This vocational instructional module on reading a micrometer is one of eight such modules designed to assist recently arrived Arab students, limited in English proficiency (LEP), in critical instructional areas in a comprehensive high school. Goal stated for this module is for the student to demonstrate ability to measure using a one-inch micrometer. Each module consists of these parts: title; program goal and performance objectives; a pronunciation key; a language page which offers the pronunciation, definition, and usage of key terms in English and in Arabic; a pretest; bilingual (English and Arabic) language (vocabulary and usage) activities; evaluation; pretest and activity answer sheets; and a list of supplementary materials and their location. For each of the four activities in this module the objective, a list of materials needed, procedure, and evaluation are provided in addition to the necessary activity sheets or pages. (YLB)
READING A MICROMETER

U.S. DEPARTMENT OF EDUCATION
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of strength and inspiration to us all.
ABOUT THE PROJECT

The Fordson Arabic Bilingual Demonstration Project is designed to assist recently arrived Arab students, limited in English proficiency (LEP), to adapt to a large and comprehensive high school. The project consists of academic and vocational instructional modules, reading services to teachers and students, bilingual aide and resource services, computer and television modules, staff development activities, and home-community liaison.

ABOUT THE INSTRUCTIONAL MODULES

The modules were designed to assist LEP students in critical instructional areas throughout the school curriculum. These areas of focus were determined by a needs survey of the entire Fordson school community. Each module consists of seven parts: title, objectives, pretest, language (vocabulary and usage) activities, evaluation, and supplementary materials. Modules were translated, duplicated, and field tested.

ABOUT THE AUTHOR

Susan Field did her undergraduate work at Wayne State University and her graduate training at the University of Michigan. Susan has worked for 11 years in Dearborn teaching business subjects and coordinating the Special Needs Project in the vocational education program at Fordson High School. The major concepts of this unit were those defined as critical for special needs students to read a micrometer.
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Developed By:

Susan Field
MICROMETER

PROGRAM GOAL: Students will demonstrate ability to measure using a 1 inch micrometer.

PERFORMANCE OBJECTIVES:
Given a module, a micrometer and a writing instrument, the student will be able to:

1. identify a micrometer;
2. write the word micrometer correctly;
3. state purpose of micrometer correctly;
4. identify five parts of micrometer with 100% accuracy;
5. write names of five parts with 100% accuracy;
6. state largest measurement read on the micrometer;
7. label five parts on drawing with 80% accuracy;
8. add numbers in the thousandths with 75% accuracy;
9. describe correctly what numbers on the sleeve represent;
10. read measurements using the numbers on the sleeve of micrometer with 80% accuracy;
11. describe correctly what numbers on the thimble represent;
12. read measurements using the numbers on the thimble of the micrometer with 80% accuracy;
13. measure five pieces of stock correctly with 80% accuracy.
PRONUNCIATION KEY

/a/ as in Adam
/ǝ/ as in cake
/e/ as in let
/ǝ/ as in meet
/i/ as in sit
/i/ as in ice cream
/o/ as in hot
/o/ as in Coke
/u/ as in Seven Up
/u/ as in blue
/b/ as in boy

C equals /s/ as in cents (10¢)
/k/ as in cat
/d/ as in day
/f/ as in four

G equals /g/ as in go
/dz/ as in page

/h/ as in he
/j/ equals /dz/ as in jail
/k/ as in kick
/l/ as in Cola

/m/ as in man
/n/ as in man
/p/ as in Li. Pepper
/qu equals /kwa/ as in quit
/r/ as in run
/s/ as in sun
/t/ as in ten
/v/ as in van
/w/ as in woman
/x/ as in extra
/y/ as in yet (sometimes /e/ as in many)
/z/ as in zebra

/sh/ as in shut
/ch/ as in church
/ng/ as in sing
/th/ (voiced) as in this
/th/ (unvoiced) as in thing

/oo equals /u/ as in food
/u/ as in good
1. **micrometer** - (mī-crom'-e-ter) n.
A micrometer is a measuring tool.

2. **measure** - (mā'-zhur) v.
Ali can measure with a ruler, too.

3. **frame** - (frāme) n.
The frame is a part of a micrometer.

4. **anvil** - (an'vil) n.
The anvil is a part of a micrometer.

5. **spindle** - (spin'-dl) n.
The spindle is a part of a micrometer.

6. **thimble** - (thim-bl) n.
The thimble is a part of a micrometer.

7. **sleeve** - (slēv) n.
The sleeve is a part of a micrometer.

8. **clockwise** - (clok'-wīz) adj.
The hands of a clock move in a clockwise direction.
9. counterclockwise
   (coun-ter-clok'-wiz) adj.
   To loosen a screw, you turn in
   a counterclockwise direction.
   The opposite direction in which
   the hands of a clock move.

10. inch - (inch) n.
    An inch is a small unit of
    measure, about the size
    of a paper clip.

11. one hundred thousandth
    (wun - hun'-dred - thou'-zandth) n.
    One hundred thousandth of an
    inch is the same as .100 of an
    inch.

12. twenty-five thousandth
    (twen-ti - fīv - thou'-zandth) n.
    Twenty-five thousandths of an
    inch is the same as .025.

13. space - (space) n.
    The space is an opening
    between the anvil and the
    spindle.
PRETEST

Get five pieces of stock from your teacher.

Measure them accurately to a hundred thousandth of an inch with your one inch micrometer.

Record your answers below:

1. ______________________
2. ______________________
3. ______________________
4. ______________________
5. ______________________
Find the statement that matches the word. Write the letter on the line next to that word. The answers may be used more than once.

A. a measuring tool
B. a part of a micrometer
C. the direction in which the hands of a clock move
D. a small unit of measure about the width of your thumb
E. how you find the size of something
F. the opposite direction in which the hands of a clock move
G. one hundred thousandths of an inch
H. twenty-five thousandths of an inch
I. an opening to be measured

inch
measure
anvil
clockwise
frame
micrometer
spindle
sleeve
counterclockwise
thimble
.025
.100
space
What is this?

This is a picture of a micrometer.
(mi'-crom'-e-ter)

A micrometer is used to measure small things.

Get a micrometer from your teacher.

ما هذا؟

هذه صورة لمايكرومتر.

يستخدم المايكرومتر لقياس الأشياء الصغيرة.

احضر مايكرومترًا! من استاذك.
DIRECTIONS:

Have an aide help you with this page.
The aide will help you say the words correctly.

This is a micrometer. Say the word.

How many parts (syllables) does the word have? It has 4.
Were you right?

Write the missing letters in the word micrometer.

You can also see the word meter in the word micrometer.
A centimeter is a measurement like an inch but shorter.*

A micrometer is used to measure.

This micrometer is used to measure only 1 inch or less than 1 inch.

Say the word (mī'crom'-e'ter) again. Write it down.__________________

Say the word measure (mā'-zhur). Write it down._________________

What do you use the micrometer for? ____________________________

* 2.54 centimeters equals 1 inch.

* 2.04 centimeters equals 1 inch.
DIRECTIONS:

1. Hold the micrometer in your hand.
2. Find the parts that are in the picture below.

There are 5 basic parts to your micrometer. Look at the picture.

- Frame
- Anvil
- Spindle
- Thimble
- Sleeve

Put your finger on the frame. Write the word frame.

Put your finger on the anvil. Write the word anvil.

Put your finger on the spindle. Write the word spindle.

Put your finger on the thimble. Write the word thimble.

Put your finger on the sleeve. Write the word sleeve.
Turn the thimble counterclockwise.
Do you see the spindle opening up?

Can you see the numbers on the sleeve?
What is happening to the numbers as you turn the thimble toward you?
They keep getting larger.

Keep turning the thimble until you can see the numbers 8, 9, then 0, on the sleeve. Stop at the 0.
Now the opening or space between the anvil and the spindle measures 1 inch.

This is the largest measurement you can read on this micrometer.
Now turn the thimble clockwise.
What happens to the numbers on the sleeve when you turn the thimble clockwise?

They keep getting smaller. Is the opening or space between the anvil and the spindle getting smaller?

Keep turning the thimble until you get to 7, 6, then 5 on the sleeve. Stop at 5. Now the space between the anvil and the spindle is only .5 of an inch or one-half of an inch.
Keep turning the thimble clockwise. The numbers are still getting smaller and the space between the anvil and the spindle is also getting smaller. Keep turning the thimble until you get to 2, 1, then 0, on the sleeve. Stop at 0.

Now there is no space between the anvil and the spindle. The micrometer is closed. The measurement is 0.
Now let's see if you know the 5 parts of the micrometer.

List them here: F __________ S __________

A __________ T __________

S __________

Name the 5 parts on the picture.

What is this tool?

What can you do with it?

The numbers on the sleeve go from:
(Circle one.)

(a) from 1 to 2 (b) from 2 to 8 (c) from 0 to 9 (d) from 0 to 0

How large a space can you measure with this micrometer?
(Circle one.)

(a) 2 inches (b) 3 inches (c) 1 inch (d) 9 inches
For the student:

You are going to learn:

to be able to identify a one inch micrometer and its parts.

In order to do this you will be given:
a module, a micrometer and a writing instrument.

You will be doing the following:

completing activity 2 in your module.

We will know you can do this when:
you label the five parts of a micrometer on a drawing with 80% accuracy.
Open the micrometer to 1 inch by turning the thimble counterclockwise until you have seen all the numbers on the sleeve.

This inch is divided into 10 parts on the sleeve. Each number is one hundred thousandths (.100) of an inch.

Turn the thimble clockwise until you get to 8 on the sleeve. Your reading is now .800 of an inch.

Turn the thimble clockwise until you get to 4 on the sleeve. Your reading is now .400 of an inch.

Turn the thimble clockwise until you get to 2 on the sleeve. Your reading is now .200 of an inch.

*4 times actual size
Each .100 part on the sleeve is divided again into 4 parts or 25 thousandths (.025) of an inch.

\[ .100 \div 4 = .025 \]

See if you can do these problems adding thousandths of an inch.

1. .025 + .025
2. .100
3. .075 + .225
4. .550 + .225
5. .375 + .450
6. .025 + .875

Turn the thimble clockwise until you get to the 9 on the sleeve. Do you see the numbers on the thimble?

Line up the 0 on the thimble with the number 9 on the sleeve. The opening now measures exactly .900 of an inch.

*2 times actual size
STUDENT ACTIVITY 3 (continued)

Turn the thimble counterclockwise 1 complete turn from 0 to 0 on the thimble.

You have just moved 25 thousandths (.025) of an inch from .900 to .925. So your measurement is .925 of an inch because .900 + .025 = .925.

Now turn the thimble counterclockwise again 1 complete turn. You have now moved .025 more or .925 + .025 = .950.

So your opening measures .950 of an inch.

Each line on the sleeve measures 25 thousandths (.025) of an inch between the anvil and the end of the spindle.

Each longer line (every fourth one) measures 100 thousandths (.100) of an inch.
See if you can answer these questions.

1. Every line on the sleeve measures ________ of an inch.

2. Each longest line (every fourth one) on the sleeve measures ________ of an inch.

3. One complete turn from 0 to 0 on the thimble moves the sleeve ________ of an inch.

4. See if you can read the setting for number 4.
   What is your answer?
   ______________

The setting is one line past the 1 on the sleeve. The 1 is .100 of an inch.

Since each small line on the sleeve measures .025, your answer would be .100 + .025 = .125 of an inch.

Were you right? If you were, read the settings on the next page.
For the student:

You are going to learn:

• to demonstrate the ability to measure using the numbers on the sleeve of a one inch micrometer.

In order to do this you will be given:

a module, a micrometer and a writing instrument.

You will be doing the following:

• completing activity 3 in your module.

We will know you can do this when:

you can read the settings using numbers on the sleeve of a one inch micrometer with 80% accuracy.
Read the following micrometer settings. Write your answers on the line provided.

5. 

6. 

7. 

8. 

9. 
STUDENT ACTIVITY 4

You know if you turn the thimble one complete turn from 0 to 0 on the thimble, you move the spindle .025 of an inch.

Some measurements come between the .025 lines.

Turn the thimble until you get to the .100 line.
Do you see the numbers on the thimble?

Now turn the thimble counterclockwise until you see 5 on the thimble.
This is .005 or 5 thousandths of an inch.

You have now moved:
.100 + .005 = .105 of an inch.
For the student:

You are going to learn:

to demonstrate the ability to
measure to a hundred thousandths
of an inch using a one inch
micrometer.

In order to do this you will be given:
a module, a micrometer and a writing
instrument.

You will be doing the following:

completing activity 4 in your
module.

We will know you can do this when:
you can read settings using numbers
on the thimble of a one inch
micrometer with 80% accuracy.
For the student:

You are going to learn:

to match words relating to a micrometer with their definitions.

In order to do this you will be given:
a module and language pages.

You will be doing the following:
completing language pages and activity number 1.

We will know you can do this when:
you have matched the words to their definitions with 75% accuracy.
Now turn the thimble counterclockwise until you see the number 10 on the thimble.

Your reading is now:

.100 + .010 = .110 of an inch.

Turn the thimble counterclockwise 3 more lines.

Now your reading is:

.100 + .013 = .113 of an inch.

When you turn the thimble further you reach 0 again.

Now your reading is .125. There are 25 lines on the thimble.

Each line is .001 or 1 thousandth of an inch.
Turn the thimble to .258. Does your micrometer reading look like this?

Answer these questions.

1. The numbers on the thimble go from: (circle one)
   (a) 1 to 2     (b) 0 to 20     (c) 0 to 0     (d) 0 to 15

2. There are _______ lines on the thimble.

3. Each line measures _______ thousandths of an inch.

If your answers are right, read the settings on the next page.
Read the following micrometer settings. Write your answers on the line provided.

If your answers are right, ask your teacher for the items you must measure for your final test.
EVALUATION

Pretest should be used as post test evaluation.
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<td>1. Frame</td>
<td>1. .025</td>
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<td>2. E</td>
<td>2. Anvil</td>
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<td>5. B</td>
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<td>6. micrometer</td>
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<td>7. B</td>
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<td>7. .850</td>
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