

Technical

Knowledge and Skills for Environmental Technology Education

High School – Technical Knowledge and Skills

Note: The numbered items below are technology education general outcomes. Their intent is compatibility with [International Technology Education Association](#) standards. The bulleted items are knowledge and skill concepts identified by ATEEC Fellows as necessary for performing tasks in environmental technology occupations. The Fellows have merged the general outcomes with the ATEEC knowledge and skills list for your information.

Technology Studies I (may be called Introduction to Technology, Technology Applications I, Principles of Technology I, or Technology Systems I)

1. Demonstrate the ability to work safely with a variety of technologies.
 - Recognize, report, and correct safety problems.
 - Demonstrate safe handling procedures.
2. Demonstrate interpersonal skills as they relate to the workplace.
3. Identify and apply methods of information acquisition and utilization.
4. Apply basic skills in communications, mathematics, and science appropriate to technological content and learning activities.
 - Demonstrate technical writing skills (e.g., memos, letters, documentation, incident narratives, research reports, procedures, plans).
 - Complete written data forms.
 - Read and interpret blue prints, flow diagrams, schematics, sketches, maps, and charts.
 - Give clear, concise verbal instructions.
 - Develop and use active listening skills.
 - Draw graphic communications (e.g., sketches, maps, charts).
 - Use photographic means to communicate/document information.
 - Demonstrate appropriate and tactful communication skills.
 - Use a microscope.
 - Read and interpret Volt-Ohm meter.
 - Use a scientific calculator.
 - Measure meteorological factors: temperature, barometric pressure, humidity, and wind velocity.
5. Demonstrate and apply design/problem-solving processes.
6. Express an understanding of technological systems and their complex interrelationships.
7. Demonstrate the ability to properly identify, organize, plan, and allocate resources.
 - Prepare budgets.
 - Maintain financial records.
8. Discuss individual interests and aptitudes as they relate to a career.
9. Demonstrate employability skills.
 - File electronic and paper documents systematically.
 - Use office equipment.
10. Demonstrate an understanding of entrepreneurship.
11. Make an informed and meaningful career choice.
12. Identify evolving technologies in our technological world.
13. Demonstrate knowledge of the basic principles of technology, the basic elements of all systems, and the components of each basic element.
 - Use surveying data and techniques.
 - Operate pumps and motors.
 - Use basic hand tools.
 - Read and interpret equipment specifications.
 - Practice preventive maintenance and good housekeeping.

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14. Demonstrate knowledge and perform special skills unique to the physical technologies.
15. Demonstrate knowledge and perform special skills unique to the information/communication technologies.
 - Use computers, peripherals, and software programs (word processing, spread sheets, data bases, statistical analysis, CD ROM).
 - Access information and transfer data by computer communication techniques (e.g., e-mail, Internet, World Wide Web, commercial on-line services, bulletin board services).
 - Transfer data from instruments (e.g., air monitors) to computers for data work-up and report preparation.
 - Use networking LAN technology.
 - Determine proper care and maintenance of information storage systems.
16. Demonstrate knowledge and perform special skills unique to the biotechnologies.
17. Demonstrate and apply fluid system principles.
 - Explain and apply basic hydraulic theory.
 - Explain the basics of how valves and pumps work in terms of efficiency, energy usage, and units.
18. Demonstrate and apply thermal system principles.
19. Demonstrate and apply electrical system principles.
 - Identify electrical properties by using appropriate meters and grounding methods.
 - Differentiate between AC and DC electricity.
 - Use a voltmeter to measure voltage.
 - Explain the relationship between energy and electricity.
 - Define and identify relationships in electrical terms such as volts, amps, and resistance.
 - Use wiring principles and diagrams to construct simple circuits.
20. Demonstrate and apply mechanical system principles.
 - Describe the effects of momentum in mechanical and fluid systems.
 - Apply the relationship between potential energy, kinetic energy, and heat energy in the conservation of energy law.
 - Define work in terms of force, distance, and energy.
 - Demonstrate basic knowledge of simple machines such as pulleys, gears, levers, etc.
 - Calculate mechanical advantage and efficiency.
 - Describe what force, pressure, voltage, and temperature difference have in common, and predict what happens to an object when unbalanced forces act on it.
21. Demonstrate a knowledge of computer control technology.

Technology Studies II (may also be called Intermediate Technology, Technology Applications II, Principles of Technology II, or Technology Systems II)

1. Continue to demonstrate the ability to work safely with a variety of technologies.
 - Develop worksite safety programs.
 - Use spill clean-up kits.
 - Identify incompatible combinations of chemicals that could result in potentially dangerous situations.
 - Present safety information in a clear and concise manner.
2. Continue to demonstrate interpersonal skills as they relate to the workplace.
 - Train personnel, using necessary/available multimedia training equipment.
3. Continue to identify and apply methods of information acquisition and utilization.
 - Develop assessment instruments and surveys.
4. Continue to apply basic skills in communications, mathematics, and science appropriate to technological content and learning activities.
 - Read, write, and follow Standard Operating Procedures (SOP's).
 - Present data interpretation in a clear and concise manner.
 - Design, develop, conduct, and evaluate training programs.
 - Determine appropriate format and procedures (including legibility) for maintaining records, logs, field and lab journals, forms, etc.

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5. Continue to demonstrate the ability to properly identify, organize, plan, and allocate resources.
 - Maintain inventory control.
 - Handle material goods.
6. Continue to demonstrate knowledge of the basic principles of technology, the basic elements of all systems, and the components of each basic element.
 - Measure pressure.
 - Read and interpret dial indicators.
 - Handle material goods properly as instructed.
7. Demonstrate knowledge and application of robotics technology.
8. Demonstrate knowledge and application of programmable controller technology.
 - Specify electronics for use in programmable logic controllers (PLC) and operate PLC.
9. Demonstrate the techniques of computer numerical control technology.
10. Demonstrate knowledge and application of computer-aided drafting technology.
11. Demonstrate knowledge and application of laser technology.
12. Demonstrate appropriate skills in analyzing and evaluating technological advancements as reported by the media.

Two-Year College – Technical Knowledge and Skills

The ATEEC Fellows have recommended the four technical courses or topical areas below as part of a core curriculum for any environmental technology program. They furthermore recommend an experiential component in the curriculum, such as an internship. The Fellows have labeled each concept below as basic, intermediate, or advanced. The labeling is based upon the Fellows' teaching experience and indicates the complexity of thinking necessary for demonstrating that a student has achieved the concept.

Introduction to Environmental Technology

- Determine jurisdiction of federal, state, and local regulatory agencies. (Basic)
- Read, interpret and apply government regulations in CFRs and Federal Register (e.g., permitting, training, reporting, procedural, planning, and other compliance requirements). (Basic)
- Determine applicability of regulations to a situation or party. (Advanced)
- Audit workplace for compliance with regulations. (Advanced)

Environmental Health and Safety

- Read, interpret, and apply information on Material Safety Data Sheets (MSDSs). (Basic)
- Recognize hazards characteristics of commonly encountered chemicals. (Basic)
- Present safety information in a clear and concise manor. (Basic)
- Apply Threshold Limit Value (TLV), Time-Weighted Average (TWA), Short-Term Exposure Limit (STEL), and Ceiling (C) to decision-making. (Basic)
- Transfer data from instrument for report preparation. (Basic)
- Demonstrate safe handling practices and procedures. (Basic)
- Use spill clean-up kits. (Basic)
- Measure meteorological factors: temperature, barometric pressures, humidity, and wind velocity. (Basic)
- Obtain health and safety background information. (Basic)
- Maintain inventory control of chemicals and safety equipment. (Basic)
- Practice preventive maintenance and good housekeeping. (Basic)
- Recognize and use the quantities that describe sound waves (i.e., intensity, distance, frequency, time). (Basic)
- Measure radiation level with common instruments and dosimetry techniques. (Basic)
- Describe the effects of alpha, beta, and gamma radiation on body tissues. (Basic)

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- Identify the signs and symptoms associated with exposure to chemicals in the hazard classes. (Basic)
- Describe chronic and acute effects associated with exposure to chemicals in the hazard classes. (Basic)
- Use medical terminology to communicate with medical personnel inside and outside the company. (Basic)
- Identify incompatible combinations of chemicals that could result in potentially dangerous situations. (Intermediate)
- Select, maintain, inspect, don, and safely use appropriate personal protective equipment (PPE). (Intermediate)
- Work within the Incident Command System (ICS). (Intermediate)
- Calibrate and use monitoring instruments associated with employee health and safety. (Intermediate)
- Evaluate chemical compatibilities and incompatibilities. (Intermediate)
- Recognize the potential hazards involved in performing an analysis or field operation and take appropriate precautions, including the use of safety equipment and personal protective equipment. (Intermediate)
- Apply radiation safety principles in working with radioactive substances. (Intermediate)
- Identify the structures and discuss the functions of major organ systems. (Intermediate)
- Define basic routes of entry and the toxicological effects of chemicals on the body, including acids, bases, solvents, carcinogens, etc. (Intermediate)
- Calculate the dose/response for a given hazardous materials exposure. (Intermediate)
- Recognize, report, and correct safety problems. (Advanced)
- Read, write, and follow Standard Operating Procedures (SOPs) for health and safety. (Advanced)
- Audit workplace for compliance with regulations. (Advanced)
- Design, develop, conduct, and evaluate safety training programs. (Advanced)
- Develop work-site safety programs. (Advanced)

Environmental Sampling and Monitoring

- Appropriately label samples and reagents. (Basic)
- Appropriately maintain records, logs, field and lab journals, forms, etc. relating to environmental sampling, analysis, monitoring, and reporting. (Basic)
- Recognize the potential hazards involved in performing an analysis of field operation and take appropriate precautions, including the use of safety equipment and personal protective equipment. (Basic)
- Select, calibrate, and use sampling and monitoring equipment (e.g., microprocessor controlled, field, analog, selective ion, colorimetric, water-level meter, and other instruments). (Basic)
- Document site information with photographs. (Basic)
- Obtain information necessary for a sampling event. (Basic)
- Locate positions on the ground that correspond with points on a map. (Basic)
- Identify soil type and color. (Intermediate)
- Draw, read, or interpret blue prints, flow diagrams, schematics, sketches, maps, and charts. (Intermediate)
- Use appropriate Quality Control/Quality Assurance techniques (QA/QC) to ensure sample integrity and precision and accuracy of analyses. (Intermediate)
- Use surveying data and techniques to determine groundwater elevation. (Intermediate)
- Determine ground-water gradient. (Advanced)
- Read, write, and follow Standard Operating Procedure (SOP) documents. (Advanced)
- Use appropriate sampling, handling, and chain-of-custody protocol. (Advanced)
- Record, transfer, and interpret sampling and monitoring data clearly, accurately, and concisely. (Advanced)
- Solve 3-point problems to determine direction of ground-water flow. (Advanced)
- Interpret data evaluating clean-up or waste management systems. (Advanced)

Internship Knowledge and Skills

- Prepare budgets.
- Compare price information and vendor specifications.
- Use office equipment.
- File documents systematically.

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