Ergonomics and Engineering- Designing for the perfect fit... even for Cinderella's glass slipper

Presented by:

Melanie Alexandre and Christine Naca

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Cool things done at JGI

Bioenergy

Carbon Cycling

Biogeochemistry

What are we going to do?

- Introduction to ergonomics
- Hands-on activities
- Review what we learned
- Summary and questions

What is ergonomics?

Ergonomics is...

- Fitting task to an individual
 - Optimize comfort, safety, and productivity

Best to think about it at the beginning!

Demo of individual differences

What are some things you do that you
do over and over again or
put in a funky position?

Ergonomic concerns about today's children

- Not being active
- Classroom furniture
- Backpacks
- Obesity
- Health issues
- Technology

Hands-on activities

Do not be afraid to ask us for help!

1. Break into small groups
2. Introduce yourself to your group members
3. Follow the instructions at each station
4. Use the Personal Ergonomics Worksheet to record information and answer questions (write your name on it right away)
5. Work together at each station for about 10 minutes (you will hear a timer)
6. Rotate through each station

Some activities are very physical, so use caution and stop immediately if something hurts!

Hands-on activity 1: Grip Strength Testing

Objectives:

- Identify if strength varies between right and left hands.
- Identify the effects of fatigue.

Directions: Read the directions for your partner and instruct them to:

1. Squeeze the grip meter with each hand three times. Record the pounds of pressure on your worksheet. Determine average for each hand.
2. Squeeze the foam object only with the hand you use for writing 60 times.
3. Squeeze the grip meter again with each hand three times. Record the pounds of pressure on your worksheet. Determine the average for each hand.

After both partners are finished, refer to your worksheets and answer the associated questions.

Hands-on activity 2: Effective Breathing

Objectives:

- Observe breathing lying on your back
- Consider how posture affects your breathing

Directions: Read the directions for your partner and instruct them to:

1. Lie on your back on the mat
 - Put your hands just below your ribs, palms down, take several breaths feel how your body changes as your lungs expand
 - Move your hands to your sides with thumbs down and fingers over some of the ribs. Now take a deep breath. Compare how much movement you feel in the ribs (front, back and side).
 - Put your hand on your chest just below your collar bones; take several breaths focusing on filling this area. Do you feel movement in your belly or chest first?
2. Roll over onto your side to stand up
3. Sit on a chair and think about how your posture affects breathing when:
 - When you sit at school in a chair or at a desk
 - When you are doing other things (using a computer, electronic game, speaking to a group, running)
4. Lean forward so your ribs are in contact with your legs:
 - Blow 3 breaths into a balloon (pinching it off between breaths to keep adding air)
 - Tie the end of the balloon.
5. Sit upright and blow 3 breaths into another balloon;
 - Tie the end of the balloon
6. Refer to worksheet and answer the appropriate questions

Hands-on activity 3: Optimizing Your Chair

Objectives:

- Identify optimal chair height and depth
- Identify possible modifications when a chair is not optimal

Directions:

1. Have your partner sit on a table that is high enough for their feet to dangle (*pressure behind the knees restricts circulation but this will be quick!*). Ask your partner to flex their ankles so the feet are parallel with the floor. Measure from the table top to your partner's heels. (See Picture 1).
 - Tabletop to heels = Optimal chair height
 - Record (in inches or cm) on worksheet.
2. Have your partner fit three fingers between the edge of the table and the back of their knees.* Then ask them to hold a ruler or dowel behind them as shown in Picture 2 while you measure the distance from the dowel to the front edge of the table.
 - Dowel to edge of the table = Optimal chair depth
 - Record (in inches or cm) on worksheet.
3. Refer to worksheet and answer the associated questions.

*Note: Fitting your fingers between the edge of the chair and the back of your knees keeps the edge of the chair from contacting or compressing the blood vessels, nerves and tendons that are right at the surface behind your knees.

Picture 1

Picture 2

Hands-on activity 4: Backpack Safety

Objectives:

- Calculate the most weight (BW) you should carry in your backpack
- Feel what that maximum recommended weight (MRW) feels like

Read directions for loading backpack :

1. Tell your partner to identify their maximum recommended backpack weight (15% of body weight) from the Backpack Weight Chart
2. Set aside enough weight to equal 15%
 - Using less weight is okay but not more
3. Make sure the backpack to be used is empty and zipped up except at the top.
4. Have partner put backpack on using both straps; making them snug. Gradually add weight to the backpack. After about half of the weight has been added check with partner after each addition.
5. Stop if any discomfort is felt.
6. If your partner feels the straps pulling or, feels the need to lean forward to balance the load, stop adding weight. That will be the MRW
7. Have partner try putting the backpack on with just one shoulder strap. See if it feels more or less comfortable.
8. Refer to your worksheet and answer the associated questions.
9. Review backpack brochure (handout) and identify if you are packing your backpack safely.

Review of learning objectives from each hands-on activity

- Grip Strength Testing
- Effective Breathing
- Optimizing Your Chair
- Backpack Safety

Engineering Design

- Exercise:
 - In groups of 2-3, design a part of a cell phone using the drawing pad and markers provided.
 - What features would make customers want to use it?

Group 1: Screen

Group 2: Keyboard

Group 3: Case - Size and Shape

Group 4: Custom Cell – for
“Senior” users (poor eye sight, difficulty
holding small items, etc.)

Design Considerations

- Who is going to use my design?
- What is most important to them?
- How often will they be using it?
- What are they using it for?
- Other considerations?
 - Looks/Feel – “Does it fit in my purse?”, “What colors does it come in

What can you do to protect yourself?

- Prevention strategies
 - Vary tasks
 - Take breaks (use a timer)
 - Move and breathe
 - Maintain proper posture
 - Maintain ears over shoulder and shoulders over hips
 - Avoid staying in one position too long (change position frequently)
 - Exercise regularly

Pay attention and take
care of your body!

Questions?

What is one thing you learned?