

WGSD Curriculum
Industrial Technology Department

Course: Architectural Drafting and Computer Aided Drafting

Grade Level: 9-12

LG 1 Safety

High Priority Standards

MoDese Performance Indicators for Industrial Technology

Drafting

1. Drafting Room Procedures - Safety

1.1 Apply safety policies and procedures.

1.3 Identify American National Standards Institute, Inc. (ANSI) and International Standards Organization retrieval).

1.6 Identify and apply ergonomic considerations.

Learning Goal	Proficiency Scale
Students will be able to keep themselves safe in a working shop environment.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: <ul style="list-style-type: none">• Exhibiting ergonomic and personal safety awareness while working.• Adapting the physical environment for personal work needs. Level 2: Student demonstrates he/she is nearing proficiency by: <ul style="list-style-type: none">• Recognizing and recalling specific vocabulary, such as: First aid, health hazard, safety hazard, chemical substance, biological agent, physical agent, ergonomics, disinfectant, risk.• Performing processes such as:<ul style="list-style-type: none">○ Identifying elements that could lead to injury to self or others in shop

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	<p>work areas.</p> <p>Level 1: Student demonstrates a limited understanding or skill with the learning goal.</p>
<p style="text-align: center;">Learning Targets</p> <p>Students know how to:</p> <ul style="list-style-type: none">● Describe and demonstrate correct ergonomics.● Consider physical environment (e.g., keyboard position, screen position, lighting).● Identify and demonstrate personal safety and awareness of safety for others (e.g., electrical and mechanical hazards).	

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LG 2 Tools and Equipment

High Priority Standards

MoDese Performance Indicators for Industrial Technology

Drafting

2.1 Hardware

- 2.1.1. Demonstrate proper care of equipment
- 2.1.2 Demonstrate proper use, care, and adjustment of drawing instruments and equipment and computer equipment.
- 2.1.4 Operate and adjust input devices (e.g., mouse, keyboard, digitizer, scanner).
- 2.1.5 Operate and adjust output devices (e.g., printers, plotters, data transfer).
- 2.1.6 Identify and use data storage, retrieval and backup systems.
- 2.1.7 Identify operating systems and procedures.

NETs-S/TILs

Tools of the Trade

Utilize a working knowledge of technology or technological support services to identify a problem/issue and its solution.

Learning Goal	Proficiency Scale
Students will be able to use and maintain computer technology used in technical fields.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: <ul style="list-style-type: none">• Operating all input, output, and storage devices independently.• Calibrating and adjusting monitors for personal use.

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- Caring for equipment and software to preserve operability of the tools.

Level 2: Student demonstrates he/she is nearing proficiency by:

- Recognizing and recalling specific vocabulary, such as: hardware, keyboard, mouse, scanner, output, server, CPU, monitor, flash drive, USB cable, pad, printer, plotter.
- Performing processes such as:
 - Identifying input, output and storage options.
 - Following class procedures to operate software and equipment .

Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Demonstrate proper care of equipment.
- Operate and adjust input devices (e.g., mouse, keyboard, digitizer).
- Operate and adjust output devices (e.g., printers, plotters, modems).
- Handle storage media, retrieval, and backup.
- Adjust monitor controls for maximum comfort and usability.

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LG 3 Drafting

High Priority Standards

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Drafting

3. Basic Drawing Skills

- 3.1 Lay out drawing.
- 3.2 Construct borders and information blocks.
- 3.3 Construct freehand sketches.
- 3.4 Read and transfer measurements (English and metric).
- 3.5 Letter freehand (letters and numerals).
- 3.6 Demonstrate techniques in line construction (e.g., weights, types and uniformity).
- 3.7 Construct a reproducible drawing with mechanical pencils.
- 3.9 Perform basic geometric construction (e.g., line dividing, angles, tangents, polygons, arcs).

Missouri Learning Standards

MATH-HSG-MG.A.3 Apply geometric methods to solve design problems. (Drawing an industry standard plan)

Learning Goal	Proficiency Scale
Students will be able to communicate with a drawing.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: <ul style="list-style-type: none">• Using drawing media with correct form and choice of tools for the task.• Using all standard measurement tools with precision.

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- Applying all line style and weights, symbols, annotations and copy methods.
- Producing an industry standard plan that someone else could use to build an item.

Level 2: Student demonstrates he/she is nearing proficiency by:

- Recognizing and recalling specific vocabulary, such as: t-square, triangle, c-size paper, drafting vellum, protractor, french curve, engineering scale, architect scale, metric scale, blueprint, line.
- Performing processes such as:
 - Identifying drawing media and standard measurements.
 - Identifying all styles, symbols, annotations and copy methods.
 - Drawing a basic plan.

Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Use drawing media and related drafting materials (e.g., papers, vellum, Mylar, plotter pens, toner cartridges).
- Use basic measurement systems (e.g., fractions, decimals, and metric measurements).
- Add correct annotation to drawing.
- Identify line styles and weights.
- Prepare title blocks and other drafting formats.
- Apply metric and/or dual dimensioning drawing standards.
- Identify and use appropriate standard symbols.
- Reproduction of originals using different methods (e.g., photocopy, plot, blueprint).
- Create freehand technical sketches.

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LG 4 Orthographic and Auxiliary Views

High Priority Standards

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Drafting

- 4. Orthographic Projections: Multi-views
 - 4.1 Identify use and application of orthographic drawings (3rd angle).
 - 4.2 Identify 1st and 3rd angle projection drawings.
 - 4.3 Interpret an orthographic projection (3rd angle).
 - 4.4 Sketch multi-view drawings (3rd angle).
 - 4.5 Prepare orthographic drawings (3rd angle).
- 5. Auxiliary Views
 - 5.1 Identify use and application of auxiliary views.
 - 5.2 Construct primary auxiliary views

Missouri Learning Standards

Math-HSG-CO.A.2 Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).

Learning Goal	Proficiency Scale
Students will understand how to illustrate a 3-dimensional object using multiple 2-dimensional views.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: <ul style="list-style-type: none">• Creating multi-view drawings that include orthographic, auxiliary, and section

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	<p>views.</p> <p>Level 2: Student demonstrates he/she is nearing proficiency by:</p> <ul style="list-style-type: none">● Recognizing and recalling specific vocabulary, such as: views, orthographic projections, 3 dimensional, solid, height, length, width/depth, face, plane, parallel, profile.● Performing processes such as:<ul style="list-style-type: none">○ Identifying orthographic, auxiliary, and section views.○ Completing multi-view sketches. <p>Level 1: Student demonstrates a limited understanding or skill with the learning goal.</p>
<p style="text-align: center;">Learning Targets</p> <p>Students know how to:</p> <ul style="list-style-type: none">● Identify, create, and place appropriate orthographic views.● Identify, create, and place appropriate auxiliary views.● Identify, create, and place appropriate section views.	

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LG 5 Pictorial Drawing

High Priority Standards

**MoDese Performance Indicators for Industrial Technology
Drafting**

8. Pictorial Drawings

- 8.1 Identify use and application of pictorial drawings.
- 8.2 Sketch pictorial drawings.
- 8.3 Construct axonometric, oblique, and perspective drawings.

Learning Goal	Proficiency Scale
Students will be able to use a two-dimensional drawing to illustrate 3 dimensions.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: <ul style="list-style-type: none">• Creating full pictorial drawings that include axonometric, oblique and perspective view. Level 2: Student demonstrates he/she is nearing proficiency by: <ul style="list-style-type: none">• Recognizing and recalling specific vocabulary, such as: horizon line, 3 point perspective, true length, vanishing point, axes, ground line, axonometric projection, isometric, oblique, cabinet style.• Performing processes such as:<ul style="list-style-type: none">○ Identifying axonometric, oblique, and perspective drawings.○ Completing pictorial sketches.

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	Level 1: Student demonstrates a limited understanding or skill with the learning goal.
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Learning Targets

Students know how to:

- Identify and create axonometric drawings (e.g., isometric, dimetric, trimetric).
- Identify and create oblique drawings (e.g., cabinet, cavalier).
- Identify perspective drawings (e.g., 1-point, 2-point, 3-point).

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LG 6 Dimensioning and Tolerancing

High Priority Standards

MoDese Performance Indicators for Industrial Technology

Drafting

9. Dimensioning and Tolerancing as Applied to Specific Drafting Fields.

- 9.1 Construct the lines used to dimension drawings.
- 9.2 Identify and apply dimensioning practices.
- 9.3 Identify and apply tolerancing.
- 9.5 Dimension drawing using ANSI and ISO Standards.

Missouri Learning Standards

Math-GMD.A.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems (Visualize relationships between two-dimensional and three-dimensional objects).

Learning Goal	Proficiency Scale
<p>The student will be able to communicate a dimensional concept with a drawing.</p>	<p>Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.</p> <p>Level 3: Student demonstrates mastery with the learning goal as evidenced by:</p> <ul style="list-style-type: none"> • Illustrating concepts (such as size, material, finishes, location, shape) of two and three-dimensional objects. • Creating dimensional drawings that meet accepted industry standards for drafting. <p>Level 2: Student demonstrates he/she is nearing proficiency by:</p>

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- Recognizing and recalling specific vocabulary, such as: aligned system, arrowhead, center line, coordinates, cutting-plane line, dimension line, height, leader, schedule, specifications, tolerance, unidirectional system.
- Performing processes such as:
 - Describing correct form and use of drawing tools.
 - Completing required drawings.

Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Apply dimensioning rules correctly (e.g., avoid redundant dimensioning, avoid dimensioning to hidden lines).
- Use correct dimension line terminators (e.g., arrowheads, ticks, slashes).
- Dimension objects (e.g., lines, arcs, angles, circular).
- Dimension complex shapes (e.g., spheres, cylinders, tapers, pyramids).
- Dimension features from a center line.
- Dimension a theoretical point of intersection.
- Use appropriate dual dimensioning standards.
- Use size and location dimension practices.
- Use various dimensioning styles (e.g., Cartesian, polar, ordnance, datum).
- Place tolerance dimensioning and Geometric Dimensioning and Tolerancing (GD&T) on drawings when appropriate.

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LG 7 Drafting in CAD

High Priority Standards

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Drafting

11. Basic CAD Skills

- 11.1 Create new 2-D drawings.
- 11.2 Perform drawing setup to applicable standards (e.g., settings, layers, line types and widths).
- 11.3 Identify and use view and display commands (e.g., settings, layers, line types and widths).
- 11.4 Use query commands to extract drawing data (e.g., entity characteristics, distance, area, status).
- 11.5 Edit, copy, and manipulate drawing entities (e.g., entity characteristics, distance, area, status).
- 11.6 Save, retrieve and manage drawings.
- 11.7 Dimension drawings.
- 11.8 Set and change dimensioning variables.
- 11.12 Create, edit and retrieve component/symbol libraries (e.g., groups, blocks, symbols, third-party libraries).
- 11.13 Identify and apply layering techniques.
- 11.14 Identify methods of sharing drawings (e.g., team projects).

NETS/TILS

Create and Communicate

Employ curriculum-specific, technology-based simulations to aid in understanding complex, real-world systems. Simulation studies include formulating problems, developing models, running models, and analyzing outputs that help predict behaviors and outcomes. (Communicating with drawings)

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Learning Goal	Proficiency Scale
<p style="text-align: center;">Student will be able to use digital tools to communicate with drawings.</p>	<p>Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.</p> <p>Level 3: Student demonstrates mastery with the learning goal as evidenced by:</p> <ul style="list-style-type: none">• Setting up and using CAD software environment and tools.• Using software-based measurement tools with precision.• Using the CAD environment to create, edit and manipulate drawings that meet industry standards. <p>Level 2: Student demonstrates he/she is nearing proficiency by:</p> <ul style="list-style-type: none">• Recognizing and recalling specific vocabulary, such as: (in addition to dimensional drawing terms): CAD, monitor, mouse, format, render, layer, control point, preset, parametric, data CAD, auto CAD, google sketch-up.• Performing processes such as:<ul style="list-style-type: none">○ Identifying and using all styles, symbols, annotations, and file management tools.○ Constructing geometric figures and wireframe/solid models.○ Using text features in the software. <p>Level 1: Student demonstrates a limited understanding or skill with the learning goal.</p>

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Learning Targets

Students know how to:

- Create new drawing.
- Perform drawing set up.
- Construct geometric figures (e.g., lines, splines, circles, and arcs).
- Create text using appropriate style and size to annotate drawings.
- Use and control accuracy enhancement tools (e.g. Entity positioning methods such as snap and XYZ).
- Identify, create, store, and use appropriate symbols/libraries.
- Create wireframe/solid models.
- Create objects using primitives.
- Create 2-D geometry from 3-D models.
- Revolve a profile to create a 3-D object.
- Create 3-D wireframe models from 2-D geometry.

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LG 8 Orthographic and Auxiliary Views in CAD

High Priority Standards

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Drafting

4. Orthographic Projections: Multi-views
 - 4.1 Identify use and application of orthographic drawings (3rd angle).
 - 4.2 Identify 1st and 3rd angle projection drawings.
 - 4.3 Interpret an orthographic projection (3rd angle).
 - 4.4 Sketch multi-view drawings (3rd angle).
 - 4.5 Prepare orthographic drawings (3rd angle).
5. Auxiliary Views
 - 5.1 Identify use and application of auxiliary views.
 - 5.2 Construct primary auxiliary views
12. Advanced CAD Skills
 - 12.5 Create 2-D geometry using 3-D models.

Missouri Learning Standards

Math-HSG-CO.A.2 Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).

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Learning Goal	Proficiency Scale
<p>Students will understand how to illustrate a 3-dimensional object using multiple 2-dimensional views in the CAD environment.</p>	<p>Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.</p> <p>Level 3: Student demonstrates mastery with the learning goal as evidenced by:</p> <ul style="list-style-type: none">• Creating multi-view drawings that include orthographic, auxiliary, and section views in the CAD environment. <p>Level 2: Student demonstrates he/she is nearing proficiency by:</p> <ul style="list-style-type: none">• Recognizing and recalling specific vocabulary, such as: views, orthographic projections, 3 dimensional, solid, height, length, width/depth, face, plane, parallel, profile.• Performing processes such as:<ul style="list-style-type: none">○ Identifying orthographic, auxiliary, and section views in the CAD environment.○ Completing multi-view sketches in the CAD environment. <p>Level 1: Student demonstrates a limited understanding or skill with the learning goal.</p>

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Learning Targets

Students know how to:

- Create, and place appropriate orthographic views.
- Create, and place appropriate auxiliary views.
- Create, and place appropriate section views.

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LG 9 Pictorial Drawing in CAD

High Priority Standards

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8. Pictorial Drawings.

8.1 Identify use and application of pictorial drawings.

8.2 Sketch pictorial drawings.

8.3 Construct axonometric, oblique, and perspective drawings.

11. Basic CAD Skills.

11. Create new 2-D drawings.

Learning Goal

Students will be able to use a two-dimensional drawing to illustrate 3 dimensions in the CAD environment.

Proficiency Scale

Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.

Level 3: Student demonstrates mastery with the learning goal as evidenced by:

- Interpreting and producing axonometric, oblique, and perspective drawings using CAD software.
- Creating full pictorial drawings that meet accepted industry standards using CAD software.

Level 2: Student demonstrates he/she is nearing proficiency by:

- Recognizing and recalling specific vocabulary, such as: horizon line, 3 point perspective, true length, vanishing point, axes, ground line, axonometric projection, isometric, oblique, cabinet style, CAD.

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- Performing processes such as:
 - Identifying axonometric, oblique, and perspective drawings.
 - Completing pictorial sketches using software.

Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Create axonometric drawings in CAD (e.g., isometric, diametric, trimetric).
- Create oblique drawings in CAD (e.g., cabinet, cavalier).
- Create perspective drawings in CAD (e.g., 1-point, 2-point, 3-point).

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LG 10 Dimensioning and Tolerancing in CAD

High Priority Standards

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Drafting

9. Dimensioning and Tolerancing as Applied to Specific Drafting Fields

- 9.1 Construct the lines used to dimension drawings.
- 9.2 Identify and apply dimensioning practices.
- 9.3 Identify and apply tolerancing.
- 9.4 Identify and apply geometric dimensioning and tolerancing techniques.
- 9.5 Dimension drawing using ANSI and ISO Standards.

12. Advanced CAD Skills

- 12.4 Edit solids, curves, and surfaces.

Learning Goal	Proficiency Scale
<p style="text-align: center;">The student will be able to communicate a dimensional concept with a drawing in the CAD environment.</p>	<p>Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal.</p> <p>Level 3: Student demonstrates mastery with the learning goal as evidenced by:</p> <ul style="list-style-type: none"> • Illustrating concepts (such as size, material, finishes, location, shape) of two and three-dimensional objects in the CAD environment. • Creating dimensional drawings that meet accepted industry standards for drafting. <p>Level 2: Student demonstrates he/she is nearing proficiency by:</p> <ul style="list-style-type: none"> • Recognizing and recalling specific vocabulary, such as: (in addition to

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dimensional drawing terms) entity, arc, cone, dome, contour, surface meshes, units, relative co-ordinates, polar co-ordinates, world co-ordinate system, user co-ordinate system.

- Performing processes such as:
 - Identifying and describing dimension objects such as lines, arcs, and angles.
 - Identifying and describing complex shapes such as spheres and cylinders.
 - Using different dimensioning styles such as polar and ordinate.

Level 1: Student demonstrates a limited understanding or skill with the learning goal.

Learning Targets

Students know how to:

- Apply dimensioning rules correctly (e.g., avoid redundant dimensioning, avoid dimensioning to hidden lines).
- Use correct dimension line terminators (e.g., arrowheads, ticks, slashes).
- Dimension objects (e.g., lines, arcs, angles, circular).
- Dimension complex shapes (e.g., spheres, cylinders, tapers, pyramids).
- Dimension features from a center line.
- Dimension a theoretical point of intersection.
- Use appropriate dual dimensioning standards.
- Use size and location dimension practices.
- Use various dimensioning styles (e.g., Cartesian, polar, ordinate, datum).
- Place tolerance dimensioning and Geometric Dimensioning and Tolerancing (GD&T) on drawings.
- Use associative dimensioning correctly when appropriate.

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LG 11 Career Skills

High Priority Standards

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Drafting

21. Leadership competencies

- 21.2 Demonstrate and understanding of one's personal values.
- 21.4 Demonstrate interpersonal skills.
- 21.5 Demonstrate etiquette and courtesy.
- 21.6 Demonstrate effectiveness in oral and written communication.
- 21.7 Develop and maintain a code of ethics.
- 21.8 Maintain a professional appearance.

Missouri Learning Standards

ELA-Literacy in Science and Technical subjects: RST.9-10.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
(Researching careers and comparing/contrasting with learned skills)

Learning Goal	Proficiency Scale
Students will understand the importance of planning for a future career in drafting.	Level 4: Student demonstrates an in-depth inference or advanced application or innovates with the learning goal. Level 3: Student demonstrates mastery with the learning goal as evidenced by: <ul style="list-style-type: none">• Describing the relationship between skills learned in class and future employment in related fields.• Creating a career plan based on interest and ability.

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	<p>Level 2: Student demonstrates he/she is nearing proficiency by:</p> <ul style="list-style-type: none">● Recognizing and recalling specific vocabulary, such as: engineer, architect, draftsman, project manager, employment trend, educational terms (associate degree, bachelor's degree, master's degree, specialized technical training, credit hours).● Performing processes such as:<ul style="list-style-type: none">○ Comparing drafting career options.○ Identifying personal and interpersonal traits that create success in any field of work. <p>Level 1: Student demonstrates a limited understanding or skill with the learning goal.</p>
<p>Learning Targets</p> <p>Students know how to:</p> <ul style="list-style-type: none">● Research what collegiate programs are available locally, nationally, and globally.● Explore what is needed to continue in this field.● Analyze job market trends locally, nationally, and globally.● Research what technical training is available locally, nationally, and globally.● Explore available internships locally, nationally, and globally.	