. What do you think are the most important technological or tool innovations that have occurred over the last hundred years?
  - What tools do you use on the construction site that have remained unchanged for many years? How long do you think these tools have been in existence?
  - Think about the power tools and hand tools that you use on the construction site. What are some of the most important innovations in construction tools that make your job easier?
  - What contributions have ethnic minorities such as African Americans, Native Americans, and Mexican Americans made to the development of tools; for example, African Americans as blacksmiths?
- 4.** Suggest that students work in small groups or as individuals on their research projects. Either assign topics or ask students to select a topic that interests them, such as one of the following:
  - steam engine
  - computer
  - cotton gin
  - scales for weighing
  - wet saw
  - assembly line
  - nail gun
  - sewing machine
  - gun
  - mechanized loom
  - printing press
  - power saw
- 5.** Distribute handout “Tools and Technology Historical Research Guide” and ask the students to identify the tool or innovation they want to research. Go over the handouts with the students to make sure they are clear on what is expected of them.

6. Direct students to use encyclopedias, history books, the Internet, or any other reference materials in the library or the classroom to complete their research. Encourage them to be as creative as possible, using music, movement, artwork, and recordings.
7. When students have completed their research, they will present their findings to the class. Request that the class give feedback to the presenters.

### Wrap Up



What might the tools that you now use on the construction site look like 50 or 100 years from now?

To help students reflect on the lesson, ask questions such as:

- What did you learn from your research that surprised you?
- What is something new you learned from the presentations?
- Who makes the tools we use on the construction site today? Do you think the tool-making process is different today than it was 100 or 50 years ago?
- Who improves on old tools or creates new tools? What type of skills do you need to do that job?
- Based on your research, what might the tools that you now use on the construction site look like 50 or 100 years from now?

### Creative Extensions

- Students could create a colorful timeline of tools for the class bulletin board.
- Students can explore and report on traditional African, Mexican, and American Indian tool use and their connection to contemporary tools and craftsmanship.
- Challenge students to write a fictional piece from the point of view of an old tool: “A Day in the Life of a Flint Knife” or “The Diary of a Stone Axe.”

### Project-Based Learning Activities

- Students could interview older workers about how tools have changed in their lifetimes. Which tools have changed the most and how are the workers’ lives different now as a result of these changes? Encourage students to write an article or otherwise summarize and share this information with the class.
- Students could find people who still know how to use an antique and/or obsolete tool and ask them to teach the skill. Students could then demonstrate to the class how to use the tool or they could bring in the person who taught them for a demonstration. Examples of old tool skills are hand carding and hand spinning wool, hand setting movable type, or using a draw knife.

## Handout 1

### The Development of Tools and Technology: Advantages and Disadvantages

Beginning with the earliest civilizations, people have used what they found around them in their natural environment to build their cultures and improve their lives. Tools, shelter, agriculture, and weapons have all come about through human ingenuity.

Today, we take all our modern tools and inventions for granted, but the discovery of steam power in the 19th century, and electrical power in the 20th century, were monumental historical developments that changed society and the nature of work forever. Manual labor (a handloom for weaving) became mechanical labor (a textile factory with automated looms), and mechanical labor (a typewriter) became electronic labor (a computer). As machines take over the work of humans, both wonderful possibilities and serious problems arise, reminding us that inventions have both good and bad consequences.

Consider the advantages and disadvantages of the following tools and inventions. Some examples have been included to get you started:

<u>Tool</u>	<u>Advantages</u>	<u>Disadvantages</u>
Power loom	Higher production	Reduces craftsmanship
Power saw	More efficient work	High risk for accidents
Computer		
Telephone		
Gas-powered leaf blower		

**Handout 2****Tools and Technology: Historical Research Guide**

**Invention (circle one):**

Air compressor

Assembly line

Automobile

Computer

Cotton gin

Nail gun

Power saw

Printing press

Steam engine

Cell phone

Other: \_\_\_\_\_

Description of invention: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

When was it invented? \_\_\_\_\_

By whom? \_\_\_\_\_

What social and human need did this invention meet?

How was daily life changed by this invention?

How did this invention change the nature of work?

What are some advantages of this invention?

What are some disadvantages?



LESSON

# 3



Photo: YouthBuild Texas

## Nature and Technology

### Aim

Students will explore how humans have created tools to exercise control over nature and discuss the relationship between tools and the environment. In this lesson, they will:

- Discuss the control — or lack of control — humans have over nature
- Understand that culture affects the way we view and treat the environment
- List tools that humans have created to exercise control over nature
- Write in their journals about alternatives to destructive tools and methods

## Time

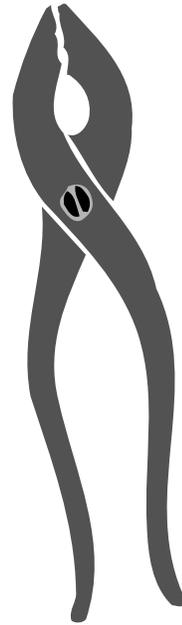
1 hour

## Things to Consider

**For this lesson** students will view the beginning of the film *Koyaanisquatis*. This film is a series of moving images set to music. For many of the students, finding meaning from a film without dialogue may be new. Think about how you can “frame” this film so that students will get the most out of it. (For more information about the film, see this web page: [www.koyaanisqatsi.org](http://www.koyaanisqatsi.org). Please note: this website was available as of January 2001, but may no longer be operational.)

## Materials, Tools, and Resources

- Handout: Control Over Nature
- Movie: *Koyaanisquatis*, by Godfrey Reggio
- Television and VCR



## Key Terms

- Nature
- Environment
- Culture

## Steps for Activity

1. Tell students that they will be discussing how humans relate to nature and how the tools and construction methods that we use affect our environment. Write the following statement on the board or flip chart:

“Do humans control nature or does nature control humans?”

Encourage student discussion with questions like:

- What are some examples of times when humans are able to control nature?
- What are some examples of times when humans are not able to control nature?
- What enables humans to exert this limited control over nature?

Discuss as a class. Encourage students to provide examples to illustrate their points of view.

2. Distribute the handout “Control Over Nature.” Ask students to work in groups of three or four to complete it. Tell them that for each natural force listed on the left, they should try to come up with at least two tools that human beings have invented to overcome it, following the example given.

When each group has completed the activity, have them present their answers to the class.

3. Ask the group to think about the way that the beliefs and values of a culture might impact the world around it. Tell students that they will be watching the beginning of the film *Koyaanisquatis* directed by an American man named Godfrey Reggio. The name of the film is a Hopi Indian word for “life out of balance.” Explain that the film is a series of images set to music and that students should try to watch and understand what the filmmaker is trying to say about humans and nature. Show the first 10 minutes of the film.

4. Ask students to share their ideas about the film. Use the following questions to promote discussion:

- What do you think the filmmaker was trying to say about the human impact on nature?
- Do you think that the filmmaker believes that the changes we make in our environment are positive or negative?
- If you were asked to make a film about the relationship between humans and the environment, what would your message be and how would you convey it?



In what ways  
would different  
world views affect  
the environment?

**6.** Tell, or read to the students, the following:

*When Europeans first came to North America seeking religious and economic freedom, they brought with them belief systems based on the Bible. They took to heart the lines in Genesis where God tells man to “have dominion over the fish of the sea, and over the birds of the air, and over the cattle, and over all the earth. And over every creeping thing that creeps on the earth.”*

*But the Native Americans who lived here when the European settlers arrived had different values. They believed that nature was the home of spirit powers and that animals could be heroes.*

*In what ways would these different world views affect the environment? For example, how did the early European settlers treat the forests and the wildlife on the North American continent? (They cleared the forests as quickly as they could, fearing the dark woods as places where the devil consorted. They saw themselves as taming a wild and unholy land.)*

*The early settlers shot buffalo on the great plains of North America and left their carcasses to lie in the sun and rot. This shocked the Plains Indians whose lives were interwoven with the buffalo. When the Native Americans hunted the buffalo, they killed for food and prayed to the beasts for more hunts in the future. The white settlers killed for sport and, though the buffalo numbered in the millions, white settlers nearly made buffalo extinct.*

*Today, Americans are a mixture of people and beliefs whose world views are still sometimes at odds. What are some beliefs that people disagree about?*

**7.** Divide students into three groups, giving each group one of the following statements describing beliefs and attitudes about humans and nature. Ask each group to discuss how the belief statement might influence the use of tools and construction. What kinds of tools and methods would people who held these beliefs use?

- Humans rule nature. Nature is to be conquered. The earth is to be used for the needs of humans.
- Earth and nature are sacred. Humans share the earth with all things. Humans cannot and should not try to control nature.
- Nature and humans are in a delicate balance. There are limits to the natural resources and tolerances of the environment. Humans must work to keep this balance.

## Wrap Up

1. Have each group share with the class a summary of their discussion. Which quote do students agree with and why?
2. After students have discussed how cultural beliefs and values affect how people treat their environment, ask students to write in their journals for 10 minutes in answer to one of the following questions:
  - What tool do you use on a daily basis that you would find it hard to live without? Describe how you use it and what you would need to do if you didn't have it.
  - What tool do you use that may have a negative impact on the environment? What alternative might you be able to use that would have less impact on nature?
  - Which of the statements we discussed in class best describe your philosophy toward the environment?

## Creative Extensions

- Ask students to work in small groups to evaluate the construction site and whether or not the materials and methods have any negative impacts on the environment. Have them research and explore “earth-friendly” alternatives to tools and methods used in construction and compare them to standard practices.
- Challenge students to research and design a floor plan for an environmentally-sound house. Have them consider energy efficiency, water saving, nontoxic building materials, and recycling systems.
- Have students research straw bale construction and to bring a report back to the class. How is a straw bale house constructed? What tools are necessary? Where is this type of construction used and does it have promise for the future?

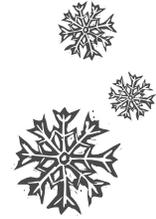
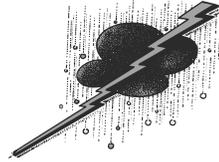
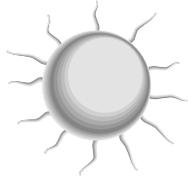
## Project-Based Learning Activities

- Have students work with a local environmental organization to sponsor a hands-on “earth friendly” construction seminar. Students might set up several booths/workshops where standard and alternative construction practices can be compared side-by-side.
- Students can volunteer through a local agency to help weatherize homes for low-income people and research the environmental benefits of weatherization.

## Handout 1

### Control over Nature

For each natural force listed on the left, write down at least two tools that humans have invented to overcome or control it.



**Rain**

Umbrella, dome stadium, windshield wipers, raincoat, roof, window pane.

**Darkness**

**Sunshine**

**Wind**

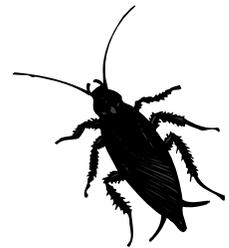
**Cold**

**Heat**

**Wild Animals**

**Flood**

**Snow**



LESSON

# 4



photo: Chris Cato

## Tools, Tools, and More Tools: Safety First

### Aim

Students will demonstrate an understanding of the basic safety rules for rough carpentry. Students will:

- Write about a time when they did not follow safety rules
- Demonstrate cause and effect relationships related to safety, accidents, and injuries
- Design safety posters to be displayed on the worksite

## Time

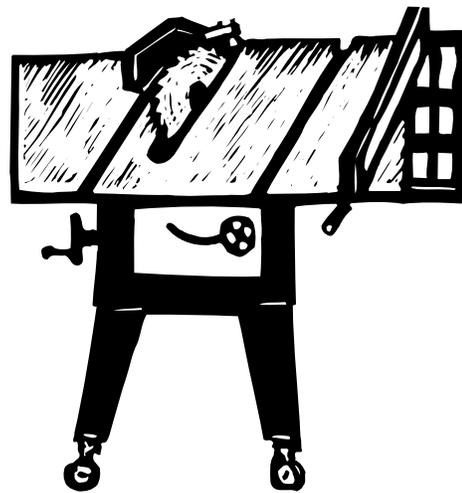
1–2 hours

## Things to Consider

**This lesson reinforces information** about safety skills related to rough carpentry. It contains some of the information introduced in the unit on Health and Safety, but does not intend to replicate it. As a result, this lesson should not be considered a substitute for a more in-depth study of safety rules, attitudes and behavior, but rather as a reinforcement of knowledge and skills previously obtained.

## Materials, Tools, and Resources

- Handouts: Carpentry Safety Do's and Don'ts; Carpentry Safety; Tool Safety; Scaffold and Ladder Safety; Decks or Floors; Falling Objects; Lifting and Carrying; First Aid
- Scrap paper
- Poster board
- Assorted colored markers
- Pencils
- Paints
- Paint brushes
- Rulers
- Straight edges
- Camera to photograph student posters for portfolios



## Key Terms

- Safety violations
- Protective gear

## Steps for Activity



*This lesson reviews basic safety rules for carpentry work — rules that often apply to other building trades as well.*

- 1.** Have students write in their journals for five minutes on the following question:  
  
Describe an incident in your own life when you were hurt because you didn't "follow the rules" (e.g., falling while running in a swimming pool area). How did you feel? Did you learn from this experience?
- 2.** Ask volunteers to share their experiences. Tell students that in this lesson they will be reviewing basic safety rules for carpentry work — rules that often apply to other building trades as well.
- 3.** Have students brainstorm as a class 10 basic safety rules for carpentry work. If this has already been done in other units, it can be expanded upon or reviewed here. Write the rules on the board as students name them. Distribute the handout, "Carpentry Safety Do's and Don'ts." Compare the information on the handout with the rules the students have brainstormed.
- 4.** Distribute the remaining handouts. Ask students to read them together in small groups and answer the questions at the end of each section. Discuss the students' answers as a class in order to clarify any questions they might have.
- 5.** Now ask students to design safety posters that illustrate the do's and don'ts of using various tools. Suggest that some students work on posters which graphically illustrate the consequences of not paying attention to a safety rule, while others might illustrate the care of certain tools. Encourage students to work in small groups, utilizing their different skills — art, printing, design, conceptualizing, or spelling.  
  
Have scrap paper available for students to plan their posters, as well as large poster board, assorted colored markers, pencils, paints, paint brushes, rulers and straight edges for making the final version.

## Wrap Up

Gather the class together and put up all the posters for everyone to see. Discuss their relative merits (clarity, message, graphic design) and decide as a group where the posters should be put up: on the worksite, in the classroom, or in the bathrooms. Assign a small group to be responsible for putting up the posters and make the materials available to do so (tacks, hammers, and tape).

## Creative Extensions

- Students could write a short story about an accident on the job — how it affects the worker, the family, and the employer.
- Challenge students to write a rap song or poem about “safety first” and perform it for the class.
- Have students research a newspaper article in the library on an industrial accident. They can write a case study based on the incident, including the causes and consequences of the accident.

## Project-Based Learning Activities

- Have students conduct one of the following interviews and report back to class with their findings:

Interview an employee of the Workers' Compensation Board. Using an actual or fictional case, write a short article for other YouthBuild students on the process a worker must go through to apply for and receive workers' compensation.

Interview an employer who pays into workers' compensation. Ask the employer how much they must pay for each worker, how they feel about the "system," and what their experience has been in the case of an accident.

Interview an injured worker and record his or her experience of being injured on the job and the process that worker went through to apply for workers' compensation.

- Students could survey safety compliance and safety violations at the worksite on a given day. How many times did students observe tools being used unsafely? Which tools were used unsafely and how? Students can share their surveys with the class and analyze their findings. Under what circumstances did the violations occur? What changes on the worksite might prevent these violations?

## Handout 1

### Carpentry Safety Do's and Don'ts

#### Do's...

- Ask questions when you are uncertain or unfamiliar with the work or materials.
- Wear protective gear and appropriate clothing.



- Use appropriate tools for each job.
- Keep hands free of grease and oil.
- Locate and heed all warning signs.



- Anticipate the movement of power equipment.
- Be cautious of highly flammable and explosive materials.
- Observe and avoid unstable structures (floor, roof, wall).
- Read and study safety rules for particular work.
- Check ladders and scaffolds for stability and strength before using them. Secure ladders at top and bottom.
- Learn how to lift properly and limit weight loads or get help.
- Be sure that pathways are free of obstacles.



- Learn first aid and make sure first aid materials are readily accessible.
- Learn where fire equipment is, and learn how, when, and where to use it.

#### Don'ts...

- Use alcohol or drugs during or before work.
- Stand under raised loads or loosened building materials.
- Handle electrical equipment or wires that may carry current.
  - Operate machinery or tools without proper training.
- Use power tools in damp or wet conditions.
- Remove guards from power tools.
- Overreach.
- Force power tools or exceed capacity.
- Allow work areas to become cluttered.
- Ignore injuries — report them.
- Run on the construction site or in the shop.



## Handout 2

### Carpentry Safety

#### Clothing

Trousers and overalls should fit properly. Trousers should have legs without cuffs. Shirts and jackets should be kept buttoned. Sleeves should also be buttoned or rolled up. Never wear loose or ragged clothing. Keep your clothes in good repair.

Do not wear tennis shoes or sneakers on the job, except when roofing calls for it. Wear heavy rubber-soled shoes with steel toes for protection of the feet. Wear head protection. If there is danger of falling objects, wear a hard hat. Most carpenters use a cap or hat to protect their eyes from the sun.

#### Protective Equipment

Safety goggles or visors may be required when working with materials or situations hazardous to the eyes. Wood splinters, fragments of metal or concrete, nails, or other materials can easily injure eyes. Paints, thinners, finishes, and lubricants are among many liquids dangerous to your eyes. Particular care should be taken in chiseling, drilling, cutting, sanding, and hammering.

Hard hats, steel-toed shoes, eye protection, and gloves should meet standards specified by the Occupational Safety and Health Administration (OSHA) and other agencies. If working around dusty areas, wear a respirator with the proper filters to protect your lungs. Gloves and breathing protection should be used when cutting or handling treated wood products.

#### Good Housekeeping

Just as at home, the worksite should be kept clean and organized. Neatness creates a safe and efficient work place. Organize building materials so they can be efficiently and safely reached when needed. Don't allow nails, bolts, empty cans, bottles, wire, or anything else to accumulate that might cause someone to trip or fall. A good appearance is contagious and it aids in the mental attitude toward the job and the worksite. Better efficiency results in fewer accidents and fewer lost work hours.

#### Carpentry Safety Questions

1. Give two reasons for having safe work habits.
2. Are steel-toed boots really necessary? Why?
3. Name four pieces of protective clothing for a carpenter, and describe how and why they should be used.
4. Why should waste materials and garbage be disposed of properly?
5. Why is it essential to use eye protection (goggles or safety glasses) when working with power tools?
6. Hard hats should be used during what construction tasks?

## Handout 3

### Tool Safety

#### Hand Tools

Keep your tools sharp and use the proper tool for the job. Dull tools cause injury and damage. Keep the handles tight. Clean tools that are greasy, and oil those that require such attention. Be careful when using your fingers or hand as a guide for starting a cut. Hold tools correctly. Also, take care in handling or carrying tools between jobs. Whenever tools are being carried from place to place, point edges away from the body or turn downward. Store tools in chests and tool boxes when not in use.

#### Power Tools

Working with power tools demands that you know what the tool does and how it works. Working with the tool safely is of utmost importance. Remember that shortcuts can be hazardous. Power tools can eliminate hours of construction time, but they can cost a lifetime of pain and misery if not properly handled. Wear eye protection when using any power tool.

#### Circular Saw

Support the material being cut in such a way that the groove made by the saw blade does not close up and bind during the cut or at the end of the cut.

*In addition:*

- Wear eye protection.
- Clamp small pieces to a bench or sawhorse.
- Cut thin materials only with adequate support.
- Do not cut the sawhorse, bench, or supporting device.
- Adjust the blade so that it cuts with no more than 1/8 inch showing through the material being cut.
- Check adjustments on the saw guide to make sure they are tight.
- Make sure the outlet used for the saw is grounded adequately according to the National Electric Code's requirements for temporary power sources.
- Make sure the saw base is on the stock with the blade clear before turning on the switch.
- Never reach under the material being cut.
- Stand to one side when cutting.
- Keep both hands on the saw when power is on.
- Change blades only when the power cord is disconnected from the electrical outlet.
- Always use a sharp blade.

**Handout 3, cont'd.****Other Power Tools**

At times carpenters and helpers will use other power tools, including table saws, radial arm saws, drills, joiners, routers, sanders, jig saws, and band saws. Each of these tools should be handled with care and manufacturer's operation instructions should be followed.

**Tool Safety Questions**

1. True or false? Keeping tools sharp is more dangerous than working with dull tools. Explain your answer.
2. Name three safety habits for using hand tools that will protect you and others.
3. Why is the use of eye protection (goggles, safety glasses, or shields) essential when working with power tools?
4. True or false? Sometimes to get the job done you have to remove the guard on power saws. This can be done safely and the saw used effectively. Explain your answer.
5. True or false? Power saws and drills can have bits and a blade changed as long as the trigger is not pushed in or is in the "on" position. Explain your answer.



## Handout 5

### Decks or Floors

Carpenters should not work on decks or floors that are not firm or solid, especially when using hand or power tools. The surface should be smooth not slippery. Install guard rails when floor openings are in heavily traveled areas. In bad weather, keep the ice and snow from surfaces where work is being done.

### Questions about Decks and Floors

1. What kind of covering might be used to protect floors from ice and snow?
2. Why do skilled carpenters need to be concerned about the floor they are working on?
3. Besides walking on it, what other ways might a carpenter determine whether a deck or floor is safe?



## Handout 7

### Lifting and Carrying

Lifting heavy objects, if not done properly, can cause hernias (a tear in the wall of the abdominal muscle), back problems, and strained muscles. When lifting heavy objects, there is a right way and a wrong way. The wrong way is to bend over from the waist and lift; the correct way is to bend the knees and lift the object while straightening the knees. Keep your back as close to vertical as possible, and lift with your legs rather than the back. Also put down heavy loads by bending the knees and keeping the back straight. Do not attempt to lift loads that cause muscle straining.

Don't twist your body or make shifting movements with your feet when carrying a heavy load. Get someone to help when carrying long pieces of lumber.

### Questions about Lifting

1. Why should you bend at the knees when lifting something?
2. What advice would you give a worker about to lift two 80-lb. bags of cement?
3. What advice would you give a worker about to lift five 10-foot long studs?
4. What advice would you give a worker about to lift a 4' by 8' piece of sheet rock?
5. What advice would you give a worker about to move a very heavy object (like a refrigerator) off of the floor?
6. What advice would you give a worker who needed to move five cinderblocks?
7. What would you do if a trainee tried to show off to his buddies by lifting something incorrectly?

## Handout 8

### First Aid

At least one person on the worksite should have had first aid training. Check with the local Red Cross to obtain instruction in first aid. Keep in mind the location of the local hospital, and learn how to get there fast. Check to make sure all emergency numbers are handy on the site.

It is a good idea to check with the medical facilities in the area where you are working to find someone who specializes in hand reconstructive surgery. Saw accidents on the job have a tendency to do a great deal of damage to fingers and hands. They can be saved if properly and quickly treated. Call the hospital to see if a hand specialist is on staff and what to do in case of an accident on the worksite.

### First Aid Questions

1. Who should know first aid on a construction site?
2. Do you know how to give first aid? If not, where could you get training?
3. Do you know the location of the first aid box at the site?
4. Do you know what to do with the components of the first aid kit?
5. Do you know the location of the emergency phone numbers on the worksite and what to say when you make an emergency call?
6. Do you know how to get to the nearest hospital?

LESSON

# 5



## Hand Tools and Power Tools Used in Carpentry

### Aim

In this lesson, students will learn about basic carpentry framing tools. They will identify and correctly use:

- Framing square/carpenter's square
- Chalk line
- Combination square
- Handsaw
- Torpedo level
- Circular saw
- Carpenter's level
- Claw hammer
- Pencil
- Screw gun
- Plumb bob (to find plumb and level)
- Metal snips
- Steel tape ruler
- Electric drill

## Things to Consider

**Each handout** in this section describes a tool and its use, followed by a series of activities designed to increase students' familiarity with the tool. Allow students time to read the instructions and work individually or in small groups to carry out the practice activities.

**Make sure** you have all the tools listed above laid out on a table in the classroom. Put a number next to each tool. For classes of 20 or more, you might want to have more than one of each tool so every student gets a chance to handle several tools.

**The activities** on the handouts require that each student have his or her own tool.

**Assist students** as needed, but allow time for them to try to follow directions on their own, making mistakes and correcting their errors.

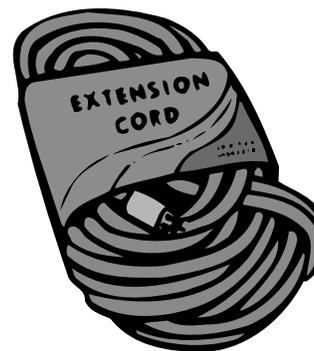
**Optional:** If your students already have some skills with these tools, you might make the activities more complex. For example, you could add an activity for each tool that is part of a larger project, such as building a bird house.

## Materials, Tools, and Resources

- One or more of each of the following tools:
  - Framing square/  
carpenter's square
  - Chalk line
  - Combination square
  - Handsaw
  - Torpedo level
  - Circular saw
  - Carpenter's level
  - Claw hammer
  - Pencil
  - Screw gun
  - Plumb bob (to find  
plumb and level)
  - Metal snips
  - Steel tape ruler
  - Electric Drill
- Cards or pieces of paper numbered 1–14
- Assorted pieces of scrap wood, including blocks of wood
- Several pieces of metal studs (2" x 4")
- Nails: #8 and #6
- Several protractors
- Tool Handouts: Framing Square/Carpenter's Square; Chalk Line; Combination Square; Handsaw; Levels; Claw Hammer; Carpenter's Pencil; Circular Saw; Plumb Bob; Screw Gun; Steel Tape Ruler; Electric Drill; Metal Snips

## Time

2 hours



## Key Terms

- Angle
- Square
- Horizontal
- Vertical
- Leverage
- Bit

## Steps for Activity

- 1.** Instruct students to quickly walk around the tables where the tools are displayed and write the name of the tool next to its number on a piece of paper. For this activity, students may not handle the tools or try to read the labels on the tools. If a student doesn't recognize a tool, suggest that he or she make up a name that seems to match the way it looks. Collect the students' papers and tell them they will correct their own papers at the end of the class. Tell students that in this lesson they will learn the names and functions of all these tools.
- 2.** Distribute one tool handout to each student. If you have more students than kinds of tools, you will need to give several students the same tool to study. Students with the same handout could work together in pairs or small groups if they like. Direct students to find the tool described on their handout among the tools laid out on the table. They should read the description and use of the tool and prepare to give a short "show and tell" to the class about their tool.
- 3.** Ask each student to make a brief presentation of the tool to the class, naming the tool and describing its use. If more than one student studied the same tool, have them present together.
- 4.** After students have completed the above, divide them into groups of two or three. Have each student bring their tool and handout with them. As a group, have students complete the activities described on the handouts. (For example, a group of three would complete the activities for three different tools.)
- 5.** If there is time, students can rotate groups until each group has had a chance to do activities with each tool.

## Wrap Up

1. Pass out the student papers from the beginning of class and ask students to correct their own. Can everyone now identify all of the tools?
2. Promote student reflection using questions such as:
  - Which of the tools that you have learned about do you have in your home?
  - Which of the tools you have learned about today do you think a carpenter would own and bring to the job? Which tools would the job site provide?
  - What are the advantages of using your own tools on the job? What are the disadvantages?



Have students create a *Tools and Materials Dictionary* to keep a record of every new tool they learn about, how to use it safely, and how to care for it.

## Creative Extensions

- Have students create a *Tools and Materials Dictionary* to keep a record of every new tool they learn about, how to use it safely, and how to care for it. Students can illustrate the dictionary with drawings or photos of tools being used on the work site. Here is a sample entry guide for the dictionary:

Tool Name:

Description:

Use:

Cost:

Best place to buy:

Safety Precautions:

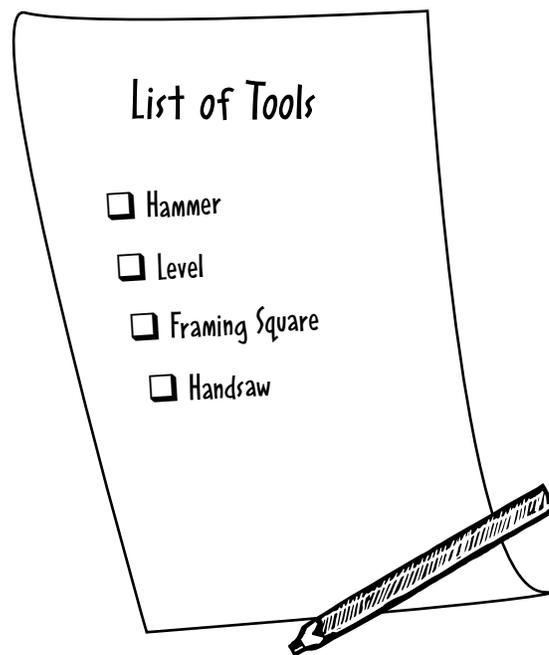
Care of Tool:

Other Information:

- Create a classroom game by dividing the students into pairs and giving a blindfold to each pair. The member of the pair who is NOT blindfolded picks up a tool and describes its parts and characteristics without saying its name. The blindfolded person has to guess what tool is being described.
- Have students create a photo exhibit on how to use tools. Photos could illustrate correct and incorrect ways to use tools or proper safety with tools.
- Some of the tool handouts have interesting questions for research and discussion. Each student could choose a topic for research and make a presentation to the class.

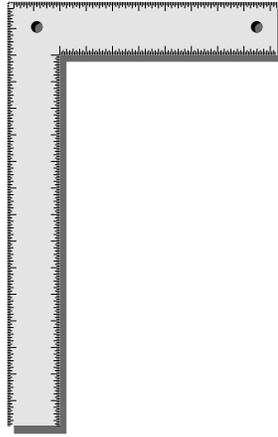
## Project-Based Learning Activities

- In third world countries such as Honduras, people build their own houses with minimal tools and materials. Have students research how a typical family dwelling in Honduras is constructed and make a list of the tools and materials used. Remind students that many rural areas of Honduras do not have electricity.
- Tell students: Imagine you are going to start your own carpentry business. Talk to a carpenter or construction worker to get an idea of the tools you will need. Make a list and go shopping, checking prices and quality. Make a budget for the cost of starting your own business. Check back with the carpenter or construction worker you first interviewed to see if you have listed the necessary equipment to operate your business and to see how realistic your figures are.



## Handout 1

### Framing Square (also known as a Carpenter's Square)



#### Description

The framing square, or carpenter's square, is an L-shaped piece of aluminum or steel. The long piece, or body of the square, is 24" x 2". It meets the shorter piece, or tongue, which is 16" x 1½", at the heel forming an exact 90 degree angle.

#### Use

Laying out straight lines, checking squares or right angles.

To mark a straight line across a board or sheet, hold the square's tongue against the straight edge of the material, and mark along the body.

To check if something is square, hold the framing square on the inside or outside of a corner formed by the intersection of two pieces of lumber or metal framing (for example two 2 x 4's, or a plate and a stud, etc.). If a right angle is formed by the intersection, the framing will fit snugly, with no play or unevenness. If the material is not square, the pieces will need to be adjusted to make an exact right angle.

#### Activities with Framing Square

1. Draw a straight line on a board at a right angle to the edge of the board. Check with a protractor to see if you have made a 90 degree angle.
2. Check the square of three corners in the room to see if they form 90 degree angles. Use walls, doors, bookcases, and tables.
3. Check the square of the corners of this page.
4. Draw a corner (the intersection of two lines) with a ruler, using only your eye as a guide. Check with the framing square to see how close you have come to a 90 degree angle.

## Handout 2

### Combination Square

#### Description

The combination square is a mini-framing square. Its handle can be used to check a 45-degree angle, and it has a spirit level for checking level and plumb.



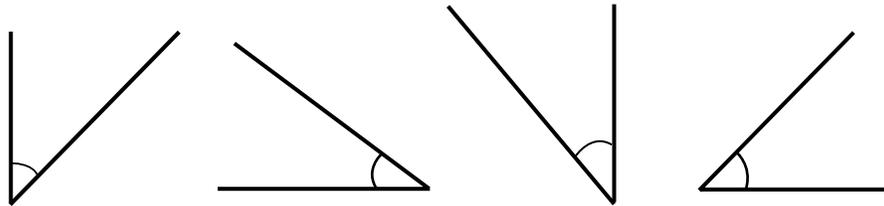
*Combination Square*

#### Use

Checking right angles, square, and plumb.

#### Activities with Combination Squares

1. Use the combination square to mark a piece of wood for crosscut. Place the body of the combination square (with spirit level) along the edge of the piece of wood to be marked. Draw a line on the wood along the ruler's edge.
2. Use the built-in 45 degree angle of the combination square to test the following 45 degree angles. Which ones are actually 45 degrees? Which one is less than 45 degrees?



3. Set the base of the combination square at three inches and then at six inches, by loosening and tightening the screw. This can be used to gauge depth without re-measuring each time. When would this be useful?

## Handout 3

### Levels



*Carpenter's level*

### Description

Levels come in many different sizes, from three inches to nine feet long. **Torpedo levels** are typically 9" long, and can slide easily into small spots. **Carpenter's levels** are 24" long and give more accurate readings. **Line levels**, used in masonry work, are small spirit levels that are hung from a string stretched between two points. **Water levels** are long clear plastic tubes filled with water or other clear liquid that are used to measure level points that are a distance apart from one another.

### Use

Determining level (horizontal trueness) and plumb (vertical trueness).

When the level is held horizontally and the air bubble in the tubing in the center lines up exactly between the two marks, the surface is level. When the level is held vertically, and the air bubble in the tubing on the top or bottom lines up exactly between the marks, the surface is plumb.

### Activities with Levels

1. Place the level alongside a vertical wall and observe the air bubble's movement and position. Is it exactly between the two lines in the tube?
2. Do the same for the floor or ground surface to observe horizontal level. Which bubbles indicate horizontal and which indicate vertical?
3. Test the level of a non-level surface, either vertical or horizontal. What changes in the surface do you think should be made to make it level?

### Questions for Research and Discussion

1. What are the advantages and disadvantages of a torpedo level?
2. When is it better to use a carpenter's level?
3. Give examples of when it is impractical to use each one.
4. Are there other kinds of levels, and if so, who uses them?

## Handout 4

### Carpenter's Pencil

#### Description

Carpenters use several types of pencils, but the most popular is a flat, hard lead pencil about eight inches long.

#### Use

Marking measurements.

#### Activities with Carpenter's Pencils

1. For use in rough work, the pencil should be trimmed so that  $\frac{1}{4}$  to  $\frac{3}{8}$  inch of the lead protrudes from the wood sheath. Check and sharpen pencil with a knife (cutting away from your body).
2. In finishing work, the pencil should be trimmed so that  $\frac{3}{8}$  to  $\frac{1}{2}$  inch of lead is exposed and the lead should be sharpened to a long flat point. When marking, the pencil should be tilted away from the ruler or square, so that the lead will mark close to the edge of the guide. Try marking this way along a piece of wood.
3. Look at a carpenter's pencil and guess where it was made, or where its different elements come from (for example, wood from Amazon or Oregon forests, graphite from Madagascar, Ceylon, or Alabama). What kinds of workers were involved in the production process of a carpenter's pencil?

## Handout 5

### Plumb Bob



#### Description

A plumb bob is a pointed weight hung at the end of a string.

#### Use

Determining and checking vertical plumb (straight up and down).

Plumb bobs can be used to find a location immediately below another point and to show if a structure is plumb, or straight up and down.

The weight of the plumb bob is hung at the end of string and the string is held in place at the desired point. The point of the plumb bob, when it comes to rest, shows the exact location immediately below.

#### Activities with Plumb Bobs

Using a plumb bob and a ruler, hold the line at three inches from the edge of a desk or chair. If all measurements are accurate (and the vertical surface is straight up and down), then the plumb bob should point to exactly three inches away from the desk or chair on the floor.

#### Questions for Research and Discussion

1. How might ancient peoples have come across the idea of a plumb bob?
2. What does "plumb" mean?
3. What principle of science does this tool utilize?
4. Historical evidence shows that an instrument for surveying land called a "merkhet" was used in Egypt in 4,000 BC. This made use of a plumb line and a v-shaped stick. See if you can find any information on this early tool. What would it have been used for 6,000 years ago?

## Handout 6

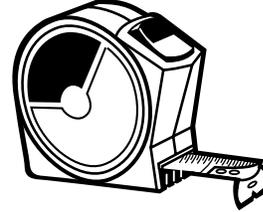
### Steel Tape Ruler or Tape Measure

#### Description

A flexible steel measuring strip rolled up inside a case.

#### Use

Measuring lengths, widths, and heights of materials and spaces.



#### Activities with Steel Tape Rulers

1. In small groups, measure three objects in the room. For example, measure a door width, a wall height and width, and the length of a desk. Each student in the group should check measurements until all reach agreement.
2. Practice measuring materials brought from the construction site into the classroom, for example, door trim, floor board, threshold, sill, and stud.
3. Using the lock on the steel tape, draw lines of the following lengths on paper:
  - 10 inches
  - $7\frac{3}{8}$  inches
  - $4\frac{1}{2}$  inches

#### Questions for Research and Discussion

1. What words are printed on the steel tape ruler?
2. Where was this tool made?
3. What is the name of the company that made this tool?

## Handout 7

### Metal Snips



#### Description

A scissors-like cutting device. This tool used to be associated with the heating and air conditioning trade. But with the appearance of metal studs, it has found its way into the carpenter's tool box.

#### Use

Cutting metal studs in framing and cutting sheet metal.

#### Activities with Metal Snips

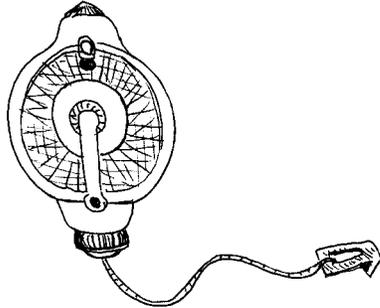
1. Mark a piece of metal stud (2" x 4") and cut along the marked line.

#### Questions for Research and Discussion

1. Snips, scissors, and pliers make use of a basic mechanical principle. What is this principle?
2. What are other examples of tools that use this principle?
3. Draw a picture of this principle at work.

## Handout 8

### Chalk Line



#### Description

A long string rubbed with chalk and rolled into a carrying case. When the line is held taut against a flat surface and then snapped, it leaves a chalk mark or line where the string was.

#### Use

Marking a straight line between two points for cutting materials or locating and placing studs or plates.

#### Activities with Chalk Lines

Measure a point 10 inches from the end of a board, a sheet of plywood, sheet rock, or concrete. Do this again on the opposite side of the board, so that connecting these points marks off a 10-inch wide piece of the material.

Extend the chalk line tightly from one measured point to the other (using the end hook if possible). Lift and release the line, snapping it against the surface. It should leave a visible colored line on the surface, marking off 10 inches.

## Handout 9

### Handsaw

#### Description

Handsaws are made to cut across the grain in wood. Their teeth act like a row of knife points, severing the wood fibers as they cut.

#### Use

Cutting lumber and other materials.

Handsaws come with 7, 8, 9, 10, 11, or 12 points per inch. The more points, the finer the cut will be. A 7-point, for example, is used for wet rough framing; an 11- or 12-point is used for fine trim work.



#### Cutting techniques

To start a cut, hold the saw upright against a board and brace the blade with your thumb knuckle. Make a full notch in the board's end.

Once the cut is underway, lower the angle to 45 degrees and cut with full, even strokes.

At the end of a cut, support the waste piece with your free hand and finish with short, upright strokes.

#### Activities with Handsaws

1. Practice cutting pieces of wood, using the cutting techniques described above.
2. Measure four pieces of wood, each four inches long. Cut each with a different size of handsaw.
4. Compare the differences in a cut made with a 7-point saw, for example, and a cut made with a 12-point saw.

#### Questions for Research and Discussion

1. What instruments or tools might have been used as the first saw? Draw pictures of what they might have looked like.
2. When might a handsaw be used in place of a power or circular saw?
3. What kinds of saws are used to cut down trees and to cut trees into building lumber?

## Handout 10

### Claw Hammer



#### Description

A hammer with a claw end for removing nails.

#### Use

Pounding nails into wood and removing nails.

#### Activities with Claw Hammers

1. Using a claw hammer, 10 #8 common nails, a steel tape ruler, a carpenter's pencil, and a block of wood, measure, mark, and place nails three inches apart along a straight line on the block of wood.
2. Using a claw hammer, 10 #6 finishing nails, a steel tape ruler, a carpenter's pencil, and a block of wood, measure, mark, and place nails two and a half inches apart along a straight line on the wood.
3. Using a small block of wood for leverage, remove the nails from the blocks of wood using the claw of the hammer. If used properly, the hammer should not leave marks or damage the material.

#### Questions for Research and Discussion

What tool has replaced the hammer on the construction site?

What are the advantages and disadvantages of this tool?

## Handout 11

### Circular Saw

#### Description

A high-powered electrical saw with a circular steel blade.

#### Use

Cutting wood and other materials rapidly.

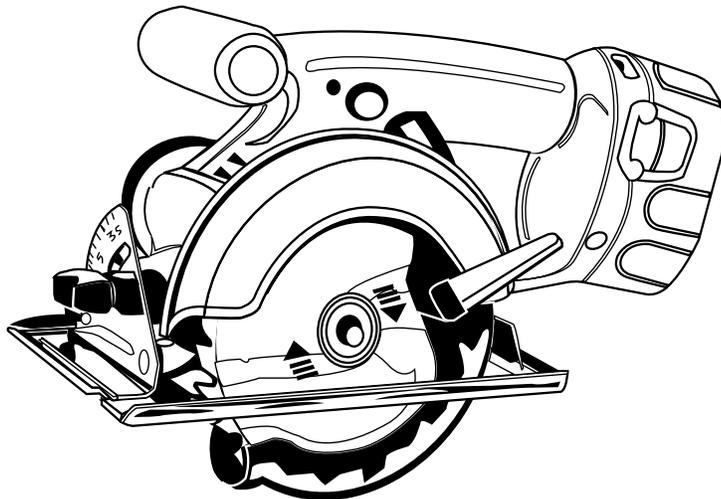
The circular saw, sometimes called a “skil” saw, is versatile and easy to transport. The saw is started by pressing a trigger in the handle and is stopped by releasing it. The newest saws have a safety switch that must be engaged in addition to the trigger.

#### Activities with Circular Saw

1. Label the parts of the circular saw in the illustration below.
2. On the real saw, adjust the depth of the saw blade to 1 inch, 1½ inch, and 2 inches.
3. Adjust the ripping fence to four inches and then to six inches, or adjust the angle of the saw blade.

#### Parts of the Circular Saw

Find and label these parts on the drawing below: handle, blade, and adjustable base plate.



#### Questions for Research and Discussion

The introduction of electricity has noticeably affected the construction process. Write a paragraph explaining how.

## Handout 12

### Screw Gun

#### Description

A variable-speed tool that resembles an electric drill. Screw guns come in electric and battery-operated versions.



#### Use

Fastening screws rapidly in framing and finish carpentry.

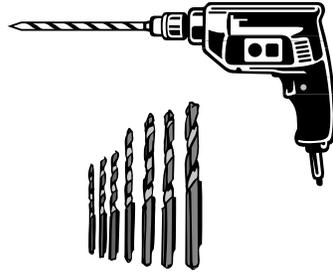
A screw gun uses zippies, which are metal, self-tapping screws used for fastening metal studs and tracks. With these zippies, the screw gun takes the place of the hammer.

#### Activities with Screw Gun

1. Examine a screw gun and all its parts. Follow these steps:
  - a. Use the key to open the bit holder.
  - b. Insert screw.
  - c. Tighten the bit holder.
  - d. Try this with three different-sized screw bits.
2. Practice using a screw gun to insert a variety of screws into a metal frame. Follow these steps:
  - a. Hold screw gun perpendicular to the object in which you are inserting screws.
  - b. Hold the screw gun level.
  - c. Apply direct and gentle pressure to insert screw.
  - d. Remember that bits go fast, so be prepared to back off carefully at the end.

## Handout 12

### Electric Drill



#### Description

A high-powered tool for drilling holes in wood and other materials. Some are cordless (battery-operated).

#### Use

For accurate drilling, especially for tough jobs such as concrete, masonry, or metal, or for pre-drilling wood prior to screwing.

#### Activities with an Electric Drill

1. Examine the electric drill and its parts. Use the chuck key to open the bit holder. Identify and insert the following bits: 1/2" spade bit, solid-center auger bit, a 1/4" twist bit, and a 1/8" twist bit.
2. Using a different bit for each hole, drill four holes into a piece of 4"x4"x2' scrap wood.
3. Examine the following bits: masonry bit, expandable auger bit, brad point bit, and hole saw with starter bit. When might you use each of these?

LESSON

# 6



photo: iStockphoto.com/Bruce Brownsville (TX)

## The Future of Tools in Construction

### Aim

Students interview vocational instructors from area technical colleges about the role of computers and advanced technology in the trades. In this lesson, they:

- Interview vocational instructors
- Take notes from interviews
- Organize interviews into narrative report
- Present report to class

## Things to Consider

In order to prepare for this activity, you will need to do some advance work. You will need to find a number of instructors who represent trades of interests to the students. Arrange the best time to do the interview.

Consider finding experts in the following areas:

- Computers
- Electronics
- Architectural Drawings
- Computer literacy
- Prefabrication
- New Power Equipment
- New Materials: Plastics, Synthetics, etc.
- Transportation of Materials
- Temperature Controls
- Heating and Cooling

Prepare the employees being interviewed by explaining that students are studying the impact of computers and technological advances on the construction trades and would like to know more about the particular skills needed to progress in their particular fields of interest. Explain that students will be writing things down and if possible, show them the questionnaires beforehand.

## Time

Allow an hour for interviews, another hour for writing essays upon return, and another hour for class presentations.



## Materials, Tools, and Resources

- Handout: Questions about Technology in the Construction Trades

## Steps for Activity



It is inevitable that the advances of the computer and technological revolution will continue to affect construction in the future.

### 1. Tell the students:

There have been many technological changes in the construction trades. It is inevitable that the advances of the computer and technological revolution will continue to affect construction in the future.

Read the following quote or write it on the board:

“Unless education programs move to incorporate technology, we’re doing students a disservice. Computer skills are essential for students to be competitive in the job market. All of the construction trades use computers, and students who are comfortable with them have access to more jobs.”

— Lea Campolo of YouthBuild Boston

Discuss the quote with the class. Ask:

Do you agree or disagree? Explain your answer.

### 2. Explain to students that they are going to be interviewing vocational instructors in order to research the impact of computers and technological advances on the construction trades.

### 3. Distribute the handout, “Questions about Technology in the Construction Trades.” Divide students into groups of three and assign them one of, or let them choose from, a few different people you’ve arranged to interview, based on their key areas of interest. Have them do interviews in groups of three, introduce themselves and politely ask the questions outlined on the handout.

Each student should take notes separately and then the small group will come together to discuss what they have learned.

### 4. Ask each group member to refine the interview into a two (or more) page narrative in which they describe what the interviewee says, in complete sentences, each category of questions written as a paragraph. Ask them to present their interviews to the class.

## Wrap Up

Ask students:

- What kinds of things did you learn interviewing a vocational instructor that you might not have been able to learn by reading the catalogue?
- What surprised you about what you learned?

## Creative Extensions

- Have students write up their interviews in the form of articles that can be published in the local Youth Build or organization publication. Accompany the articles with photographs and brief biographies of the instructors interviewed.

**Handout 1****Questions About Technology in the Construction Trades**

Interviewer's Name: \_\_\_\_\_

Date of Interview \_\_\_\_\_

**Introduce yourself and the project:**

*This is a school project to learn more about the role of computers and advanced technology in the trades.*

*Thank you very much for taking the time to meet with us today.*

1. What is your name?
2. What is your title?
3. How long have you been teaching this trade?
4. How long have you worked in this trade?
5. How have the tools changed in this trade in the past five years?
6. In the past ten years?
7. In the past one hundred years?

**Handout 1, cont'd.**

8. What would you say are the most important changes occurring in this trade?
  
9. Can you show us examples of the technological advances or computerized tools that are part of this trade?
  
10. What are the advantages of these changes?
  
11. What are the disadvantages?
  
12. Has the technological revolution effected the reading, writing or math skills needed to do this trade?
  
13. Has the technological revolution made the trade open to more people or more selective?
  
14. What skills do you think entry level people ought to have to be more prepared for the technological changes they will be facing?
  
15. What advice would you give to young people interested in going into this trade?

LESSON

# 7



## Workplace Technology Exploration

### Aim

Students conduct investigations of workplaces and the changes taking place in tools and technology. They explore the skills needed to adjust to new tools and technologies. In this lesson they:

- Observe a workplace where technological changes are taking place
- Write observations in a one-page paper
- Present observations to the group

## Time

1 hour

## Things to Consider

**In this activity,** students conduct an observation of a worksite where technological changes are taking place. Based on the observation students answer questions on the handout.

**Instructors will need to coordinate** site visits in advance. Consider arranging visits to some of the following sites:

- active construction site (carpentry, masonry, electrical, or concrete)
- hospital
- business office
- stock brokerage
- real estate agency
- mine
- warehouse
- dock or port
- transport facility (ship, train, truck, or postal)



## Materials, Tools, and Resources

- Handout: Workplace Observation — Technology

## Key Terms

- Observation
- Exploration

## Steps for Activity

- 1.** Distribute the handout, “Workplace Observation: Technology.” Tell students that they are going to do practice observations of a worksite. Divide students into groups of three and assign them one of a number of worksites where technological changes are taking place.
- 2.** Have students leave in groups of three to go to setting, introduce themselves and quietly observe, using the handout as a guideline. Each student will take notes separately on the handout, then meet in small groups to discuss what they have observed.
- 3.** Have small groups refine their observations into a one-page paper in which they write a paragraph to outline the information in each of the subheadings on the observation handout. Then ask small groups to present their observations to the class for feedback and critical evaluation. Ask the students to reflect on their observations. Ask:
  - Were you surprised by what you saw?
  - Was it interesting?
  - What did you learn?
  - What would you like to know more about?
  - Would you like to do any of the jobs in this workplace?



*Does the technology  
you observed seem  
like something you  
would like to learn  
more about?*

**Wrap Up**

Have students write in their journals for five minutes in answer to the question:

Does the technology you observed seem like something you would like to learn more about? Why or why not?

**Creative Extensions**

- Have students write up their observations in narrative format. Publish the observations in a book. Accompany with photographs taken during the observations.
- Have students create a bulletin board in which they display written reports of their observations accompanied by photographs.

**Handout 1****Workplace Observation Worksheet: Technology**

Student Name \_\_\_\_\_

Date \_\_\_\_\_

Site Observed \_\_\_\_\_

Name of Company \_\_\_\_\_

**Description of Work**

1. Describe the building or structure you observed.
2. What work is being done?
3. Describe tasks you saw being performed.

**Tools, Materials and Skills**

4. What tools and materials are being used?
5. What skills are used?
6. What tasks are being performed?

**Handout 1, cont'd.**

7. What work is done by hand (manually)?
8. What work is done by machines?
9. What work is done by computers?
10. Describe the tools, technology or machines that are used.
11. What skills are needed to operate these tools?
12. Would you enjoy doing this type of work? Explain.
13. What training or education is needed to perform the work that interests you?
14. Are there any job openings at this workplace?
15. Any other comments or observations?

LESSON

# 8



Photo: Martin Dixon

## Adaptability in the Face of Change

### Aim

Students will discuss the importance of adapting to coming periods of technological change. They will do job market research to find examples of technological change. In this lesson, they will:

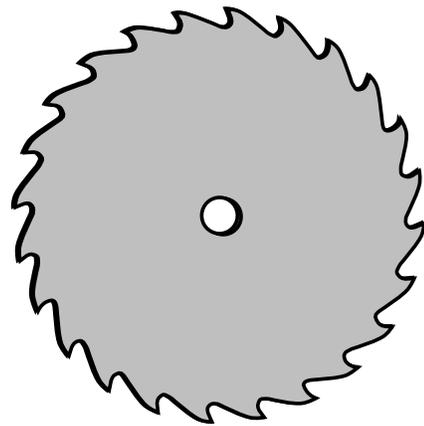
- Read a parable about change to draw inferences about adaptability and jobs
- Read want ads for examples of technological skills needed in the marketplace and compile results to draw conclusions

## Materials, Tools, and Resources

- Handout: Frogs in the Bucket
- Handout: Charting Technology
- Assorted employment “want ads” from local paper; enough for students to work alone or in pairs

## Time

1 hour



## Key Terms

- Flexibility
- Adaptability
- Survival

## Steps for Activity



We face a rapidly  
changing world.

What qualities and  
skills will help us  
survive and thrive?

1. Distribute the handout, “Frogs in the Bucket.” Tell students that this story was read at a management training conference for business people, in order to help them prepare for upcoming layoffs and small business failures, and to provide them with survival skills.
2. Ask students to read the passage and answer the questions. Discuss student answers to these questions with the class:
  - Why did the frogs jump in the bucket of milk?
  - What kind of long-range thinking was involved in this action?
  - What happened to the first two frogs and why did it happen?
  - What does this story tell us about changing conditions?
  - How did the third frog survive?
  - We face a rapidly changing world. What qualities and skills will help us survive and thrive?
  - The dramatic and rapid changes in technology are important changes that have been taking place. What do they mean for us and what can we do about them?
3. Distribute the handout “Charting Technology” and enough copies of the classified section of the local newspaper for students to work alone or in pairs. Have students look through the want ads to find 10 jobs in construction or related fields (skilled or unskilled).  
Using the chart, have students record information about technology they find in the want ads. Have them find out:
  - Are tools mentioned in the ads?
  - What technological skills are needed?
  - Are workers provided with tools or expected to have their own?
  - What kinds of knowledge of tools or technology is required?
  - Do applicants need experience with certain technology?

## Wrap Up

- 1.** Once students have completed the survey, discuss their results as a class. Ask:
  - What did they find?
  - Were they surprised by what they found?
  - What are the implications of this information for their own job search?
- 2.** Have students write in their journals for five minutes about their feelings related to technological change. Ask them to address these or related questions as they write:
  - Do they feel prepared to take additional courses in the future to supplement their current knowledge?
  - Are they interested in learning more about computers in the workplace?
  - Do they already possess some computer skills?
  - Do they feel any fears about learning about and using new technologies?
  - Do they feel excitement or enthusiasm about the prospect?

## Creative Extensions

- Have students survey the local paper over a week's time, perhaps focusing on the business section, to collect articles related to technology in the workplace. Have students write summaries of the main ideas expressed in the articles. Create a bulletin board which displays the articles and students' summaries.
- Have students write skits involving adaptability and change in the workplace. These skits might involve a conflict between two workers, one who sees the importance of gaining new skills and learning about new technologies, and one who does not. Have students perform the skits for the class.

## Project-Based Learning Activities

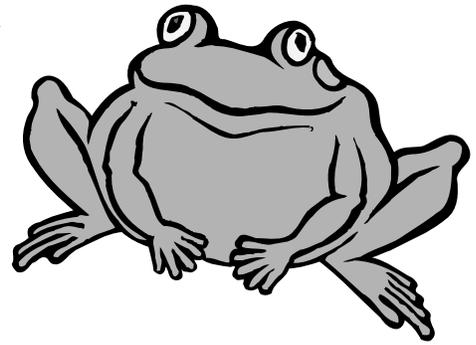
- Have students make an appointment with a counselor at a local community college or technical college to interview him or her about the fields of study and course offerings which relate to technology. They can investigate the prerequisite skills needed to take these courses, chart how many courses relate to computers or other innovations, and research the career opportunities available to people in technological fields. Have them write up the interview and report to the class.

**Handout 1**

### Frogs in the Bucket

Once upon a time there were three frogs who were dear friends and they hung out together all the time. They were jumping around a field and came across a bucket full of milk. Agreeing that this would be a wonderful opportunity for a swim and a drink, they all jumped in the bucket.

For about an hour they swam around and drank fresh milk. They were having the time of their lives, when finally one of them said, "I'm ready to go home." He tried to jump out of the bucket but was too far from the top, and he had no leverage or surface to jump up from. When the others saw this they too tried to jump, but it was useless. They started to panic and were swimming very hard through the milk hoping to get a way to jump out. But it all seemed very hopeless. Another hour had gone by, and then another with no success. Finally, one of the frogs was ready to give up, but his pals told him to keep trying. He did for awhile, but finally gave up and drowned in the milk.



Two were left, and they were even more panicked by the death of their buddy. They swam and paddled harder to stay afloat, fearing that they would soon go under. Another hour went by and the second frog called out that he was going under. He soon gave up and sank to the bottom. The lone frog that remained paddled a few more times and the milk turned to butter, and began to harden. He had something he could push from and he easily jumped out of the bucket.

## Handout 2

### Charting Technology

Look through the want ads to find ten jobs in construction. Clip the ads and tape them on the chart. Record information about technology and technological skills needed for the jobs.

Job listing (tape clipping here)	Tools needed	Tech skills	Are tools provided?	Experience needed?
1.				
2.				
3.				
4.				
5.				

**Handout 2, cont'd.**

Job listing (tape clipping here)	Tools needed	Tech skills	Are tools provided?	Experience needed?
6.				
7.				
8.				
9.				
10.				

LESSON

# 9



Photo: Martin Dixon

## Final Assessment: Portfolios

### Aim

This lesson is designed to help both the teacher and the students assess the students' skills, attitudes, feelings and beliefs related to the history and future of tools and technology. Students will demonstrate their skill, attitudes, values and understanding in three ways.

They will:

- Collect material they have produced throughout the unit into individual portfolios (see Portfolio Assessment Checklist at the beginning of this unit)
- Write a reflective self-assessment of skills, attitudes, values and beliefs, based on collected work
- Create a final product as a means of presenting their portfolio work visually, in the form of a bulletin board, table display or book

## Things to Consider

**Prepare students** for the self-assessment by asking them to review all of the materials in their portfolio. Tell them to use these materials to help them review and understand key concepts and to judge how well they have mastered the material. Encourage creativity and self-expression in the creation of a final presentation of their work.

## Materials, Tools, and Resources

- Student journals
- Student portfolio items
- Portfolio Assessment Checklist
- Assorted art materials

## Time

Much of the portfolio assessment will be done over time. Students gather materials over the course of the unit, but need time at the end of the unit to collect material, write the final self-assessment, and create a final product.



## Key Terms

- Portfolio
- Self-assessment
- Values
- Beliefs

## Steps for Activity

- 1.** Throughout the unit, students should have been collecting material for their portfolios. Provide time for them to collect this material, check for completeness, organize, and label.
- 2.** As a final journal entry in the unit, and as a part of the culminating assessment process, ask students to write in their journals the answers to the following questions:
  - What do you know about the history and future of tools and technology that you did not know before?
  - How do you think your skills, attitudes, beliefs, and ideas have changed as a result of this unit? Be specific.
- 3.** Ask students to create a final product as a means of presenting their portfolio work visually. Tell them the presentation may take one of the following forms, and allow ample opportunity to create, revise, and complete the product.
  - A bulletin board, done individually or with several other students, in which they display their work and graphically depict their key attitudes and beliefs about the material in the unit. They might create collages. They might use photos, magazine cutouts, drawings, collected art, or cartoons.
  - A table display, done individually or with other students, in which they display their work and graphically depict their understanding of the material in this unit. They might include drawings and items they've built or designed, labeling each and telling how it relates to the topic.
  - A book in which they display their work and graphically depict their key attitudes and beliefs about the material in this unit. They might design a cover and chapter headings using photos, magazine cutouts, drawings, collected art, or cartoons. They might include additional research they have written to demonstrate their understanding of the topic.

**Wrap Up**

Consider having an open house to invite parents, friends, and community members to view the students' work. You might also find that the students' portfolios make an excellent introduction to YouthBuild for incoming students.



What do you know  
about the history  
and future of tools  
and technology  
that you did not  
know before?



# Tools and Resources

## **Selected Readings**

### **Architecture and Culture**

*Adobe Architecture*, Myrtle Stedman, Wildred Stedman.

Images and sketches of adobe and other southwestern architecture.

*Alternative Housebuilding*, Michael McClintock.

*Ancient Egyptian Construction and Architecture*, Somers Clarke, et al.

### **The Construction Business**

*The Builder's Guide to Running a Successful Construction Company*, David Gerstel.

*Building a Business: The Jim Walter Story*, Alvin Moscow.

### **General**

*Builders Guide to Foundations and Floor Framing* (Builders Guide Series), Dan Ramsey.

*Building Design and Construction Handbook*, Frederick S. Merritt, Jonathan T. Ricketts.

*Building with Junk and Other Good Stuff: A Guide to Home Building and Remodeling Using Recycled Materials*, Jim Broadstreet.

These are the more relevant and useful books from the Contractors Zone bookstore. The complete list can be found at:

<http://www.contractorszone.com/Contractors/Testimonials/Bookstore/bookstore.html>.

*Building Construction Illustrated*, Frank Ching, Francis D. Ching, Cassandra Adams, (John Wiley and Sons, 1991).

Details the major systems of a building, how each is constructed, and how each is influenced by its relationship to other systems. The second edition includes coverage of basic structural steel, reinforced concrete, and curtain wall systems.

*Construction and Computers*, Patti and William Feldman, (McGraw-Hill, 1996).

How to maximize potential by using computers to keep a database, perform computer-aided design, generate estimates and spreadsheets, perform accounting and invoices, and more.

*The Digital Architect: A Common-Sense Guide to Using Computer Technology in Design Practice*, Ken Sanders, AIA, (John Wiley and Sons, Inc.: New York, 1996).

*Eco-Tech: Sustainable Architecture and High Technology*, Catherine Slessor, (Thames and Hudson: New York, 1997).

An international survey of 1990s projects, with several photographs.

*Why Buildings Fall Down*, Matthys, Levy and Mario Salvadori, (W.W. Norton and Co.: New York, 1992).

*The New Way Things Work*, David Macaulay, Houghton Mifflin Company, 1998.

*Carpentry*, Gaspar Lewis, Delmar Publishers, 1995. Has sections on power tools.

*Giving Children Hope and Skills for the 21st Century*, Susan M. Quattrociocchi and Barbara Peterson, Career Information System, 1996.

*Better Homes and Gardens Step by Step, Basic Carpentry*, Benjamin W. Allen, Editor. Meredith Publishing, 1997.

## Web pages

The Electronic Journal of Information Technology in Construction:  
<http://itfcon.org/> <http://itfcon.org/>

Woodworking Construction and Tools:  
<http://www.cise.ufl.edu/~jmfedora/wood.html>

**Related Books:** The Construction Research Group, Thousands of related books on construction subjects:  
<http://www.icongroupedition.com/Construction/home%20book-recommendations1.html>

NAWIC - National Association of Women in Construction:  
<http://www.nawicregion10.org>

International Construction Organizations:

<http://cic.vtffi/links/organs.html>

Native American Culture Across the Math and Science Curriculum:

[http://www.carson.enc.org/reform/journals/enc0113/113\\_10.8htm](http://www.carson.enc.org/reform/journals/enc0113/113_10.8htm)

World Philosophy Course Notes — “Native American Philosophy”:

<http://www.kemetro.cc.mo.us/longview/socsci/philosophy/world/native.htm>

The Foundations of African Philosophy:

[http://www.lhup.edu/library/InternationaReview/african\\_phil.htm](http://www.lhup.edu/library/InternationaReview/african_phil.htm)

Joannou and Paraskevaides Group — International Contractors:

<http://www.jnp-group.com/>

African-American Inventors of Today:

<http://www.edcen.ehhs.cmich.edu/~rlandrum/today.htm>

Tooltalk:

<http://www.tooltalk.org/>

Almanac: Colonial Life:

<http://www.history.org/life/tools/tlhdr.htm>

Native American Technology and Art:

<http://www.nativetech.org/>

Building and Fire Research Laboratory:

<http://www.bfrl.nist.gov/863/cic.html>

Accountant’s Home Page:

<http://www.cinputercpa.com/constr.htm>

Computers in Construction:

<http://www.nwbuildnet.com/nwbn/publications.html>

Essays in Wildlife Conservation:

<http://www.meer.org/chap2htm>

To build on-line communities of support for young women in technical fields:

[www.edc.org/CCT/telmentoring](http://www.edc.org/CCT/telmentoring)