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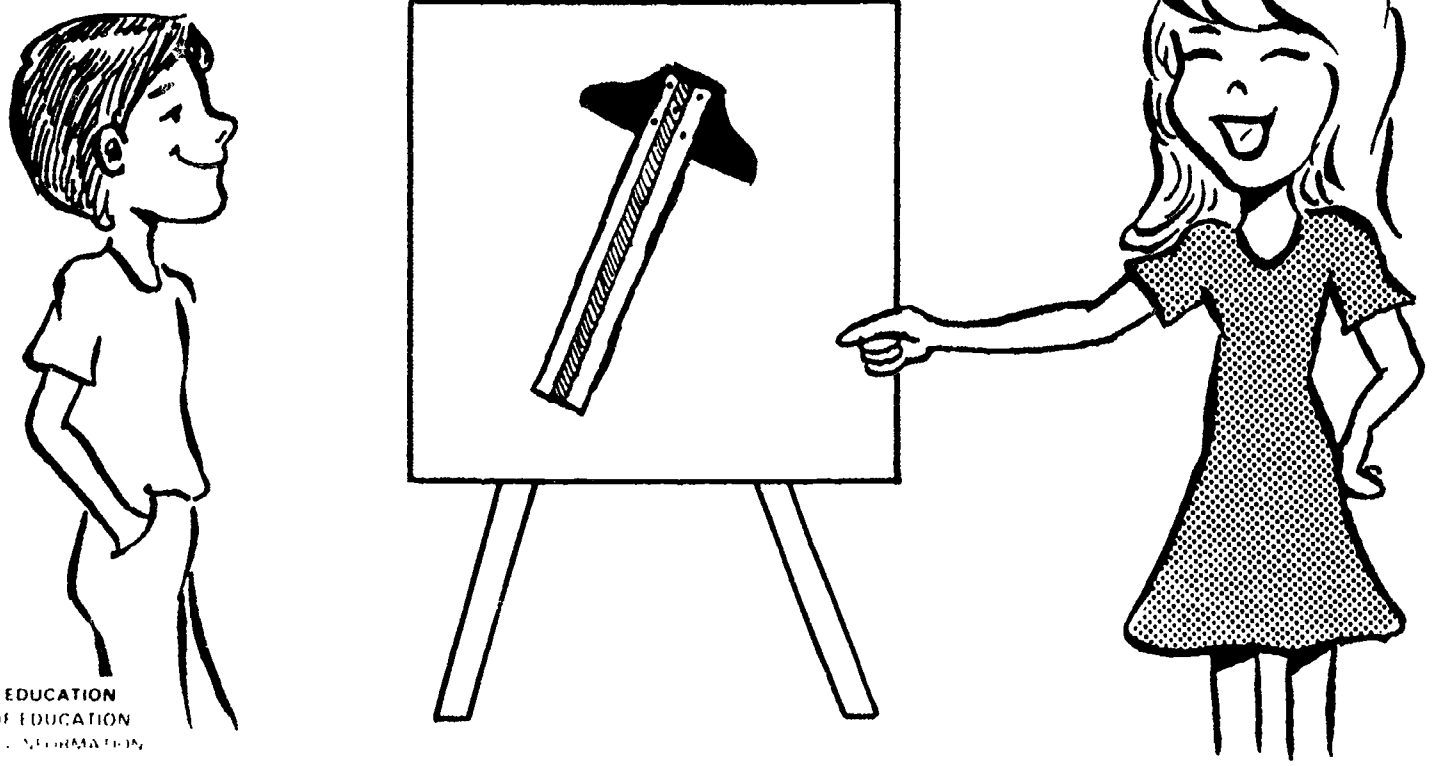
ABSTRACT

This guide contains instructional techniques that were developed for teachers of industrial education students who demonstrate a need for additional instruction in verbal/visual communication. They were written by industrial education teachers with a particular emphasis on drafting. In order to help teachers to identify those students who require additional help with the basic skills, a checklist is provided with the module. Additionally, a basic skills verification form is provided to aid in identification of basic skills needs and to provide help in instruction. Eight lessons are presented in this guide; they cover the following projects: model making, demonstrating a drawing task to the instructor, sports car design, a drawing check sheet, constructing a cube, "what's wrong?," alphabet of lines, and question/answer day. Each activity includes a list of student materials, student instructions, student assignment sheet, and extra student activities. Lessons are illustrated with line drawings. (KC)

"Learning to Verbally & Visually Communicate the Drafting Way"



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Industrial Education InService Project

in cooperation with

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Field Operations Section
Industrial Education Unit

and

California State University - Los Angeles
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Instructional Techniques

INTRODUCTION

These instructional techniques were developed for those industrial education students who demonstrate a need for additional instruction in the areas of reading, writing, math, verbal and visual communication. They were written by industrial education teachers with a particular emphasis upon teaching a basic skill while retaining a major focus on the subject areas of auto, woods, metals, electronics, and drafting.

Each of these instructional techniques were written using the same format and with guidance from an expert in the areas of reading, writing, math, verbal and visual communication.

In order to help you identify those students who require additional help with the basic skills, a simple easy-to-use BASIC SKILLS CHECKLIST is provided with each subject area module. This Basic Skills Checklist will enable you as the Industrial Education Teacher to better identify those students in your classes who require additional help in the basic skills.

Additionally, a BASIC SKILLS VERIFICATION FORM is provided which will enable you to ask your school's reading resource teacher, basic skills teacher, math resource teacher, Hart Bill Conferencing teacher, or grade counselors, to verify your identification and provide you with help in the instruction of the basic skills.

You may wish to use these techniques as instruction for your entire class, or as a take-home, parent-involvement assignment. They may also be used in your school's reading or math lab or in conjunction with your school's basic skills instructional programs.

These instructional techniques are successful because your students are able to relate reading, writing, math, verbal and visual communication to their own industrial education classes. When your students succeed, they feel good about themselves, good about their schools, and good about their future.

Name _____

CONFIDENTIAL

Grade _____ Class _____

Date _____

BASIC SKILLS CHECKLIST (DRAFTING)

The following is a list of the basic skills (reading, writing, math, verbal & visual communication) that the student should demonstrate an ability in for the purpose of employment or advanced training in the drafting field.

1.0 Verbal Communication: The student needs additional instruction in verbal communication if any of the items below are checked NO:

1.1 Yes ____ The student understands verbal instructions given by the teacher.

No ____ Example: Does the student select the correct drawing sheet size after receiving verbal instruction on which size to use?

1.2 Yes ____ The student asks questions about verbal instructions or information not understood.

No ____ Example: Does the student ask questions about the use of drafting equipment when it appears that the instruction given was not understood?

1.3 Yes ____ The student is able to relay simple verbal instructions to another student.

No ____ Example: Is the student able to show a new student how to fasten a drawing sheet to the drawing board or table?

1.4 Yes ____ The student is able to verbally communicate with the teacher.

No ____ Example: Is the student able to explain to the teacher why certain views were selected to illustrate and describe an object?

2.0 Writing: The student needs additional instruction in writing if any of the items below are checked NO:

2.1 Yes ____ The student is able to write basic instructions to self and others.

No ____ Example: Is the student able to fill out a work order or a descriptive log on each drawing assignment?

2.2 Yes ____ The student is able to write the answers to questions.

No ____ Example: After a student has demonstrated that they can answer questions orally, can they write the answers on paper?

3.0 Reading: The student needs additional instruction in reading if any of the items below are checked NO:

3.1 Yes ____ The student is able to read and understand job related materials.

No ____ Example: Does the student's responses to written test and informal oral questions indicate that they understand written materials contained in textbooks or instruction sheets?

3.0 *Reading (Continued)*

3.2 *Yes* ____ *The student is able to follow step by step procedures on instruction or job sheets.*

No ____

Example: Is the student able to perform tasks in sequence after being given a demonstration and a procedure sheet to follow?

4.0 *Math: The student needs additional instruction in math if any of the items below are checked NO:*

4.1 *Yes* ____ *The student is able to read a rule to increments of 1/16th inch.*

No ____

4.2 *Yes* ____ *The student understands relationships between fractions and decimals.*

No ____

Example: Is the student able to use a conversion chart to convert fractions to decimals?

4.3 *Yes* ____ *The student understands basic geometric construction.*

No ____ *Example: Is the student able to lay out basic geometric constructions such as: bisecting an arc, drawing a hexagon, drawing a tangent arc, etc.?*

4.4 *Yes* ____ *The student can add and subtract whole numbers and fractions.*

No ____ *Example: Is the student able to add and subtract whole numbers and fractions while dimensioning drawings?*

5.0 *Visual Communication: The student needs additional instruction in visual communication if any of the items below are checked NO:*

5.1 *Yes* ____ *The student understands the relationship between drawings and manufactured products.*

No ____

Example: Given the tools and shop skills, is the student able to construct a simple item from a sketch or drawing?

IDENTIFICATION Made by: _____

BASIC SKILLS VERIFICATION FORM

Student _____ Male____ Female____ Grade Level____

Teacher _____ Class_____ Date_____

The Basic Skills Check List (attached) for the above student indicates a need for instructional assistance in the basic skills (reading, writing, math, verbal or visual communication). The following verification and recommendations are made:

____Lacks Reading Skills

____Lacks Writing Skills

____Lacks Mathematical Skills

____Lacks Verbal Communication Skills

____Lacks Visual Communication Skills

METHOD USED FOR VERIFICATION

Recent Test Scores:

Test	Score	Date

Other Verification Methods:

_____

_____

RECOMMENDATIONS

The following instructional assistance is recommended: _____

_____

Verification & Recommendations Made By: _____ Date:_____

Title:_____

_____

_____

FOLLOW UP

Action Taken: _____

Results: ____Qualified for advanced training

____Qualified for employment in the trade

____Other_____

Certified by: _____ Date:_____
Teacher

MODEL MAKING

(Visual Communication)

Drafting Verbal/Visual 1

MODEL MAKING

TEACHER MATERIALS:

1. CONCEPTS OF TECHNIQUE:

a. What SKILL will this technique teach?

VISUAL COMMUNICATION: This technique will help the student visualize three-dimensional products from two-dimensional drawings.

b. What student learning problem(s) prompted the development of this technique?

This technique was developed because of the inability of some students to understand the relationship between drawings and manufactured products.

2. TEACHER INSTRUCTIONS FOR THE USE OF THIS TECHNIQUE:

a. Assign your students the job of producing a styrofoam model of an object they have drawn.

b. Inexpensive supplies and tools are easily obtained:

1. 3/4" styrofoam (insulation or packaging material).
2. Coping saw blades or band saw blades (6-8" long and taped at one end for a handle.)
3. Sand Paper
4. Glue

c. A portable vacuum cleaner is recommended for clean-up.

d. Full scale models can be made of small products. Large and more advanced models should be scaled down.

e. Explain to your students the importance of models being made to accurate scale.

3. Suggested Related Activities:

The student can repeat this assignment and further reinforce his/her ability to visually understand drawings by making models from more advanced drawings.

MODEL MAKING

STUDENT MATERIALS:

1. STUDENT INSTRUCTIONS:

a. Your assignment is to make a styrofoam model from a drawing.

b. You will draw the layout on the styrofoam before cutting it.

c. Use a coping saw and carefully cut the lines you have drawn.

d. Sand all sides with fine sandpaper.

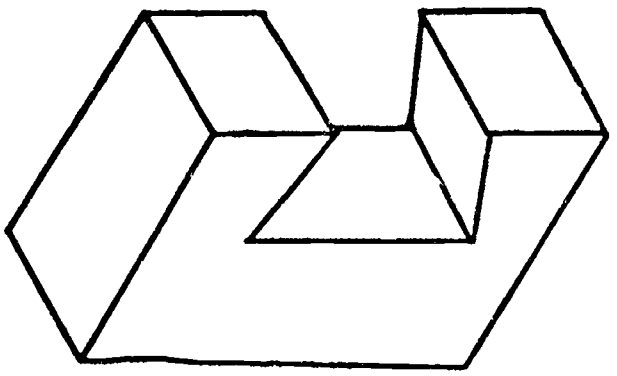
2. STUDENT ASSIGNMENT:

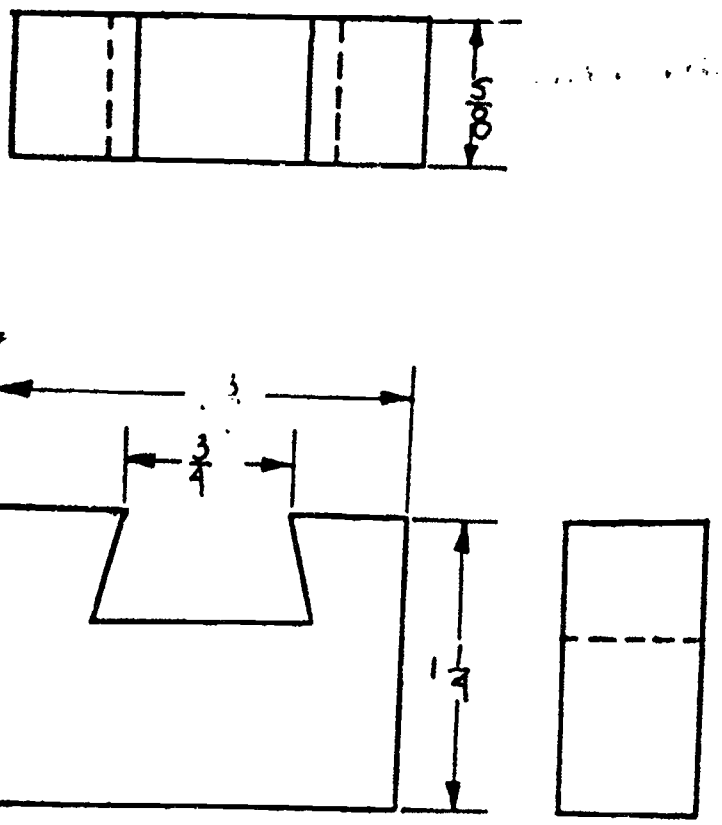
An example drawing is attached on STUDENT PAGE 2.

3. EXTRA THINGS THAT YOU CAN DO:

You may wish to repeat this assignment for extra credit and to make models of more advanced products.

MODEL MAKING





DAVID BOATMAN
SACRAMENTO HIGH

STUDENT PAGE 2

DEMONSTRATING A DRAWING TASK TO THE INSTRUCTOR

(Verbal Communication)

Drafting Verbal/Visual 2

DEMONSTRATING A DRAWING TASK TO THE INSTRUCTOR

TEACHER MATERIALS:

1. CONCEPTS OF TECHNIQUE:

a. What SKILL will this technique teach?

This technique will help the student in verbally communicating with the teacher and will reinforce the students' ability to read and comprehend technical material.

b. What student learning problem(s) prompted the development of this technique?

This technique was developed because of the inability of some students to communicate with the teacher.

2. TEACHER INSTRUCTIONS FOR THE USE OF THIS TECHNIQUE:

a. Identify students who have difficulty communicating with you.

b. Identify a drawing task this student is having difficulty completing (e.g. producing a half-section drawing of a machine part).

c. Assign a section in the text book for this student to read, summarize, and to make possible sketches of the task.

d. After the student has reviewed the task, have him/her verbally explain and/or demonstrate how to successfully perform the drawing task.

3. SUGGESTED RELATED ACTIVITIES:

The student can reinforce his/her ability to communicate verbally by demonstrating the task to other students needing help.

DEMONSTRATING A DRAWING TASK TO THE INSTRUCTOR

STUDENT MATERIALS:

1. STUDENT INSTRUCTIONS:

a. You have been assigned the task to review and demonstrate to your instructor the following: _____.

b. The drawing task is explained in your textbook on page___.

c. You are to read, summarize and possibly sketch the task assigned.

d. When you think you are able to demonstrate and explain the task, you should practice your demonstration with a friend before presenting it to your instructor.

e. You will be graded on the assigned task and your grade will depend on how well you have prepared and presented the demonstration.

2. STUDENT ASSIGNMENT:

Your assignment is found on STUDENT PAGE 2.

3. EXTRA THINGS THAT YOU CAN DO:

After giving your demonstration to your instructor you may wish to demonstrate it to students needing help. You will strengthen your skill and help other students as well.

DEMONSTRATING A DRAWING TASK TO THE INSTRUCTOR

ASSIGNMENT SHEET

STUDENTS' NAME: _____

NAME OF THE DRAWING TASK: _____

TEXTBOOK ASSIGNMENT: _____

DATE ASSIGNED: _____

DEMONSTRATION DATE: _____

SUMMARY (IMPORTANT POINTS):

SKETCHES:

DRAWING TOOLS REQUIRED:

Sports Car Design

(Visual Communication)

Drafting Verbal/Visual 3

SPORTS CAR DESIGN

TEACHER MATERIALS:

1. CONCEPTS OF TECHNIQUE:

a. What SKILL will this technique teach?

VISUAL COMMUNICATION: This technique will help the student better understand the relationship between a drawing and a manufactured product.

b. What student learning problem(s) prompted the development of this technique?

This technique was developed because of the student's need to understand how his or her drawings relate to the manufacturing design process.

2. TEACHER INSTRUCTIONS FOR THE USE OF THIS TECHNIQUE:

a. Ask your students to design the exterior shape of a sports car.

b. Most students can relate to a car, therefore this project should be of high interest.

c. Require your students to sketch the four exterior views of the sports car. They can use regular drawing procedures with drafting tools.

d. Require your students to plan their arrangement on the paper.

e. Have a worksheet available that will give specific size requirements such as wheel base length, overall length, etc.

3. SUGGESTED RELATED ACTIVITIES:

For extra credit, have students design another familiar product such as a truck, boat or motorcycle.

SPORTS CAR DESIGN

STUDENT MATERIALS:

1. STUDENT INSTRUCTIONS:

a. Your assignment is to design the exterior of a sports car.

b. You are to draw a side view, a front view, a rear view and a top view.

c. You must follow required sizes given, such as: maximum wheel base length, overall width, length, and height.

d. Use regular drawing procedures that you have been using in class.

2. STUDENT ASSIGNMENT:

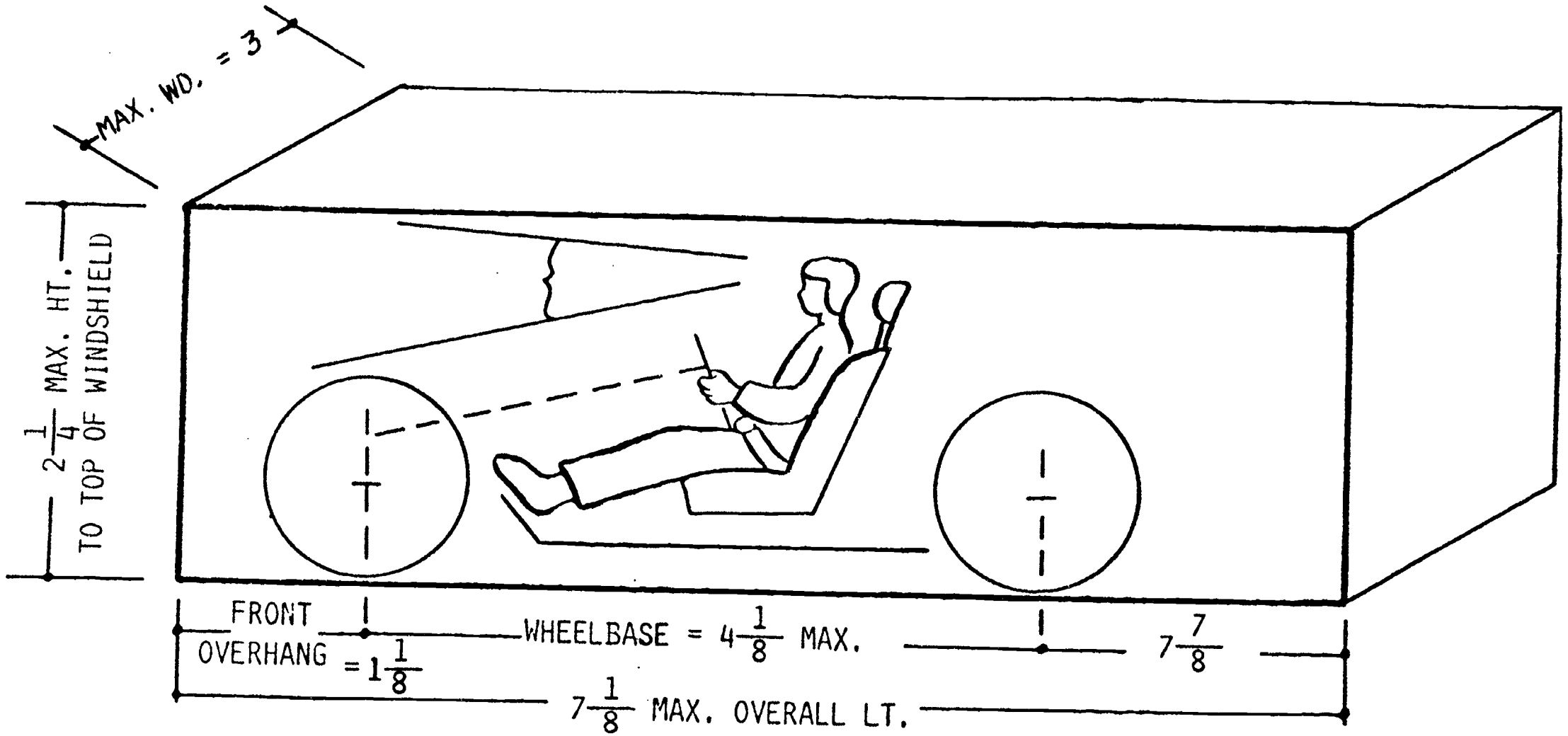
See attached information sheet.

3. EXTRA THINGS THAT YOU CAN DO:

You may wish to check out an automotive magazine from the library to get some ideas.

For extra credit you may wish to make a perspective drawing.

STUDENT PAGE 2



DRAWING CHECK SHEET

(Verbal Communication)

Drafting Verbal/Visual 4

DRAWING CHECK SHEET

TEACHER MATERIALS:

1. CONCEPTS OF TECHNIQUE:

a. What SKILL will this technique teach?

Verbal communication - this technique will assist the student in learning to verbally communicate instructions to other students.

b. What student learning problem(s) prompted the development of this technique?

This technique was developed because of the students inability to relay simple verbal instructions to fellow students.

2. TEACHER INSTRUCTIONS FOR THE USE OF THIS TECHNIQUE:

a. Students can be assigned to check each others drawings before they turn them in to you for a grade.

b. Student checkers can use the Drawing Check Sheet to evaluate other students' drawings.

c. The Drawing Check Sheet is a guide to be used by the checker as he/she verbally explains the drawing evaluation to the student drafter.

d. The student drafter can then make any changes on his/her drawing before turning it into you.

e. The student drafter can then be assigned to be a checker for another student who is about to complete the drawing.

DRAWING CHECK SHEET

3. SUGGESTED RELATED ACTIVITIES:

The instructor can assign students to use this technique to help other students who are behind because of absences. A separate check sheet can be developed for drawings in progress.

DRAWING CHECK SHEET

STUDENT MATERIALS:

1. STUDENT INSTRUCTIONS:

a. You have been assigned to check a fellow students' drawing.

b. Put your name and the drafters name on the Drawing Check Sheet.

c. Check the factors listed on the Drawing Check Sheet. You will grade the check sheet outstanding, satisfactory or unsatisfactory for each factor listed.

d. After you finish the check sheet, explain to your fellow student why you graded it the way you did.

e. The student drafter can make any changes on the drawing before turning it in to the instructor.

f. Remind the student drafter to attach this Drawing Check Sheet to his/her drawing.

2. STUDENT ASSIGNMENT:

Use the Drawing Check Sheet found on STUDENT PAGE 2.

3. EXTRA THINGS THAT YOU CAN DO:

a. You may wish to show a new student the procedure in checking drawings.

b. You may use this procedure for your own drawings.

DRAWING CHECK SHEET

STUDENT CHECKER: _____

DATE CHECKED: _____

STUDENT DRAFTER: _____

DRAWING TITLE OR NUMBER: _____

FACTORS TO CHECK	OUT-STANDING	SATIS-FACTORY	UNSATIS-FACTORY	NOTES
1. ACCURACY				
A. VIEWS COMPLETED				
B. DIMENSIONS COMPLETED				
2. LEGIBILITY				
3. LINE QUALITY				
A. BORDER LINES				
B. OBJECT LINES				
C. DIMENSION LINES				
D. EXTENTION LINES				
E. _____				
F. _____				
4. DIMENSIONS				
A. ARROWHEADS				
B. NUMBERING				
C GRID LINES				
5. LETTERING				
6. TITLE BLOCK				
7. ARRANGEMENT				

CONSTRUCT A CUBE

(Visual Communication)

Drafting Verbal/Visual 5

CONSTRUCT A CUBE

TEACHER MATERIALS:

1. CONCEPTS OF TECHNIQUE:

a. What SKILL will this technique teach?

1. Transfer of a drawing into a 3 dimensional object
2. Following directions that are verbalized
3. Drawing accurately

b. What student learning problem(s) prompted the development of this technique?

1. Students have trouble relating what they draw in drafting to anything that is 3 dimensional.

2. They also have the idea that accurate measurements are not important.

3. Students have trouble visualizing the 3 views needed in an orthographic projection.

2. TEACHER INSTRUCTIONS FOR THE USE OF THIS TECHNIQUE:

a. Emphasize the need for accurate measurements in all drawings.

b. Tell your students that this project will help them to more clearly visualize the various views of a 3 dimensional object.

c. Have your students copy the attached drawing full scale, twice. Normally an orthographic has only 3 views; top, front, and right side. But for this project we need 6 views since we are going to glue the sides together later to form a cube. Label the views.

d. After the six views are drawn, have them make glue tabs on the necessary edges. If they can visualize where the tabs need to go, fine. They probably will need help. Using an overhead transparency of the sample drawing will help to illustrate to your students where the glue tabs need to go.

e. Have your students cut all six views out being careful to leave the glue tabs on.

f. The glue tabs need to be folded over a sharp edge such as a triangle.

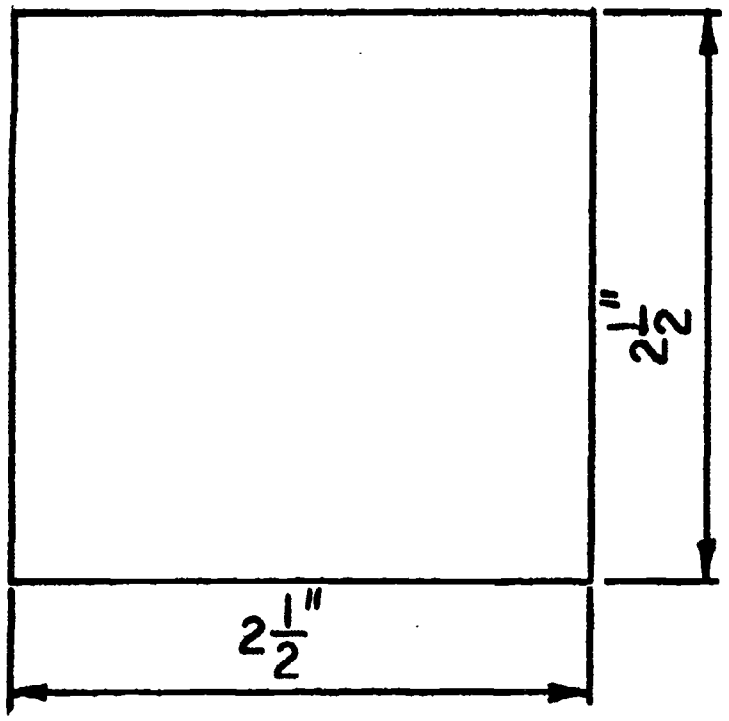
g. Glue the cube together. Inaccurate measurements will show themselves at this point.

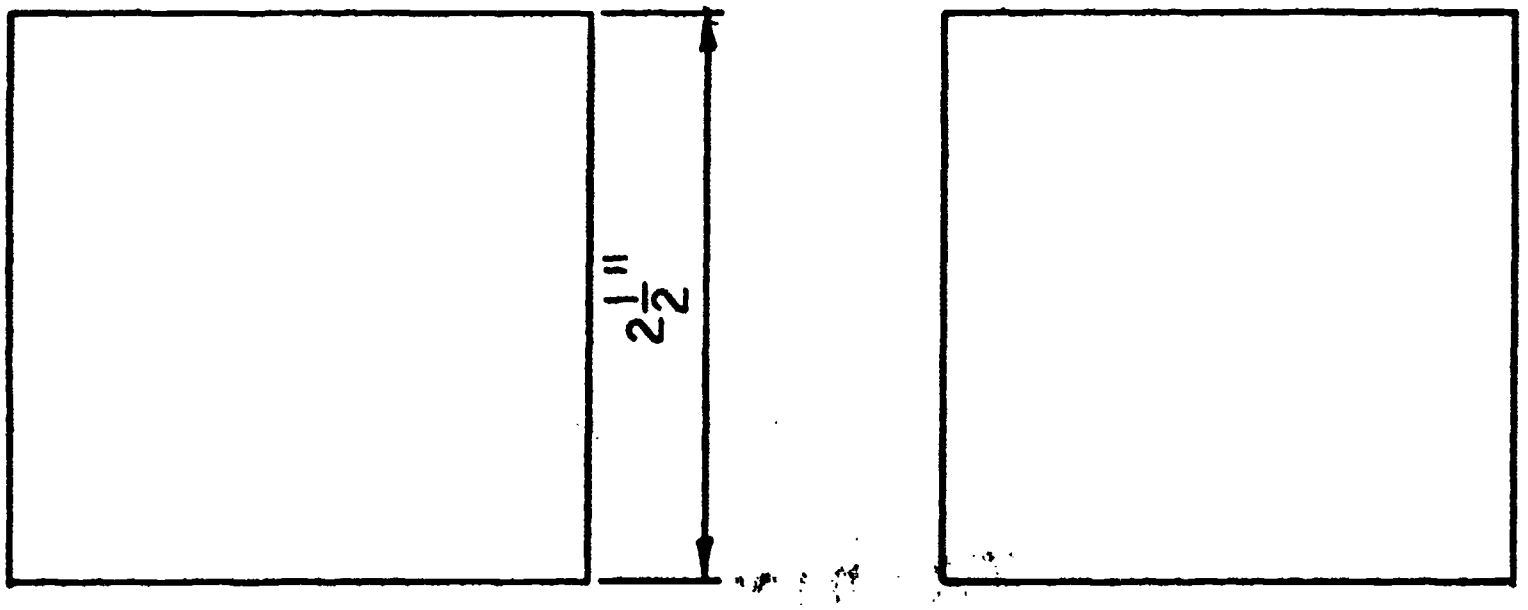
b. You may want your students to finish off the cube as a die. Remember, opposite sides of the die add up to seven.

3. SUGGESTED RELATED ACTIVITIES:

You may want your students to construct more complex drawings such as those with auxiliary views.

CONSTRUCT A CUBE





J.F. KENNEDY
C.W. BRYSON

5.3

WHAT'S WRONG?

(Verbal Communication)

Drafting Verbal/Visual 6

WHAT'S WRONG?

TEACHER MATERIALS:

1. CONCEPTS OF TECHNIQUE:

a. What SKILL will this technique teach?

1. Reading a drawing
2. Selecting pertinent data
3. Writing explanations

b. What student learning problem(s) prompted the development of this technique?

1. Reading a drawing for specific details is frequently a problem for students.

2. Students need writing experiences in drafting classes.

2. TEACHER INSTRUCTIONS FOR USE OF THIS TECHNIQUE:

a. Distribute copies of the attached drawing.

b. Tell the students to find as many things wrong in the drawing as they can and to write (explain) each error on a sheet of paper. Number the errors.

c. Follow up with a discussion of the errors and why details are important.

d. Make your own list of mistakes before you hold a class discussion.

List such things as:

1. The front door is too wide.
2. Porch light should be controlled from inside.
3. There is no need for 220 volt outlets between toilets.
4. Who needs three toilets side-by-side in a bath?
5. There is no need for a window in the kitchen/living room divider.

3. SUGGESTED RELATED ACTIVITIES:

Students can produce similar designs containing errors. Good products could be reproduced and worked on by the class at another time. Symbols could be emphasized.

WHAT'S WRONG?

STUDENT MATERIALS:

1. STUDENT INSTRUCTIONS:

a. Find as many errors as you can in the work sheet.

b. Explain each mistake by writing a full sentence on a sheet of paper. Number the mistakes.

c. Wait for further instructions from your teacher.

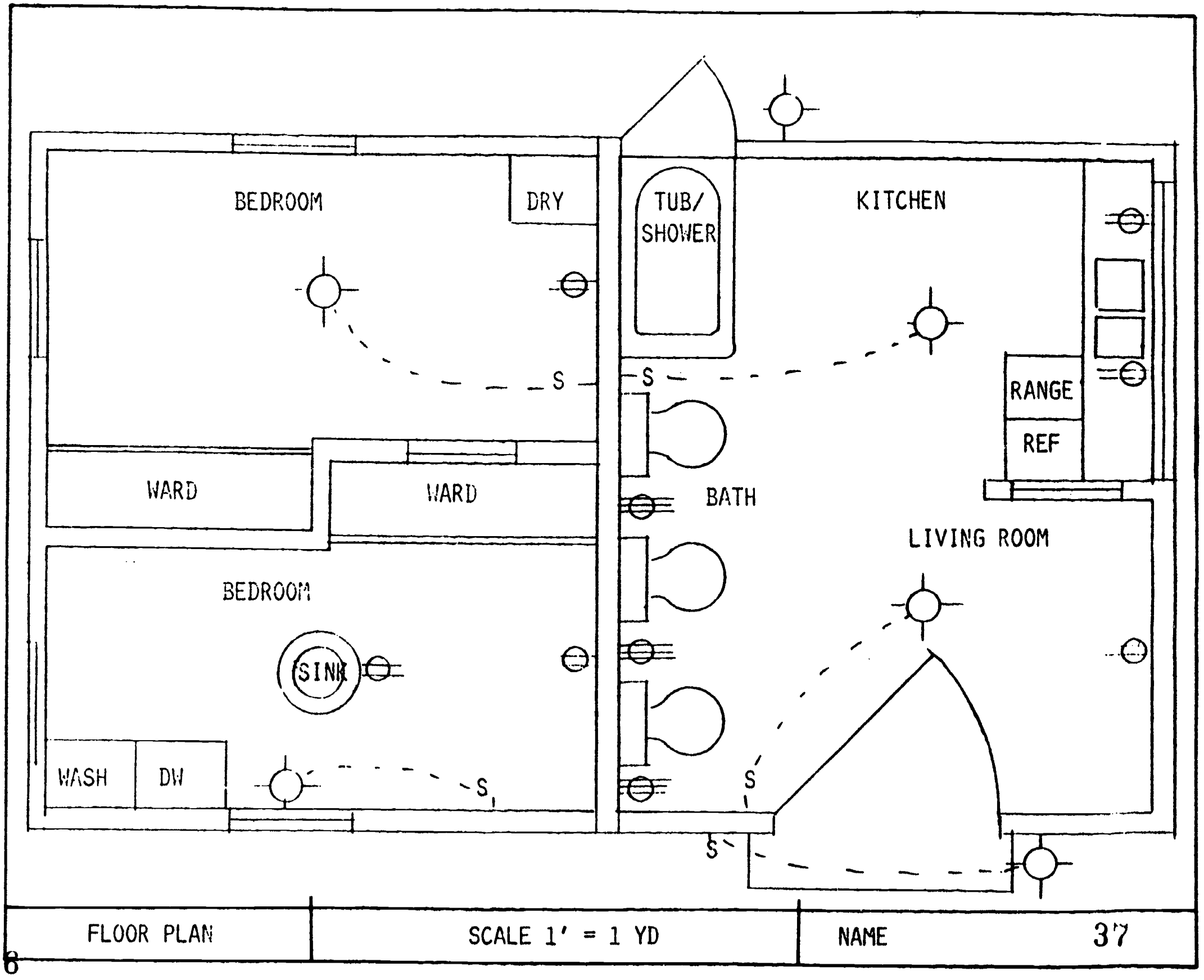
2. STUDENT ASSIGNMENT:

Your assignment is found on STUDENT PAGE 2.

3. EXTRA THINGS THAT YOU CAN DO:

Do a floor plan as an assignment for class and have a friend check it for errors.

STUDENT PAGE 2



FLOOR PLAN | SCALE 1' = 1 YD | NAME

STUDENT WORKSHEET

ALPHABET OF LINES

(Visual Communication)

Drafting Verbal/Visual 7

ALPHABET OF LINES

TEACHER MATERIALS:

1. CONCEPTS OF TECHNIQUE:

a. What SKILL will this technique teach?

Spelling	Note Taking
Vocabulary	Writing Definitions
Listening	Visual Communication

b. What student learning problem(s) prompted the development of this technique?

Students often do a lot of drawing without knowing the names and meanings of some of the lines they use.

2. TEACHER INSTRUCTIONS FOR THE USE OF THIS TECHNIQUE:

a. Use this technique before or after students have been using the various lines.

b. You may wish to have a review lecture on the alphabet of lines and have students take notes on their worksheet.

c. You may want students to use the worksheet and look up the meanings of the lines.

d. Have students use worksheets as study aids.

e. Explain to students that different lines are designed to give the builder or machinist an understanding of what the product is, how it is shaped, and its dimensions.

3. SUGGESTED RELATED ACTIVITIES:

Have a follow-up quiz a few days later and use the same worksheet for the quiz.

ALPHABET OF LINES

STUDENT MATERIALS:

1. STUDENT INSTRUCTIONS:

a. Read and study the "Alphabet of Lines".

b. The lines you use in drawing have different meanings.

c. In the first column of the worksheet, you are to identify the lines using the line list.

d. In the second column you are to explain what the lines represent.

2. STUDENT ASSIGNMENT:

Your assignment is found on STUDENT PAGE 2.

3. EXTRA THINGS THAT YOU CAN DO:

Continue to review this lesson whenever you forget about the "Alphabet of Lines".

WORKSHEET

ALPHABET OF LINES

1. ______________ 1. ______________

2. ______________ 2. ______________

3. ______________ 3. ______________

4. ______________ 4. ______________

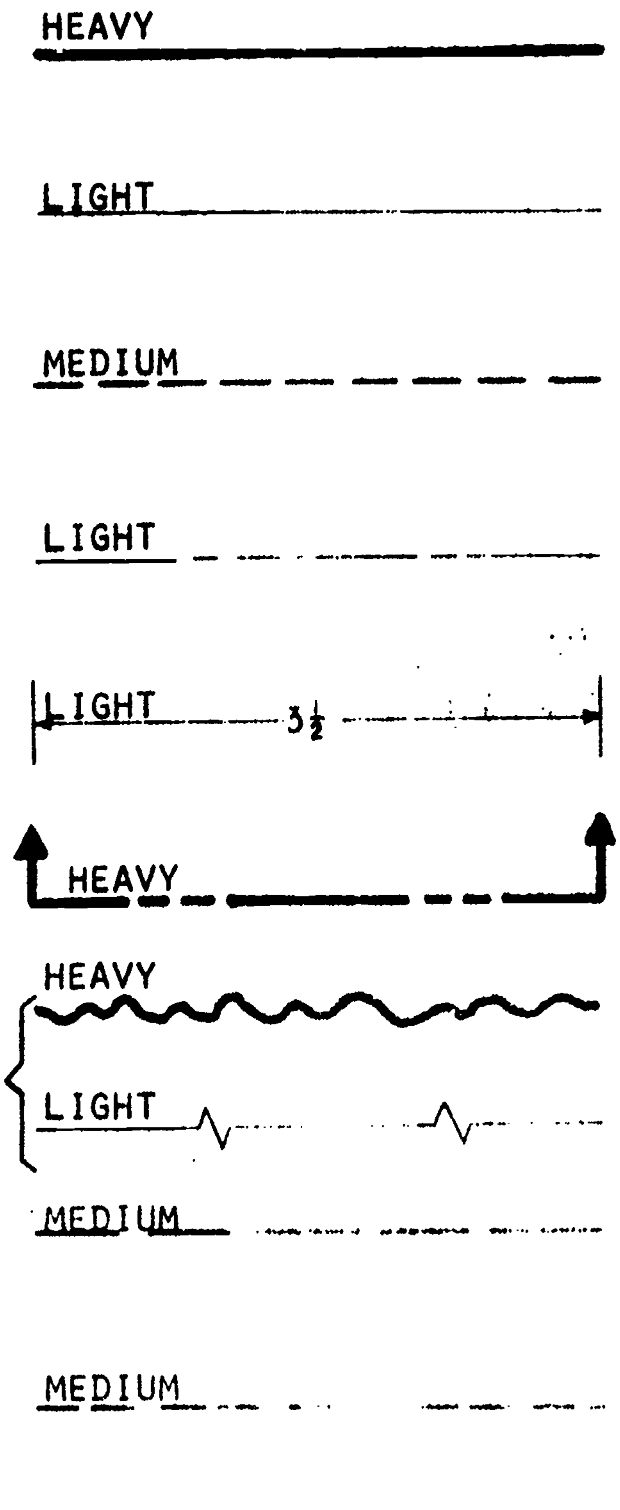
5. ______________ 5. ______________

6. ______________ 6. ______________

7. ______________ 7. ______________

8. ______________ 8. ______________

9. ______________ 9. ______________



STUDENT PAGE 2

ALPHABET OF LINES

Various lines on a drawing have different meanings. They may appear solid, broken, thick, or thin. Each is designed to help the blueprint reader make an interpretation. The standards for these lines were developed by the American National Standards Institute. These lines are now known as the **ALPHABET OF LINES**.

OBJECT LINE	HEAVY ———	THE OUTLINE SHOULD BE THE OUTSTANDING FEATURE AND THE THICKNESS MAY VARY TO SUIT THE SIZE OF DRAWING.
SECTION LINES	LIGHT ———	SPACED EVENLY TO MAKE A SHADED EFFECT
HIDDEN LINES	MEDIUM — — — — — —	SHORT DASHES
CENTER LINES	LIGHT — · ——— · ———	BROKEN LINE, MADE UP OF LONG AND SHORT DASHES, ALTERNATELY SPACED
DIMENSION AND EXTENSION LINES	LIGHT ←——— ———→	LINES UNBROKEN, EXCEPT AT DIMENSIONS
CUTTING PLANE LINE	HEAVY — · — · —	BROKEN LINE, MADE UP OF ONE LONG AND TWO SHORT DASHES, ALTERNATELY SPACED
BREAK LINES	HEAVY ~~~	FREEHAND LINE FOR SHORT BREAKS
	LIGHT ——/\/\/———	RULED LINE AND FREEHAND ZIG-ZAG FOR LONG BREAKS
ADJACENT PARTS AND ALTERNATE POSITIONS	MEDIUM — — — —	BROKEN LINE MADE UP OF LONG DASHES
DITTO LINE	MEDIUM — — — — — —	INDICATION OF REPEATED DETAIL

QUESTION/ANSWER DAY

(Verbal Communication)

Drafting Verbal/Visual 8

QUESTION AND ANSWER DAY

TEACHER MATERIALS:

1. CONCEPTS OF TECHNIQUE:

a. What SKILL will this technique teach?

1. Asking appropriate questions

2. Organizing the thought behind the question

b. What student learning problem(s) prompted the development of this technique?

1. Students are often reluctant to ask questions because they feel other students will ridicule them or because they do not want to take time away from their class assignment.

2. Student questions are often not well thought out.

2. TEACHER INSTRUCTIONS FOR THE USE OF THIS TECHNIQUE:

a. Make available to your students a specific place where they may deposit written questions.

b. Inform the students that they will remain anonymous.

c. Select a certain time of the week that you will answer the questions and let your students know when that will be. For example, Friday can be a day when questions are answered.

d. Encourage students to ask questions that are specific and brief.

e. You will most likely get prank questions so preview the questions <u>before</u> reading them to the class.

f. You might "plant" a few questions to get things started.

g. This technique will make it easier for the student who will not voice his or her question in front of the class.

3. SUGGESTED RELATED ACTIVITIES:

When your students feel more comfortable submitting written questions, have some of your students read the questions to the class.

THE FOLLOWING INDUSTRIAL EDUCATION BASIC SKILL INSTRUCTIONAL TECHNIQUES ARE AVAILABLE FROM:

VOICE (VOCATIONAL OCCUPATIONAL INFORMATION CENTER FOR EDUCATORS)

721 CAPITOL MALL
SACRAMENTO, CALIFORNIA 95814

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"LEARNING TO VERBALLY & VISUALLY COMMUNICATE THE WOODWORKING WAY"

"LEARNING TO READ AND WRITE THE METALWORKING WAY"
"LEARNING TO DO MATH THE METALWORKING WAY"
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"LEARNING TO READ AND WRITE THE DRAFTING WAY"
"LEARNING TO DO MATH THE DRAFTING WAY"
"LEARNING TO VERBALLY & VISUALLY COMMUNICATE THE DRAFTING WAY"