



HUMAN FACTORS & ERGONOMICS



STUDENT LESSON
PLANS

University of Rhode Island



ANTHROPOMETRY



University of Rhode Island

ANTHROPOMETRY

PURPOSE

To understand how objects and tools should be designed to fit the needs of humans. This interactive activity helps students learn about the importance of anthropometry in design, its limitations and potential areas of improvement.

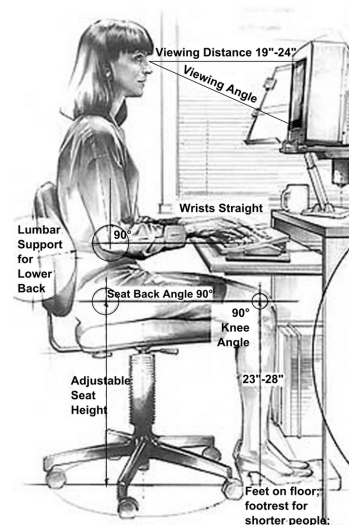
BACKGROUND INFORMATION

Anthropometry is an important aspect of ergonomics; it is comprised of the measurements and dimensions of the human body. This branch of ergonomics influences how people interact with products, as well as how products and work spaces are designed.

There are several databases that provide average measurements taken from sample populations. The most commonly used resources are Mankins and ANSUR II. These databases are commonly used when designing products and work areas. The measurements from these sources can potentially be inaccurate, leading to some of the common injuries seen with prolonged use, such as carpal tunnel or back pains.

APPLICATION TO HF&E

Imagine you work at a desk, where you're neck is strained to see your monitor and your back is hunched over in your uncomfortable chair. How does this affect your health? Have you considered the short term and long term effects? Understanding the proportions of the human body and its limitations can help allow future engineers to design better products and work spaces which have a wide range of applications whether you are working at a desk or using everyday tools.



<https://en.wikipedia.org/wiki/Anthropometry>



<https://milkatcarmel.wordpress.com/2016/10/14/hand-span-measurement/>



LESSON PLAN GRADES 4 - 6



University of Rhode Island

ANTHROPOMETRY TEACHER MATERIALS



YOUTUBE LINK

"Introduction of Anthropometry"

<https://www.youtube.com/watch?v=yUd8Mud2L9k>

KEY TAKEAWAYS

- There are two categories of anthropometry:
 - Static: Body measurements while standing still
 - Dynamic.: Body measurements while in motion
- There are several factors that influence anthropometry, including: age, gender, and ethnic origin.

REFLECTION

1. What are the two categories of anthropometry?
2. Was it hard to push all of the buttons on the regular remote? Why or why not?
3. Was the prototype easier for you to use? Why or why not?
4. How do you think the prototype could be designed even better?

ANTHROPOMETRY TEACHER MATERIALS

LENGTH OF COMPLETION

60 minutes

BILL OF MATERIALS

Rulers (\$0.47 for 1 at Walmart)

Pencils (\$0.47 for 12 at Walmart)

Construction paper (\$3.47 for 120 pages at Walmart)

Scissors (\$6.06 for 6 at Walmart)

Tape / glue sticks (\$10.88 for 6 / \$10.60 for 30 at Walmart)

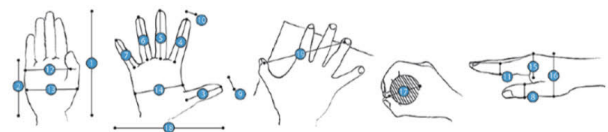
TV remote controls (1 per pair) (\$5.90 at Walmart / ask students to bring from home)

PROCEDURE

1. Show students the video from the previous page of the introduction to anthropometry.
2. Divide students into pairs (Student A and Student B).
3. Student A will begin by holding the remote and trying to press each of the buttons. Student B will then do the same.
4. Time to measure! Student A will choose 10 hand features from Figure 1 and measure those features of Student B's hand.
5. Student B will record the results in Table 1.
6. Student B will choose 10 hand features from Figure 1 and measure those features of Student A's hand.
7. Student A will record the results in Table 1.
8. Prototype Time! Using the materials provided, each student will make a new and improved remote for their partner.
9. Testing! Students will give the prototype to their partners to try out.
10. Evaluation! Answer the reflection questions provided for the activity.

Feature	Measurement (centimeters)

Table 1. Hand Measurements



Source: Image from *Industrial and Interaction Design: "Sennheiser Cordless Mixture", Anthropometrics*

#	Feature	#	Feature	#	Feature
1	Hand length	8	Thumb breadth	15	Hand thickness metacarpal
2	Palm length	9	Thumb thickness	16	Hand thickness with thumb
3	Thumb length	10	Index finger breadth	17	Maximum grip diameter
4	Index finger length	11	Index finger thickness	18	Maximum spread
5	Middle finger length	12	Hand breadth metacarpal	19	Maximum functional spread
6	Ring finger length	13	Hand breadth across thumb		
7	Little finger length	14	Hand breadth minimum		

<https://www.wccusd.net/cms/lib03/CA01001466/Centricity/domain/1040/stem-west%20grant/ErgonomicsTVremoteActivity080714.pdf>

Figure 1. Hand Measurement Options

ANTHROPOMETRY STUDENT HANDOUT

LENGTH OF COMPLETION

60 minutes

BILL OF MATERIALS

Rulers

Pencils

Construction paper / cardstock

Scissors

Tape / glue

TV remote controls (1 per pair)



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"Introduction of Anthropometry"

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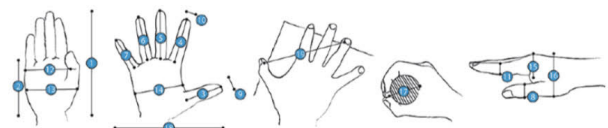
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Figure 1. Hand Measurement Options

REFLECTION

1. What are the two categories of anthropometry?
2. Was it hard to push all of the buttons on the regular remote? Why or why not?
3. Was the prototype easier for you to use? Why or why not?
4. How do you think the prototype could be designed even better?



LESSON PLAN GRADES 7 - 9



University of Rhode Island

ANTHROPOMETRY TEACHER MATERIALS



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 - Static: Body measurements while standing still
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REFLECTION

1. What factors can influence anthropometry (human body dimensions)?
2. Was it difficult to push all of the buttons on the regular remote? Why or why not?
3. Was your partner able to push all of the buttons easily and comfortably on your prototype? Why or why not?
4. How do you think the prototype you made could be further improved?

ANTHROPOMETRY TEACHER MATERIALS

LENGTH OF COMPLETION

60 minutes

BILL OF MATERIALS

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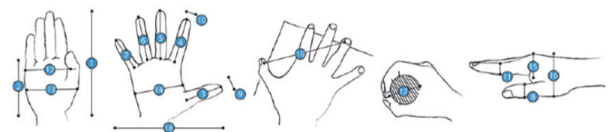
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Figure 1. Hand Measurement Options

ANTHROPOMETRY STUDENT HANDOUT

LENGTH OF COMPLETION

60 minutes

BILL OF MATERIALS

Rulers

Pencils

Construction paper / cardstock

Scissors

Tape / glue

TV remote controls (1 per pair)



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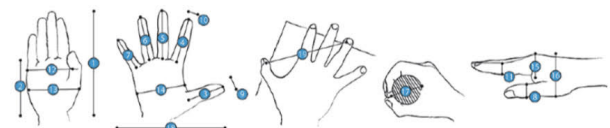
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REFLECTION

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LESSON PLAN GRADES 10 - 12



University of Rhode Island

ANTHROPOMETRY TEACHER MATERIALS



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REFLECTION

1. After watching the video, how do you think anthropometry can influence engineering designs?
2. After using the regular remote, what problems did you notice you had with pushing the buttons?
3. Were the anthropometric features you chose in Step 4 / 6 helpful when calculating the remote's measurements? If not, what features would you have measured instead?
4. Was your partner able to use your prototype easily and comfortably? If not, what changes would you make to your design?

ANTHROPOMETRY TEACHER MATERIALS

LENGTH OF COMPLETION

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BILL OF MATERIALS

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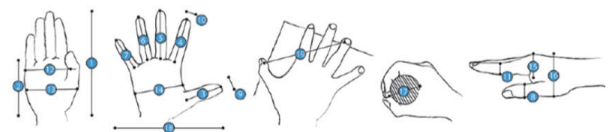
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Figure 1. Hand Measurement Options

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LENGTH OF COMPLETION

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Construction paper / cardstock

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Tape / glue

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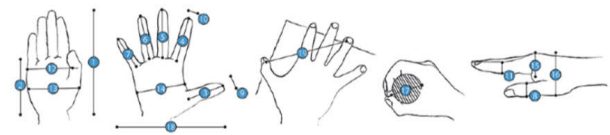
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