

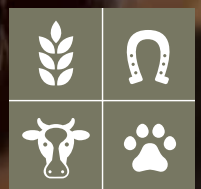


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# Understanding and Applying Veterinary Science

## Module 2: Vitals on Vitals



## Facilitator Guide

## Understanding and Applying Veterinary Science - Module 2: Vitals on Vitals

# Acknowledgements



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## Understanding and Applying Veterinary Science - Module 2: Vitals on Vitals

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# Facilitator Tips:

How to get the most from this curriculum

## Teaching and Learning Strategies

All activities in the *Understanding and Applying Veterinary Science in 4-H* curriculum were designed using experiential learning and inquiry. **Experiential learning (EL)** is grounded in the idea that experience is essential to learning and understanding. Specifically, EL involves a recurring sequence of three distinct steps: 1) an experience (“Do”) that involves learner exploration; 2) a period of reflection (“Reflect”) where learners share their reactions and observations, process their experience, and make generalizations to real-life examples; and 3) an opportunity to apply (“Apply”) new knowledge and skills in an authentic manner, which helps learners deepen and broaden their understanding (it helps learning last!).

**Inquiry** is a teaching and learning strategy whereby learners are engaged in activities that require the observation and manipulation of objects and ideas in order to construct knowledge and develop skills. Inquiry is grounded in experience, focuses on the use and development of critical thinking skills, and targets the learning and application of specific content knowledge.

The inquiry-based activities in the *Understanding and Applying Veterinary Science in 4-H* curriculum were designed using the 5-step EL cycle (Pfeiffer and Jones, 1983): Experience, Sharing, Processing, Generalizing, and Application. It is recommended that adequate time be allotted for youth learners to proceed through each step in order for learning to be maximized.

## Organization of Learning Environment

### Creating the environments where learning takes place

The activities in the *Understanding and Applying Veterinary Science in 4-H* curriculum were designed to be facilitated in a small group-learning environment. Learners construct understanding through inquiry using observations, the manipulation of objects and ideas, and personal reflection. However, **learning is a social endeavor** where dialogue and reflection with others are critical elements. Therefore, creating physical and social environments where learners can carry out inquiry will help them organize their thoughts and develop an understanding of the content and processes being emphasized in specific curriculum activities.

# Facilitator Tips:

How to get the most from this curriculum

## Curriculum Activity Layout

- **Activity Title**  
The activity title introduces the facilitator to the topic that will be addressed during the activity. A subtitle may specify the area of focus within the topic.
  
- **Background Information**  
This introductory section provides facilitators with a brief overview of the subject matter and offers examples that help to explain why the topic is important. This section may also include brief descriptions of the sections included in each activity (e.g., concepts and vocabulary, life skills targeted, subject links to education standards, and an overview of activities.)  
  

**Facilitator Tip:** The background information is **not** meant to be shared with the youth prior to the activity. Rather, it is intended to support facilitators by providing factual information that may help ground and inform group discussions.
  
- **Time Required**  
Each module includes an estimate of the time needed to complete the activities. The actual time required for the activities will vary based on level of learner interest, size of the group, age of the group members, and the setting in which the activities take place.
  
- **Learning Objectives: Concepts and Vocabulary**  
Facilitators are provided with a list of defined concepts and vocabulary that represent key curriculum content that is meant to be discovered by the youth through their exploration, reflection, and discussion with others.  
  

**Facilitator Tip:** The list should **not** be provided to the youth at the beginning of the activity. At the end of each activity, the facilitators should ensure that the appropriate terms and concepts have been discovered by or introduced to the youth.
  
- **Life Skills**  
Life skills are abilities that help youth become productive, contributing members of society. The activities are designed to provide youth with the opportunity to practice particular life skills that are utilized in everyday life. The life skills being targeted are listed for each activity. Learn more about the Targeting Life Skills model at: [http://www.csrees.usda.gov/nea/family/res/pdfs/Targeting\\_Life\\_Skills.pdf](http://www.csrees.usda.gov/nea/family/res/pdfs/Targeting_Life_Skills.pdf)
  
- **National Science Education Standards Supported**  
The Next Generation Science Standards are guidelines for educators regarding what K-12 students should know, comprehend, and be able to do in order to be scientifically literate, competent members of society. Each activity supports at least one of the Next Generation Science Standards Crosscutting Concepts. For more information about the Next Generation Science Standards, visit: <http://www.nextgenscience.org/sites/ngss/files/Appendix%20G%20-%20Crosscutting%20Concepts%20FINAL%20edited%204.10.13.pdf>
  
- **Suggested Groupings**  
Activities are designed for youth to work in pairs, small groups, large groups, or individually. The suggested groupings are meant to help facilitate quality learning among the youth.

# Facilitator Tips:

How to get the most from this curriculum

## Materials Needed

A list of the materials needed to complete the activities is provided for the facilitator. The list describes the materials to be used, as well as how many of each item is required for each activity. Most materials are provided (these are marked with an \*); however, other materials will need to be obtained by the facilitator.

## Getting Ready

This section describes what needs to be done by the facilitator to prepare for the activity. It is highly recommended that facilitators review this list carefully and prepare necessary materials prior to activity implementation.

## Opening Questions/Prompts

**Facilitator Tip:** This is the point where each activity begins with the youth.

Questions or prompts presented at the beginning of each activity are meant to draw the youth into the topic being addressed in the activity. Responses to the questions will also provide the facilitator with an understanding of what the youth already know about the topic. Each question is designed to be open-ended and to support collaboration within the group. Facilitators should encourage the youth to record their answers to these introductory questions on the provided flip chart paper, as this is an important part of the learning process.

**Facilitator Tip:** Ask the questions/prompts as they are written. Open-ended questioning is a key element of inquiry-based learning.

## Procedure (Experiencing)

This is the part of the curriculum when the youth experience and complete the activity itself. It is highly recommended that facilitators review the procedure prior to implementing with youth so the activity flows smoothly from one section to another. It is important for youth to record their observations, ideas, and other thoughts during the procedure on the flip chart paper provided, as this is an important part of the learning process.

## Sharing, Processing, and Generalizing

Following the activity procedure there is a period of reflection, during which time the youth come back together as a large group and share their observations with each other. This is an opportunity for youth to communicate their findings, listen to what others discovered, consider the various thought processes, and learn from each other. This section helps to solidify what the youth have learned throughout the course of the activity.

## Concept and Term Discovery/Introduction

At this point of the activity, most of the concepts will have most likely already been discovered by the youth. Many concepts will have already been defined by now as well. However, some technical terms may need to be introduced to the youth. The facilitator needs to confirm that all important terms and concepts have been defined.

# Facilitator Tips:

How to get the most from this curriculum

**Facilitator Tip:** Ensure that all terms/concepts have been discovered by or introduced to the youth. Additionally, make certain that any misconceptions have been addressed.

- **Concept Application**

The true test of understanding takes place when learners attempt to apply their new knowledge and skills to authentic situations. At this point of the activity, youth have already completed the hands-on activities that have introduced the new concepts and skills. The concept application section provides the facilitator with activities that allow youth the opportunity to take what they have learned and apply it to independent, real-world situations. This application may be subdivided according to level of knowledge and experience of the learners. This application of knowledge is a critical step of the learning process. It is recommended that the youth be required to participate in the application activity and report back on their experience at the following group meeting.

- **References:**

Following the concept application section, the facilitator is provided with a list of references. The references list can be used as an additional resource by the facilitator to learn more information about the topics addressed during the activity.

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# Understanding and Applying Veterinary Science

## Module 2: Vitals on Vitals

### Background Information

#### Major Body Systems

Understanding major **body systems** (or organ systems) is essential to understanding an animal's health. Major body systems include:

- **Circulatory system:** The circulatory system carries blood and other substances throughout the body of an animal. Organs in the body related to this system include the heart and blood vessels such as arteries, veins, and capillaries.
- **Digestive system:** The digestive system digests and absorbs food, enabling animals to utilize nutrients for energy, growth, and maintenance. Organs and structures within this system include the mouth, teeth, stomach, intestines, liver, pancreas, and rectum.
- **Endocrine system:** The endocrine system is the glandular system that produces hormones that control certain body functions including growth, metabolism, and sexual development.
- **Immune system:** The immune system is a network of cells able to control and eliminate a wide range of pathogens, i.e., viruses, bacteria, fungi and parasites. In contrast to other systems that have major organs, the immune system is relatively “invisible” and is made up of many different types of immune cells.
- **Integumentary system:** The integumentary system refers to an animal's covering such as skin, scales, feathers, fur, and hair. This system protects animals' bodies from disease by providing a barrier to dehydration, overheating or freezing, viruses and bacteria.
- **Lymphatic system:** The lymphatic system helps to defend against infection by moving lymph fluid through the body to filter out disease-causing organisms and drain fluid waste. The lymph system gathers those fluids and returns them to the blood through capillaries and other blood vessels.
- **Muscular system:** The muscular system enables movement in animals, from the beating of the heart, and contraction of blood vessels, to the movement of legs. There are three types of muscular tissue: smooth muscles are rarely controlled, e.g., muscles in the intestines; cardiac muscles are found in the heart; and voluntary muscles are those that help movement, e.g., muscles in the legs of animals.
- **Nervous system:** The nervous system in animals controls senses, action, and blood flow. It interacts with every system in the body. There are two parts to the nervous system, the central nervous system that includes the brain and spinal cord, and the peripheral nervous system that includes neurons that carry signals to muscles and glands.
- **Reproductive system:** The reproductive system enables animals to breed and feed their offspring. Organs involved in reproduction include testes, penis, ovaries, uterus, vagina, vulva, and udder.
- **Respiratory system:** The respiratory system allows for the exchange of oxygen and carbon dioxide from the body. Air moves in (inhalation) and out (exhalation) of lungs where oxygen is taken in and carbon dioxide is released. The principal organs involved with the respiratory system are the lungs.
- **Skeletal or support system:** The skeletal or support system is the framework of the body and carries weight. Bones are connected for support and movement. Some animals have a skeleton inside their body (endoskeleton) made up of bones, and some have a skeletal system made of hard plates on the outside of their bodies (exoskeleton).
- **Urinary system:** The urinary system removes waste materials and water from the blood in the form of urine. The kidneys are the core organs involved in this system; related body parts include the bladder, ureters, and urethra.

## Background Information (continued)



### Vital Signs

“Vital” refers to something that is essential. Thus, when monitoring an animal’s health it is important to look for and measure essential information that helps one assess an animal’s condition and recognize potential abnormalities. **Vital signs** are indicators of specific physical conditions and are associated with different organ systems. For example, **body temperature**, which is controlled by the central nervous system, measures the level of heat produced and sustained by an animal’s (bird or mammal) body; **heart rate (pulse)**, a part of the circulatory system, refers to the number of times a heart beats per minute; and **respiration rate**, a part of the respiratory system, is the number of breaths (inhalation/exhalation) per minute taken by an animal.

The vital signs of healthy animals function within a range of what is considered “normal” for a specific species. For example, the heart rate of an adult dog can range from 60-180 beats per minute, whereas the normal heart rate of an adult horse is 23-70. Furthermore, vital signs vary relative to the age of an animal. In young puppies, heart rates can be as high as 220 beats per minute, while foals (young horses) have a heart rate of 80-100.

Although a variety of factors such as exercise or extreme temperatures in the surrounding environment may influence body temperature, heart rate, and the rate of respiration of an animal, deviations from an animal’s normal vital signs may indicate a health condition that needs to be addressed. Thus, measuring an animal’s body temperature, pulse, and respiration rate (**TPR**) on a regular basis can provide a good indication of its state of health. Changes from normal TPR values may indicate a health problem and help determine when professional veterinary care is necessary.

#### Normal values for adults of common species

Species	Rectal temperature	Heart Rate (beats per minute)	Respiration Rate (breaths/minute)
Dog	38.1–39.2°C	60–120	10–30
Cat	37.8–39.2°C	140–220	15–25
Cow	38–39.5°C	40–100	27–40
Horse	37.8–38.5°C	28–40	10–14
Sheep	38.9–39.7°C	70–80	12–20
Pig	38.5–39.5°C	60–80	10–20
Rabbit	37.5–39.5°C	130–325	32–60

# Background Information (continued)

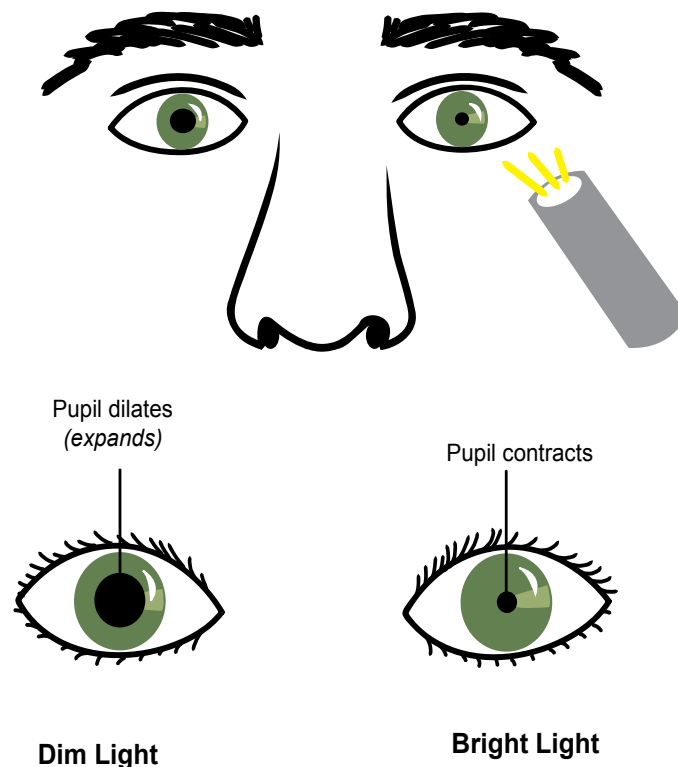
## Vital Signs (continued)

Additional important health indicators that can be observed easily are the form and reactive response of an animal's **pupils**. The pupil is the opening in the center of an animal's eye that allows light to pass through the eye's lens so an image of what is being viewed can be sent to the brain. Eyes are an organ of the central nervous system and pupil dilation is an associated central nervous system response. In a normal state of health, the eye's pupil is **dilated** (larger) under conditions of low light and **constricted** (smaller) under conditions of bright light (see Figure AA ). However, different health conditions can affect the pupil and regular observations of its size, shape, and **response time** should be recorded. For example, are the animal's pupils constricted under conditions of low light? Are they dilated during the bright light of day? Furthermore, under normal conditions, the pupils in both eyes will respond identically to a light, regardless of which eye is being stimulated. For example, if the left eye is being stimulated by a light, the pupils in both eyes will respond. If this is not the case it could indicate a health condition.

Other observable signs that may indicate a health condition include changes in an animal's behavior, movement, or indications of pain. For example:

- Behavior: abnormal vocalizations, little or no vocalizations, self-mutilation, hyper-excitability, loss of appetite and weight loss, reduced or no grooming, hyper-aggressiveness.
- Movement: limping, restlessness, lethargy, immobility, circling, head tilting, unusual posture or positions.
- Pain Indicators: labored, noisy, or rapid breathing; rapid heart rate or blood loss due to injury; vomiting or diarrhea; muscle twitching.

Figure AA



# Background Information (continued)

## Measuring Vital Signs

### *Restraint and Handling*

For reasons of personnel safety and safety of the animal, some level of restraint will be needed when measuring an animal's vital signs. However, safe and appropriate methods of restraint vary for each type of animal and should be learned in advance of measuring vital signs. Furthermore, regardless of the type of animal or restraint technique used, the goal of all restraint is that it be done safely with the least amount of stress to the animal.

**Facilitator Tip:** Information on animal restraint techniques can be found in a variety of sources. One possible reference that includes several common species: [http://loudoun.nvcc.edu/vetonline/vet105/restraint\\_and\\_handling.htm](http://loudoun.nvcc.edu/vetonline/vet105/restraint_and_handling.htm)

### *Body Temperature*

A rectal thermometer is used when taking the temperature of most animals. Steps to using a rectal thermometer correctly include:

1. Clean the thermometer with soap and water to remove debris; wipe with alcohol.
2. Prepare the thermometer by shaking it or putting it in cool water so the initial reading is below the normal range of the animal in question.
3. Lubricate the bulb of the thermometer using KY-type jelly. Vaseline is not recommended; it can adversely affect temperature readings.
4. Restrain animal as appropriate.
5. Insert the thermometer into the rectum gently, rotating it slightly. Do not force the thermometer.
6. Keep the thermometer in the rectum for at least 60 seconds. For large animals, make certain that the thermometer stays in contact with the wall of the rectum.
7. After 60 seconds, remove the thermometer gently. Wipe any feces from the end of the thermometer.
8. Take a reading immediately and record the information. A temperature that is above the normal range is a **fever**; **hypothermia** is a condition when sick animals have a temperature below normal.

### *Heart Rate (Pulse)*

The heart rate of an animal can be measured by palpating the pulse along a major **artery** (each pulse corresponds with one contraction of the heart); alternatively, a stethoscope can be used to listen to the heartbeat directly. Procedures to measure the pulse:

1. Ensure that the animal is relaxed and still; restrain as appropriate.
2. When measuring the pulse without a stethoscope, apply the tips of two fingers directly on the artery; when using a stethoscope, place the bell of the instrument appropriately for the animal being examined.
3. Count the number of pulsations over 10 seconds; multiply by 6.
4. Record the information.

**Note:** Using a stethoscope can be a challenging skill to master and requires practice.

**Facilitator Tip:** Resources on the use of stethoscopes in veterinary medicine include:

- Small animal (dog): <http://www.vetvisions.com/p411.htm#howtousestethoscope>
- Large animal (cow): <http://research.vet.upenn.edu/Default.aspx?tabid=4072>

### *Respiration Rate*

The rate of respiration is measured by counting the number of times an animal exhales for a period of 15 seconds and then multiply that number by 4. This information should then be recorded. Additionally, the quality for an animal's breathing should be noted and recorded. For example:

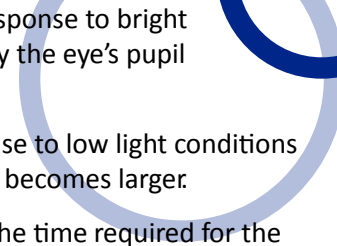
- Are the breaths strong or shallow?
- Does the animal make abnormal sounds while breathing (e.g., gasping; wheezing; whistling)?

Other important observations of the respiratory system include:

- Does the animal struggle to breathe?
- What is the color of the animal's gums? Pink is healthy; blue indicates a lack of oxygen.

Keep a written record of these types of observations. They represent valuable information to share with a veterinarian.

# Concepts and Vocabulary

- 
- **Body Temperature:** The level of heat produced and maintained by body processes. Characteristic of birds and mammals. Variation (too high or too low) in body temperature is an indicator of illness and other abnormalities.
  - **Circulatory System:** The circulatory system carries blood and other substances throughout the body of an animal. Organs in the body related to this system include the heart and blood vessels such as arteries, veins, and capillaries.
  - **Fever:** An abnormally high body temperature.
  - **Heart Rate (Pulse):** The rate at which an animal's heart beats, calculated as the number of beats per minute.
  - **Hypothermia:** An abnormally low body temperature.
  - **Nervous System:** The nervous system in animals controls senses, action, and blood flow. It interacts with every system in the body. There are two parts to the nervous system, the central nervous system that includes the brain and spinal cord, and the peripheral nervous system that includes neurons that carry signals to muscles and glands.
  - **Pupil Constriction:** A response to bright light conditions whereby the eye's pupil becomes smaller.
  - **Pupil Dilation:** A response to low light conditions whereby the eye's pupil becomes larger.
  - **Pupil Response Time:** The time required for the pupil to respond to changes in light intensity.
  - **Respiration Rate:** An animal's rate of breathing, calculated as the number of breaths per minute.
  - **Respiratory System:** The respiratory system allows for the exchange of oxygen and carbon dioxide from the body. Air moves in (inhalation) and out (exhalation) of lungs where oxygen is taken in and carbon dioxide is released. The principal organs involved with the respiratory system are the lungs.
  - **Vital Signs:** Indicators of specific physical conditions and are associated with different organ systems. The most common vital signs measured are body temperature, heart rate (pulse), and respiration (breathing) rate. Collectively these are referred to as TPR.

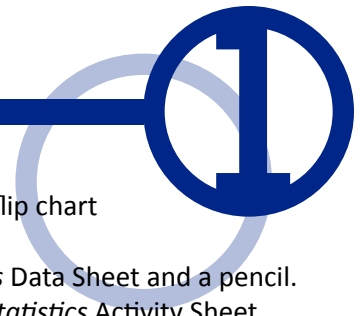
## Life Skills Targeted

- Sharing, concern for others, empathy, cooperation, communication, keeping records, planning/organizing, goal setting, critical thinking, problem solving, decision making, learning to learn, disease prevention, self-discipline, self-responsibility, teamwork, responsible citizenship, leadership

## Next Generation Science Standards: Cross-Cutting Concepts Supported

- Patterns
- Cause and Effect – Mechanism and Prediction
- Structure and Function
- Stability and Change

# Activity 1: Measuring and Recording Basic Health Information and Statistics



## Learning Objectives:

- Beginner: Measuring Vital Signs
- Intermediate/Advanced: Measuring Vital Signs

## Suggested Groupings: Pairs

**Time Required:** 30-45 minutes

## Materials Needed

- \**Vital Statistics* Data Sheet (APPENDIX A; one sheet per person)
- \**Vital Statistics* Activity Sheet (APPENDIX B; one per pair of youth)
- Pencils (one per person)
- Timer (one per pair of youth)
- Plastic cup half-filled with water (one per pair of youth)
- Penlight (one per pair of youth)
- Flip chart paper (one sheet per pair of youth)
- Markers (1-2 per pair of youth)

\**Materials supplied in curriculum*

## Getting Ready

- Provide each pair of youth with a piece of flip chart paper and markers.
- Provide each youth with one *Vital Statistics* Data Sheet and a pencil.
- Provide each pair of youth with one *Vital Statistics* Activity Sheet.

## Opening Questions/Prompts

1. Explain what you know about physical exams veterinarians perform on animals. Ask the youth to record their ideas on the flip chart paper provided.
2. Explain why you think it is important for veterinarians to keep written records of their patients' health checks. Ask the youth to record their ideas on the flip chart paper provided.

## Procedure (Experiencing)

Working in pairs, have youth decide who will be youth "A" and who will be youth "B" for this activity. Ask youth to complete the "Background Information" section on the data sheet provided.

### Observations

1. Youth "A" will observe youth "B" first.
2. Youth "A" should ask youth "B" the following questions. Responses

should be recorded under the *Behavior* section on the data sheet provided:

- Have you noticed any changes in your appetite recently? If so, please explain.
- Have you noticed any changes in your weight recently? If so, please explain.

**Note:** Youth should also note and record the strength and quality (e.g., gravelly, hoarse, ringing, nasal, shrill) of youth "B's" voice.

3. Youth "A" should ask youth "B" to walk 10-15 steps in one direction, turn around, and walk back.
  - Youth "A" should look for any limping, unusual foot or leg positioning, atypical posture, etc. Record this information under the *Movement* section of the data sheet provided.
4. Youth "A" should next ask youth "B" if he/she has experienced any recent injury or had any condition that caused pain. If so, ask them to explain. Record this information under the *Pain Indicators* section of the data sheet provided.
5. Switch places and repeat the procedures.

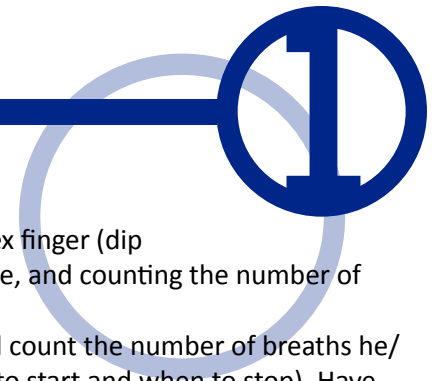
### Temperature

**Note:** For this activity, assume a normal body temperature (37°C) for all youth. This statistic has already been recorded under the *Body Temperature* section of the data sheet provided.

### Resting Heart Rate (Pulse)

1. Youth "B" should find his/her pulse by placing the tips of two fingers lightly on the inside of their left wrist (see Figure 1) or by placing the tips of two fingers lightly on the left side of their neck immediately below the angle of the jaw (see Figure 2).
2. Youth "B" should measure his/her pulse while youth "A" watches the timer and records the data. Youth "B" should count the number of beats he/she detects in 10 seconds (**Note:** Using the timer, youth "A" should indicate when to start and when to stop). Have the youth multiply the number of beats per 10 seconds x 6 to determine youth "B's" heart rate per minute. This represents youth "B's" resting heart rate and should be recorded.
3. The youth should switch places and repeat the procedures.

## Activity 1: Measuring and Recording Basic Health Information and Statistics (continued)



### Procedure (Experiencing) (continued)

#### Resting Respiration Rate

1. Ask youth "B" in each pair to find his/her respiration rate by moistening their index finger (dip it into a glass of water), holding his/her finger parallel to their lips under their nose, and counting the number of breaths they feel on their moistened finger as they exhale through their nose.
2. Have youth "A" in each pair watch the timer and record the data. Youth "B" should count the number of breaths he/she detects in 10 seconds (**Note:** Using the timer, youth "A" should indicate when to start and when to stop). Have the youth multiply the number of breaths per 10 seconds x 6 to determine their respiration rate per minute. This represents youth "B's" resting rate of respiration and should be recorded.
3. Ask the youth to switch places and repeat the procedures.

#### Pupil Response

1. Have youth stand close and face each other.
2. Ask youth "A" to observe the pupils of youth "B." Ask them to record their observations (e.g., color and shape).
3. Next, have youth "A" take the penlight, point it to the outside of one eye, and move the light slowly across the eye toward the center of youth "B's" face. Ask the youth to observe the eye's response and record their observations. Repeat this procedure with the other eye. (**Note:** The eye must be kept open during this procedure. Additionally, the light should pass slowly and evenly across the eye; please remind the youth to avoid leaving the beam of light on the eye for more than just a few seconds.)
4. Ask the youth to switch places and repeat the procedures.

### Sharing, Processing, and Generalizing

Working together in a small group, follow the lines of thinking that have been developed by the youth through their explorations and sharing of their observations and comparisons. Specific questions/prompts might include:

1. Compare the data sheets within and between pairs of youth. Ask the youth to discuss their observations and comparisons. Ask youth to record these observations, comparisons, and impressions on the flip chart paper provided.
2. Ask the youth to describe any unexpected observations or results. Record these on the flip chart paper provided.
3. Ask youth to discuss how they went about reaching their conclusions. Additionally, ask them to think about how their conclusions from this activity might be similar to or different from monitoring vital signs in animals. Discuss how this information might be useful in caring for animals. Ask youth to record their ideas on the flip chart paper provided.

**Facilitator Tip:** Ask each pair to present their thoughts and ideas to the other youth. Discuss similarities and differences.

### Concept and Term Discovery/Introduction

At this point of the activity facilitators need to ensure that the following terms and concepts have either been discovered by the youth during their exploration or introduced by the facilitator:

**Body Temperature, Circulatory System, Fever, Heart Rate (Pulse), Hypothermia, Nervous System, Pupil Constriction, Pupil Dilation, Pupil Response Time, Respiration Rate, Respiratory System, Vital Signs**

**Facilitator Tip:** The goal is to have the youth develop an understanding of the concepts through their exploration and define the terms using their own words.

### Concept Application

**Facilitator Tip:** The concept application activity for this module follows Activity 2.