GEORGIA | PEACH STATE PATHWAYS

Career, Technical, & Agricultural Education

ACCT—ARCHITECTURAL DRAWING

PATHWAY: Architectural Drawing and Design

COURSE: Introduction to Engineering Drawing and Design

UNIT: Single View Drawings – Unit 4

INTRODUCTION

Annotation:

This unit is to introduce the student to basic drafting skills through either using traditional (board) tools or a CAD system. Instructors should choose activities to support whichever system of teaching is used.

Grade(s):

X	9th
X	10th
X	11th
X	12th

Time: Sixty (60) 50-minute periods

Author: Liz Pharr

Additional Author(s):

Students with Disabilities:

For students with disabilities, the instructor should refer to the student's IEP to be sure that the accommodations specified are being provided. Instructors should also familiarize themselves with the provisions of Behavior Intervention Plans that may be part of a student's IEP. Frequent consultation with a student's special education instructor will be beneficial in providing appropriate differentiation.

FOCUS STANDARDS

GPS Focus Standards:

ACT-IED-8. Students will demonstrate the use of proper line types.
Demonstrate the ability to perform a drawing setup, e.g., sheet size, border, and title block.
Control entity properties by layer, color, and line type.
Demonstrate the use of the alphabet of lines.

ACT-IED-9. Students will demonstrate the ability to read and draw using the proper scale.
Demonstrate the ability to measure using the architect's scale, engineer's scale, and metric scale.
Select proper drawing scale.

ACT-IED-10. Students will create and dimension single view drawings while applying geometric construction.
Produce geometric shapes such as straight lines, geometric angles, plane figures, circles and arcs, and irregular geometric figures.
Apply geometric construction techniques to problems.
Draw problems that show construction procedure.
Apply correct dimensioning procedures.
Apply the symmetrical features of a center line to its proper size and location.
Demonstrate multiple construction techniques (including lines, conics, circles, splinters, arcs, and polygons) given size, orientation, and location specifications.
Use fundamental CAD commands to create drawings.

GPS Academic Standards:

MM1P1. Students will solve problems (using appropriate technology).
SCSh4. Students will use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.
MM1G1. Students will investigate properties of geometric figures in the coordinate plane.
MM1G3. Students will discover, prove, and apply properties of triangles, quadrilaterals, and other polygons.
MM4G1. Students will understand the properties of circles.
MM1P4. Students will make connections among mathematical ideas and to other disciplines.
MM1P5. Students will represent mathematics in multiple ways.

National / Local Standards / Industry / ISTE:

ADDA: Fundamental drafting skills
ADDA: Basic CADD skills

UNDERSTANDINGS & GOALS

Enduring Understandings:

- All technical drawings are composed of common elements known as standards to present a drawing "readable" to all design professionals.

Essential Questions:

- Why is it important that drawings or prints can be "read" the same way by anyone?

Note: Depending on when or whether traditional (board) drafting is going to be taught in addition to CAD systems, activities may need to be supplemented or changed accordingly.

Knowledge from this Unit:

- Understand vocabulary for geometric terms.
- Learn standard size drawing sheets.
- Understand names and uses for tools and/or CAD systems.
- Understand dimensioning nomenclature and standards.
- See the relationship between dimension placement and ease in reading and understanding drawings.
- Understand the difference in size and location dimensions.

Skills from this Unit:

- Measure with a rule.
- Use traditional drafting equipment or draw and manage files on a CAD system.
- Read blueprints.
- Determine standard paper size or drawing layouts.
- Lay out borders and title blocks.
- Center drawings.
- Perform geometric constructions.
- Dimension using ANSI standards.
- Apply correct annotation.
- Apply text correctly.
- Reproduce drawings.

ASSESSMENT(S)

Assessment Method Type: Select one or more of the following. Please consider the type(s) of differentiated instruction you will be using in the classroom.

____ Pre-test
_x_ Objective assessment - multiple-choice, true- false, etc.
_x_ Quizzes/Tests
_x_ Unit test
_x_ Group project
____ Individual project
_x_ Self-assessment - May include practice quizzes, games, simulations, checklists, etc.
__ Self-check rubrics
__ Self-check during writing/planning process
__ Journal reflections on concepts, personal experiences and impact on one's life
__ Reflect on evaluations of work from teachers, business partners, and competition judges
__ Academic prompts
_x_ Practice quizzes/tests

_____ Subjective assessment/Informal observations
__ Essay tests
__ Observe students working with partners
__ Observe students role playing
_____ Peer-assessment
__ Peer editing & commentary of products/projects/presentations using rubrics
__ Peer editing and/or critiquing
_x_ Dialogue and Discussion
__ Student/teacher conferences
__ Partner and small group discussions
_x_ Whole group discussions
__ Interaction with/feedback from community members/speakers and business partners
_____ Constructed Responses
__ Chart good reading/writing/listening/speaking habits
__ Application of skills to real-life situations/scenarios
_____ Post-test

Assessment(s) Title:

Draw, pan and zoom – quiz
Draw, pan and zoom – quiz key
User interface quiz
User interface quiz key
Alphabet of lines quiz
Dimensioning quiz
Board drawing 1 quiz key
Board drawing 1 quiz

Assessment(s) Description/Directions:

Attachments for Assessment(s):

Draw, pan and zoom – quiz
Draw, pan and zoom – quiz key
Drawing rubric
User interface quiz
User interface quiz key
Alphabet of lines quiz
Dimensioning quiz
Board drawing 1 quiz key
Board drawing 1 quiz

LEARNING EXPERIENCES

Sequence of Instruction

Notes:

The choice of activities is determined by whether the students are doing traditional (board) drafting or starting on a CAD system. (The directions for the CAD activities are based on Autodesk's AutoCAD 2009 software but can be modified for other programs.) The instructor should choose the appropriate instruction to support either board or CAD drafting.

Dimensioning is not in the sequence as a separate unit but is embedded in all the lessons for each particular kind of construction taught within the lesson.

Specific drawings are not given for the assignments but suggestions as to the kind of drawing to assign. Instructors should choose examples to support the skills being taught from their course texts.

Blueprint reading assignments should be chosen from a text also. One of the best books to use for blueprint reading for an introduction class is any edition of "Basic Blueprint Reading and Sketching" by Dr. C. Thomas Olivo and Thomas P. Olivo. New and used editions are available on Amazon. Each short unit has an explanation and examples followed by a drawing with questions. The units cover most skills taught in an introduction class.

See "Drawing and problems sources" for additional sites to get drawing exercises.

Enter autodesk in the search window at www.youtube.com to find several videos and tutorials for use in this unit.

Snagit is software for capturing images,videos and webpages. Download a free 30-day trial at http://www.techsmith.com/screen-capture.asp, but when you see its value in preparing lessons, PowerPoints, tutorials, and handouts, you'll buy it at the end of your 30 days. It is very reasonable and easy to learn.

A great source for materials is at www.schroff.com. Schroff provides texts for several kinds of software including Autodesk, SolidWorks, MicroStation, ProEngineer and others. They also have the books for earlier releases and versions for older software.They offer up to five examination copies for instructors. Most of the books are accompanied by CD's with projects, videos, and tutorials.

1. Identify the Standards. Standards should be posted in the classroom for each lesson.

ACT-IED-8. Students will demonstrate the use of proper line types.

Demonstrate the ability to perform a drawing setup, e.g., sheet size, border, and title block.
Control entity properties by layer, color, and line type.
Demonstrate the use of the alphabet of lines.

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Demonstrate the ability to measure using the architect's scale, engineer's scale, and metric scale.
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Produce geometric shapes such as straight lines, geometric angles, plane figures, circles and arcs, and irregular geometric figures.
Apply geometric construction techniques to problems.
Draw problems that show construction procedure.
Apply correct dimensioning procedures.
Apply the symmetrical features of a center line to its proper size and location.
Demonstrate multiple construction techniques (including lines, conics, circles, splinters, arcs, and polygons) given size, orientation, and location specifications.
Use fundamental CAD commands to create drawings.

2. **Review Essential Questions.**

   Why is it important that drawings or prints can be "read" the same way by anyone?

3. **Identify and review vocabulary. (Some terms may not be applicable based on whether you're using a CAD system or teaching on the board.) Vocabulary is listed in each lesson.**

4. **Interest approach – Mental set**

   Ask students how errors or lack of standardization can affect the outcome of drawings. Ask in what ways this could be dangerous, expensive, and time-consuming.

LESSON 1 IDENTIFYING TOOLS AND EQUIPMENT

For board drafting:

1. **Show traditional drafting equipment and demonstrate the use of tools.**
2. **Identify and review vocabulary.**

- Parallel bar
- 30/60 triangle
- 45 triangle
- Lead holder
- Scale
- Erasing shield
- Ames lettering guide
- Lead pointer
- Horizontal
- Vertical
- Perpendicular
- Parallel
- Right angle
- Templates
- Compass
- Dividers

3. **See "**Hand drawing notes."
4. **Review terms as used and have students make sketches of tools and add notes.**
5. **Lay out tools labeled.**
6. **Quiz students on tools' names unlabeled.**

For CAD drafting:

1. Project browser from your software.
2. Identify and review vocabulary.

- Browser
- User interface
- Ribbon
- Draw menu
- Modify menu
- Application button
- Command window
- Application status bar
- History of commands
- Draw menu
- Modify menu
- Parallel
- Perpendicular
- Right angle

3. See "User interface – Instructor's notes"
4. Access http://usa.autodesk.com/adsk/servlet/item?siteID=123112&id=13202153&linkID=9240615, show video "AutoCAD User Interface Overview."

5. See “User interface handout.”

6. See “User interface worksheet.”

7. Review terms each day until you give “User interface quiz.”

8. Demonstrate starting new drawing in CAD and file management procedures.

LESSON 2 MEASURING

Note: If you’re teaching CAD, this lesson would probably be better taught before Lesson 1.

1. Read “Estimating distances – Instructor’s notes” and “Reading a rule – Instructor’s notes”

2. Identify and review vocabulary.

   - Scale
   - Rule
   - Architect’s scale
   - Engineering scale
   - Metric scale

3. See
   “Estimating distances – handout.”
   “Estimating distances – worksheet.”
   “Estimating distances – key.”
   “Estimating distances – supplemental.”
   “Calculating square footage handout.”

4. Show
   “Reading a ruler – PPT.”

5. Handout, read or show
   “Engineers_architects_scales (http://www.usfa.dhs.gov/downloads/pdf/nfa/engineer-architect-scales.pdf).”
   “Types of scales”
   “Scale reading exercises.”

Note: The instructor should develop numerous scale and rule reading exercises for practice.

LESSON 3 LINETYPES AND WEIGHTS

1. Identify and review vocabulary.

   - Line weight
   - Object line
   - Visible line
   - Hidden line

- Dimension line
- Extension line
- Center line
- Leader
- Section line
- Hatching
- Cutting plane line
- Border line

2. **Read "**Prep for linetypes and precedence – Instructor's notes." (Parts of this can be used as a handout also.

3. **Show** "Alphabet of lines – PPT." **Explain the alphabet of lines (weight and style) and the importance of standardization.**
4. Give out "Alphabet of lines handout."
5. Use lessons and blueprint reading exercises from "Basic Blueprint Reading and Sketching" by Dr. C. Thomas Olivo and Thomas P. Olivo. Use the units and assignments for The Alphabet of Lines and Object Lines, Hidden Lines and Center Lines, and Extension Lines and Dimension Lines. These three units have four blueprint reading assignments included.
6. Give "Alphabet of lines quiz."

LESSON 4 BASIC DRAWING SKILLS

1. Identify and review vocabulary. (Additional vocabulary in notes)
   - Title blocks
   - Setting layers
   - Commands
   - Aliases
2. Show standard size drawing formats.
3. Demonstrate squaring drawings and correct attachment to board. Allow students to practice and check for square.
4. Show use of triangles and parallel bar to construct vertical and horizontal lines.
5. Show how to lay out a title block and run the diagonals to find the center of the drawing space. Give students examples they will use in class and have them practice. Draw the same as theirs and print to show importance of correct line weight.
6. Show how to center the drawing. Use handout "Tips for Working with Fractions." Emphasize putting midpoint of distance on center point and marking 0 and total width or height rather than measuring half the distance and then moving scale to measure next half. Make the point of the chances of making a measuring error rather than a centering error.
7. Demo how to start new drawings in CAD.
8. Show or have students access "Drawing setup tutorial."
9. Read "User interface – Instructor's notes."

"User interface handout"
"User interface quiz"
"User interface quiz key"
"User interface worksheet"

10. Demo basic Draw and Modify commands.

11. Demo three different ways of giving commands

12. Show or have students access "Drawing objects tutorial."

13. Give out "Basic drawing commands handout"

14. Show or have students access "Drawing setup tutorial."

15. "Commands and aliases handout"

16. Give out "Draw lines handout" and demonstrate.

17. Read "Draw, pan and zoom –Instructor's notes."
    Demo draw, pan and zoom commands.
    Draw, pan and zoom – handout and vocabulary
    Draw, pan and zoom – quiz
    Draw, pan and zoom – quiz key

18. Give out "MIRROR handout" and demonstrate.

19. Give out "OFFSET handout"

20. Give out "REGEN command handout" and demonstrate.

21. Give out "TRIM and EXTEND commands handout" and demonstrate.

22. Give out "Undo and Redo handout" and demonstrate.

23. Explain and demo object snaps.
    Give out "Object snaps handout" and demonstrate.

24. Show how and where to save drawings and file management.

25. Demo how to insert title blocks.

26. Demo how to add text.
    Give out "Text style handout" and demonstrate.

27. Show how to enter distances.
    Give out "Entering direct distances handout" and demonstrate.

28. Show how to set layers.
    Draw an object without setting lineweights and print as a handout.
    Go back and set lineweights and print to show correct way for drawing to look. Use as the second handout.
    Give out "Making a CAD Drawing."

29. Choose a drawing made up of only horizontal and vertical lines for the first assignment. (Brick pattern, parquet flooring, fence, etc.)

30. Demo dimensioning practices for horizontal and vertical lines.
    Show difference in aligned and unidirectional styles.
    "Dimensioning notes"
    "Dimensioning quiz"
    "Setting units"

31. Access Microsoft PowerPoint - dimensioning06.pps This is a good PPT from Texas.
    www.texastandi.unt.edu/curriculum/lessons/drafting_trades/dimensioning06/dimensioning06_handout.pdf
    Show slides from this PPT that are applicable for each set of dimensioning skills to teach.

32. Have students take the same drawing as in # 29 and dimension it.

33. Continue to have students draw figures made up of vertical and horizontal lines but dimension each object.

34. Demo how to plot drawings. "Plotting A size" handout

35. Show or have students access "Precision drawing tutorial."

36. Demonstrate the use of triangles to draw inclined lines.

37. Demo correct procedure to dimension angles by offset method or angular.

38. Demo entering angles in CAD.

39. Choose drawings made up with inclined lines and have students draw and dimension.

40. Introduce and review vocabulary for circles and arcs and the standards for dimensioning each.

41. Introduce compasses, circle templates, and french curves.

42. Show commands for drawing circles and arcs.

43. Explain standards for center lines and arc centers.

44. Give students a simple drawing with circles and arcs.

45. Demonstrate the correct procedure of dimensioning circles and arcs.

46. Give students increasingly difficult single view drawings involving straight, inclined and curved lines and have them dimension each drawing.

47. Introduce polygons and geometric terms and constructions.

    Hand out "Geometric figures – group activity."

48. Demonstrate construction to students on board or on computer.
49. Hand out "Constructing polygons" for CAD
50. Give students drawings to practice new construction.

Attachments for Learning Experiences:

- Draw, pan and zoom –Instructor's notes
- Draw, pan and zoom – handout and vocabulary
- Draw, pan and zoom – quiz
- Draw, pan and zoom – quiz key
- Drawing setup tutorial
- Drawing objects tutorial
- Estimating distances – handout
- Estimating distances – Instructor's notes
- Estimating distances – supplemental
- Estimating distances – worksheet
- Estimating distances - key
- Engineers_architects_scales (http://www.usfa.dhs.gov/downloads/pdf/nfa/engineer-architect-scales.pdf)
- Reading a rule – Instructor's notes
- Reading a ruler – PPT
- Scale reading exercises
- Calculating square footage handout
- User interface – Instructor's notes
- User interface handout
- User interface quiz
- User interface quiz key
- User interface worksheet
- Lynn Allen's Tips and Tricks for Using AutoCAD 2009
- Alphabet of lines – PPT
- Alphabet of lines handout
- Alphabet of lines quiz
- AutoCAD window
- Basic drawing commands handout
- Precision drawing tutorial
- Dimensioning notes
- Dimensioning quiz
- Drafting links
- Drawing rubric
- Drawing and problems sources
- Geometric figures – group activity
- Hand drawing notes
- MIRROR
- Object snaps
- OFFSET
- Plotting A size
- Prep for linetypes and precedence – Instructor's notes
- REGEN command
- Scale reading
- Types of scales
- TRIM and EXTEND commands
- Setting units
- Making a CAD drawing
- Text style
- Tips for Working with Fractions
- Undo and Redo
- Commands and aliases handout
- Constructing polygons
- Polygons
- Draw lines handout
- Entering direct distances handout
- Object snaps handout
- QuickCalc handout
- Board drawing 1 quiz key
- Board drawing 1 quiz
- NOCTI folder
- CAD vocabulary supplement
- Math resources

Notes & Reflections:

http://www.usfa.dhs.gov/downloads/pdf/nfa/engineer-architect-scales.pdf
See "Lynn Allen's Tips and Tricks for Using AutoCAD 2009."
See folder NOCTI.
See QuickCalc handout
See notes in "Math resources."

CULMINATING PERFORMANCE TASK (Optional)

Culminating Unit Performance Task Title:

Single view drawing test

Culminating Unit Performance Task Description/Directions/Differentiated Instruction:

Attachments for Culminating Performance Task:

Instructor should choose a problem to draw using the basic constructions of horizontal, vertical, and inclined lines including circle(s) and arcs for the students to demonstrate skills. Have students dimension drawing using standard dimensioning practices and correct linetypes.

UNIT RESOURCES

Web Resources:

Attachment(s):

- http://www.usfa.dhs.gov/downloads/pdf/nfa/engineer-architect-scales.pdf
- See "Lynn Allen's Tips and Tricks for Using AutoCAD 2009."
- See folder NOCTI.
- See QuickCalc handout
- See notes in "Math resources."

Materials & Equipment:

What 21st Century Technology was used in this unit:

	Slide Show Software		Graphing Software		Audio File(s)
	Interactive Whiteboard		Calculator		Graphic Organizer
	Student Response System		Desktop Publishing		Image File(s)
	Web Design Software		Blog		Video
	Animation Software		Wiki		Electronic Game or Puzzle Maker
	Email	X	Website	x	CAD software