Healthy Nervous and Endocrine Systems

Teacher's Guide
Middle School

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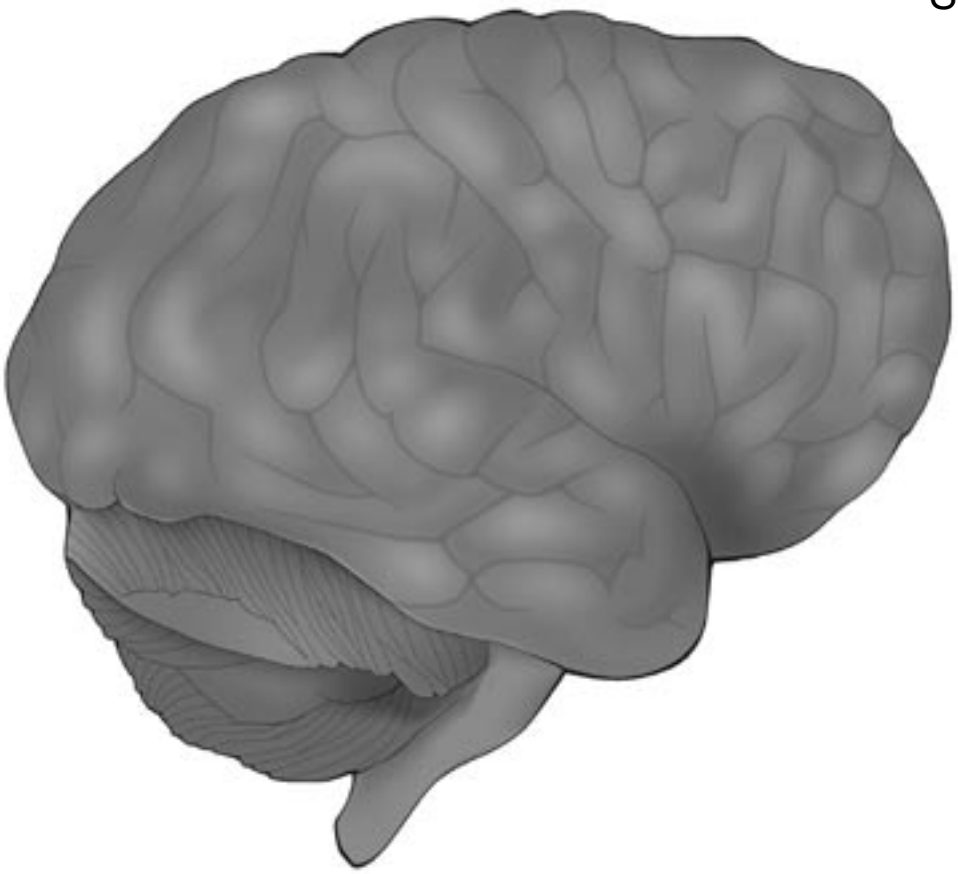

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A Message from our Company. . .

Dear Educator:

Thank you for your interest in the educational videos produced by the Visual Learning Company. We are a Vermont-based, family owned and operated business specializing in the production of quality educational science videos and materials.

We have a long family tradition of education. Our grandmothers graduated from normal school in the 1920's to become teachers. Brian's mother was an elementary teacher and guidance counselor, and his father was a high school teacher and superintendent. This family tradition inspired Brian to become a science teacher, and to earn a Ph.D. in education, and led Stephanie to work on science educational programs at NASA.

In developing this video, accompanying teacher's guide, and student activities, our goal is to provide educators with the highest quality materials, thus enabling students to be successful. In this era of more demanding standards and assessment requirements, supplementary materials need to be curricular and standards based - this is what we do!

Our videos and accompanying materials focus on the key concepts and vocabulary required by national and state standards and goals. It is our mission to help students meet these goals and standards, while experiencing the joy and thrill of science.

Sincerely,

Brian and Stephanie Jerome

National Standards Correlations

National Science Education Standards

(Content standards: 9-12, National Academy of Sciences)

Life Science (Content Standard C - Structure and Function in Living Systems)

As a result of activities in grades 5-8, all students should develop understanding of:

- The human organism has systems for digestion, respiration, reproduction, circulation, excretion, movement, control, and coordination, and for protection from disease. These systems interact with one another.

Science in Personal and Social Prespective (Content Standard F - Personal Health)

- The potential for accidents and existence of hazards imposes the need for injury prevention. Safe living involves the development and use of safety precautions and the recognition of risk in personal decisions. Injury prevention has personal and social dimensions.

Benchmarks for Science Literacy

(Project 2061 – AAAS)

The Human Organism - Human Identity (6A)

By the end of the 8th grade, students should know that:

- Like other animals, human beings have body systems for obtaining and providing energy, defense, reproduction, and the coordination of body functions.

The Human Organism - Basic Functions (6C)

- Interactions among the senses, nerves, and brain make possible the learning that enables human beings to cope with changes in their environment.
- Hormones are chemicals from glands that affect other body parts. They are involved in helping the body respond to danger and in regulating human growth, development, and reproduction.

Student Learning Objectives

Upon viewing the video and completing the enclosed student activities, students will be able to do the following:

- Appreciate the important roles the nervous and endocrine systems play in controlling and regulating functions of the human body.
- List three examples of senses and the structures responsible for the senses.
- Understand that the nervous system is the control center of the body.
- Differentiate between the central nervous system and peripheral nervous system.
- State the major components of the central nervous system such as the brain and spinal cord.
- Describe the role of the peripheral nervous system.
- Briefly explain how the peripheral nervous system and central nervous system work together to gather information, and process it.
- Discuss some of the various problems which may arise with the nervous system such as strokes, concussions, and infections.
- Stress the importance of preventing and avoiding injuries to the nervous system. List some things everyone should do to prevent injuries including wearing a helmet, buckling seat belts, wearing protective eye wear, preventing damage to hearing, and avoiding the consumption of dangerous substances such as drugs and alcohol.
- Understand why the endocrine system is considered to be the body's regulator.
- Explain that glands are the major structures in the endocrine system responsible for secreting hormones.
- State the function of the following structures in the endocrine system: pituitary gland, thyroid gland, and pancreas.
- Briefly describe a couple of problems which may occur with the endocrine system such as problems with the thyroid gland, and diabetes.
- Explain the importance of eating a healthy diet, regular exercise, and having an annual physical examination.

Assessment

Preliminary Assessment:

The Preliminary Assessment, provided in the Student Masters section, is an assessment tool designed to gain an understanding of students' pre-existing knowledge. It can also be used as a benchmark upon which to assess student progress based on the objectives stated on the previous pages.

Video Review:

The Video Review, provided in the Student Masters section, can be used as an assessment tool or as a student activity. There are two main parts. The first part contains questions that can be answered during the video. The second series of ten questions consists of a video quiz to be answered at the conclusion of the video.

Post Assessment:

The Post Assessment, provided in the Student Masters section, can be utilized as an assessment tool following completion of the video and student activities. The results of the Post Assessment can be compared against the results of the Preliminary Assessment to evaluate student progress.

Introducing the Video

Before showing the program to your students ask them if they have ever been sick and had swollen glands in their necks. You may also want to ask them if they know anyone who has diabetes or another endocrine system disorder. Write the term endocrine system on the board. Briefly explain that the major function of the endocrine system is to secrete hormones which regulate a wide range of body functions. You may want to introduce the terms gland and hormone.

Next, ask students to gently tap their heads. Have them describe how their head feels. Explain to them the reason their head feels hard is because underneath the hair and skin is bone. Ask them if they know the name of the bone, and ask them if they know what its primary purpose is. Next, ask your students if they or anyone they know have ever had a concussion. Explain that a concussion is an injury to the brain. Discuss why an injury to the head can be a serious matter. Discuss the fact the brain is the control center of hte nervous system. Tell students to pay close attention to the program to learn about the nervous and endocrine systems and how these systems function.

Video Viewing Suggestions

The student Master “Video Review” is provided for distribution to students. You may choose to have your students complete this Master while viewing the program or to do so upon its conclusion.

The program is approximately twenty minutes in length and includes a ten question video quiz. Answers are not provided to the Video Quiz on the video, but are included in this teacher’s guide. You may choose to grade student quizzes as an assessment tool or to review the answers in class.

The video is content-rich with numerous vocabulary words. For this reason you may want to periodically stop the video to review and discuss new terminology and concepts.

Video Script: Healthy Nervous and Endocrine Systems

1. Humans can do amazing things.
2. Physically, the body can perform acrobatic movements,
3. ...run great distances,
4. … and accomplish things that take a great deal of strength and coordination.
5. Humans are also capable of producing masterful works of art,
6. … and playing complex music.
7. Over the centuries the human mind has produced millions of books,
8. … developed scores of different languages,
9. … and created complex machines,
10. ...such as space vehicles and computers.
11. How does the human body accomplish these feats, and how does the body regulate its functions?
12. You might be surprised to learn that our nervous and endocrine systems play a vital role in helping us do all of these things.
13. What are some of the parts of these systems and how do they function?
14. And, what are some of the problems which may occur in the nervous and endocrine systems?
15. During the next few minutes we are going to explore these questions and others, as we investigate the health of the nervous and endocrine systems.
16. **Graphic Transition – The Nervous System**
17. Have you ever walked into your house and smelled the odor of fresh baked cookies?
18. Your eyes most likely scanned the kitchen for the cookies.
19. You located them, picked one up, took a bite, and you heard it crunch in your mouth. Ah, delicious!
20. These are examples of your senses at work. We have five senses including smell, sight, touch, hearing, and taste.
21. **You Decide!** Where is the information gathered by the senses sent and processed.
22. The information is sent to your brain – a very important part of the nervous system.
23. This control tower is the command center of this busy airport.
24. Similarly, the nervous system is the control center of the human body.
25. There are two main sections of the nervous system: the central nervous system, and the peripheral nervous system. Both work together.

Script (cont.)

26. The central nervous system includes the brain which is encased in your skull,
27. …and the spinal cord which is protected by vertebrae making up the backbone.
28. The peripheral nervous system consists of all the other nerves in the body.
29. Sense organs such as eyes, skin, and ears send messages via the peripheral sensory system to the central nervous system.
30. In turn, the brain responds by sending messages back through the central nervous system to various parts of the peripheral nervous system.
31. Both systems consist of specialized cells called neurons.
32. Neurons are very sensitive cells in that they respond to small electrical charges which act like messages.
33. Messages are able to travel along neurons at incredible speeds of over hundreds of kilometers per hour; as fast as this high speed jet!
34. The brain in the central nervous system is the most complex organ on the planet.
35. It consists of different types of specialized nerve tissue which perform a wide variety of tasks from storing information, to processing sensory stimuli, to controlling body functions like balance and breathing.
36. Scientists are still learning new things about the way the brain works everyday.
37. The spinal cord consists of a long bundle of neurons running the entire length of your back.
38. The spinal cord relays messages from all parts of the body to your brain,
39. …and from your brain to muscles and glands.
40. If you did not have a peripheral nervous system, the brain would not be able to control your body.
41. The brain uses the peripheral nervous system to control actions of different parts of the body.
42. This is just a brief, simplistic look at some of the main features of the very complex nervous system.
43. **Graphic Transition – Common Problems of the Nervous System**
44. If you have ever fallen on the ground and hit your head,
45. …or have had a severe blow to the skull while playing a sport, you may have received a concussion.
46. **You Observe!** What is the very important organ located beneath the skull?
47. That's right, it's the brain.
48. A concussion is an injury to the brain that can be caused by a significant blow to the head or by a violent shaking of the brain.
49. One of the important jobs of the skull is to protect the brain.

Script (cont.)

50. But, if the skull is hit hard enough, the brain can be injured resulting in a concussion.
51. While concussions are often not serious, they can result in loss of memory and hospitalization.
52. Severe head trauma, however, such as that received during a bad fall or car accident can cause permanent or long-lasting brain damage.
53. Another brain related problem may occur as a result of a stroke.
54. More common in older people, strokes occur when there is a lack of blood flow to a portion of the brain causing the brain tissue to be damaged.
55. A stroke may cause brain damage or paralysis.
56. Paralysis is the partial or total loss of the ability to use muscles.
57. Strokes, or other injuries to the brain or spinal column can result in paralysis.
58. While paralysis may limit a person's mobility – it does not prevent them from leading active lives.
59. The nervous system can also be harmed in another way – by microorganisms.
60. There are several harmful microorganisms which can infect the nervous system.
61. Rabies and polio are examples of nervous system disorders caused by microorganisms.
62. **Graphic Transition – Caring for the Nervous System**
63. An injury to the central nervous system, whether it be to the brain or spinal cord is a serious matter.
64. Therefore, it is well worth the effort to decrease the chances of such injuries in our day-to-day lives.
65. One of the most important things you can do to protect your nervous system is to buckle your seat belt every time you get in a car.
66. The impact of hitting your head on the windshield or other part of the car at high speeds can be fatal.
67. Every year 42,000 people are killed in the United States in car accidents alone, with the majority of deaths due to head injuries.
68. So, buckle up!
69. If you ride a bicycle, motorcycle, skateboard, snowboard, ski, rock climb or do any other activity in which you could fall or hit your head, wear a helmet.
70. Helmets, when worn properly, help prevent concussions and other serious head injuries.
71. But remember, a helmet only protects your head if you wear it!
72. Protecting specific sense organs is also important.
73. **You Predict!**
    What can be the consequence of continued exposure to loud sounds?

Script (cont.)

74. Continued exposure to loud sounds such as music or machinery can cause permanent hearing damage.
75. Wear earplugs or other ear protection, when working around loud machinery.
76. Protect your eyes by wearing safety goggles when necessary.
77. And wear sunglasses when outside in bright sunlight.
78. And, of course, avoid drugs, tobacco, and alcohol, all of which can damage the nervous system.
79. It is also important to have a physical examination once a year so a medical professional can examine various components of your nervous system.
80. **Graphic Transition – The Endocrine System**
81. If you have ever been sick perhaps you have felt swollen glands in your neck.
82. Glands such as the ones in your neck, are located throughout your body, and make up part of the endocrine system.
83. You can think of the endocrine system as the body's regulator.
84. The endocrine system is composed of tissues and organs throughout the body that secrete hormones.
85. Glands are the specific structures which make and release hormones.
86. "Hormones" are chemicals carried in the blood which are responsible for triggering a wide variety of changes in different parts of the body.
87. If you're suddenly alarmed by a passing train you may have felt a rush of adrenaline throughout your body.
88. "Adrenaline" is one type of hormone which is excreted by adrenal glands, and often causes the body to take quick action.
89. Many different hormones are secreted by a variety of glands.
90. The pituitary gland, for example, located here at the base of the brain, regulates other glands in the body, and is sometimes referred to as the "master gland."
91. The thyroid, another gland, releases a hormone which controls the rate of metabolism in the body.
92. The pancreas is an organ which secretes insulin. It regulates blood-sugar levels and regulates substances which influence digestion.
93. Males and females have different glands which secrete hormones that cause changes in the body as adolescents mature into adults.
94. These are just a few examples of the many different glands and hormones which regulate activities in the body.
95. **Graphic Transition – Problems of the Endocrine System**
96. The health of the body depends on hormones being released at the right time,

Script (cont.)

and in the correct amounts.

97. Diabetes is a condition in which the hormone insulin is not released in sufficient amounts, or at all. Insulin is produced by certain cells in the pancreas. It is a very important hormone because it regulates levels of sugar in the blood.
98. Therefore, a person with insulin-dependent diabetes has to carefully monitor their blood sugar, follow a special diet,
99. ...and take insulin on a regular basis to regulate sugar levels.
100. If a person with diabetes keeps blood sugar levels under control they will live a long, active, and normal life.
101. Another common problem with the endocrine system is related to the thyroid gland.
102. The thyroid gland controls the rate at which the body uses energy.
103. If the thyroid gland produces too little or too much hormone a wide variety of problems with the body may occur.
104. Both thyroid conditions, once diagnosed, are commonly treated with medications.
105. **Graphic Transition – Caring for the Endocrine System**
106. As with other body systems overall good health habits are important in maintaining a healthy endocrine system.
107. Eating a healthy balanced diet, and regular exercise are important.
108. Obtaining sufficient sleep and rest are also essential elements.
109. A regular annual physical examination is also recommended.
110. In a physical examination, a medical professional can evaluate your overall fitness, physical development, and body health.
111. **Graphic Transition – Summing Up**
112. During the past few minutes we have discussed some of the interesting features of the nervous,...
113. ...and endocrine systems.
114. We began by exploring some of the general characteristics and functions of the central and peripheral nervous systems.
115. The role neurons play in transmitting messages in the nervous system was discussed.
116. Key things everyone can do to prevent damage to the nervous system were demonstrated including buckling seat belts, wearing helmets when necessary, avoiding dangerous substances, and having annual physical examinations.
117. Next, we covered some of the major structures and functions of the endocrine system.

Script (cont.)

118. More specifically glands, hormones, and their roles were explained.
119. Some specific endocrine system problems were discussed including diabetes.
120. Last we discussed a couple of ways to care for the endocrine system.
121. Like eating a healthy well balanced diet, and seeing a medical professional for a physical exam on a yearly basis.
122. So, the next time you play a sport,...
123. ...use your senses,
124. ...or marvel at the ways the body regulates itself,
125. ...think about some of the things we discussed in the past few minutes.
126. You just might think about the health of your nervous and endocrine systems a little differently.
127. **Graphic Transition – Video Assessment**

Fill in the correct word to complete the sentence. Good luck and let's get started.

1. The brain and spinal cord make up the _____ nervous system.
2. Nerve cells are referred to as _____.
3. Sense organs are part of the _____ nervous system.
4. A _____ is an injury to the brain.
5. Whenever you ride in a car, _____ to prevent injuries.
6. When skateboarding or bicycling always wear a _____.
7. The endocrine system is responsible for _____ many different body processes.
8. _____ are responsible for secreting hormones.
9. Diabetes is a condition in which the hormone _____ is insufficiently produced.
10. It is important to rest, eat a balanced diet, and have an annual physical _____.

Answers can be found on page 17

Student Assessments and Activities

Assessment Masters:

- Preliminary Assessment
- Video Review
- Post Assessment

Student Activity Masters:

- A Sense of Taste
- Reaction Time
- Vocabulary of *Healthy Nervous and Endocrine Systems*

Answers to Student Assessments

Preliminary Assessment (pgs. 20-21)

1. senses
2. central
3. neurons
4. concussion
5. stroke
6. seat belt
7. endocrine
8. glands
9. diabetes
10. physical
11. true
12. false
13. true
14. true
15. false
16. false
17. true
18. true
19. true
20. false

Video Review (p. 22)

1. The information is sent to your brain – a very important part of the nervous system.

2. The very important organ located beneath the skull is the brain.

3. Continued exposure to loud sounds such as music or machinery can cause permanent hearing damage.

Video Quiz (p. 22)

1. central
2. neurons
3. peripheral
4. concussion
5. buckle up
6. helmet
7. regulating
8. glands
9. insulin
10. examination

Post Assessment (pgs. 23-24)

1. stroke
2. physical
3. senses
4. seat belt
5. diabetes
6. central
7. glands
8. neurons
9. endocrine
10. consussion
11. false
12. true
13. false
14. true
15. true
16. true
17. true
18. false
19. false
20. true

Answers to Student Activities

A Sense of Taste (p. 25-26)

Solution	Area of Tongue Sensed
Sugar	tip of tongue
Vinegar	side edges of tongue
Salt	front, center of tongue
Bitter	back, center of tongue

1. The tip of the tongue is responsible for tasting sweetness.

2. The front, center portion of the tongue detects salty tastes.

3. Much of the food we taste is greatly influenced by the smell of food. Our sense of smell detects a much wider range of odors than we taste.

Reaction Time (p. 28-29)

1. Answers will vary depending on student reaction time.

2. The reaction time of many people improves with practice.

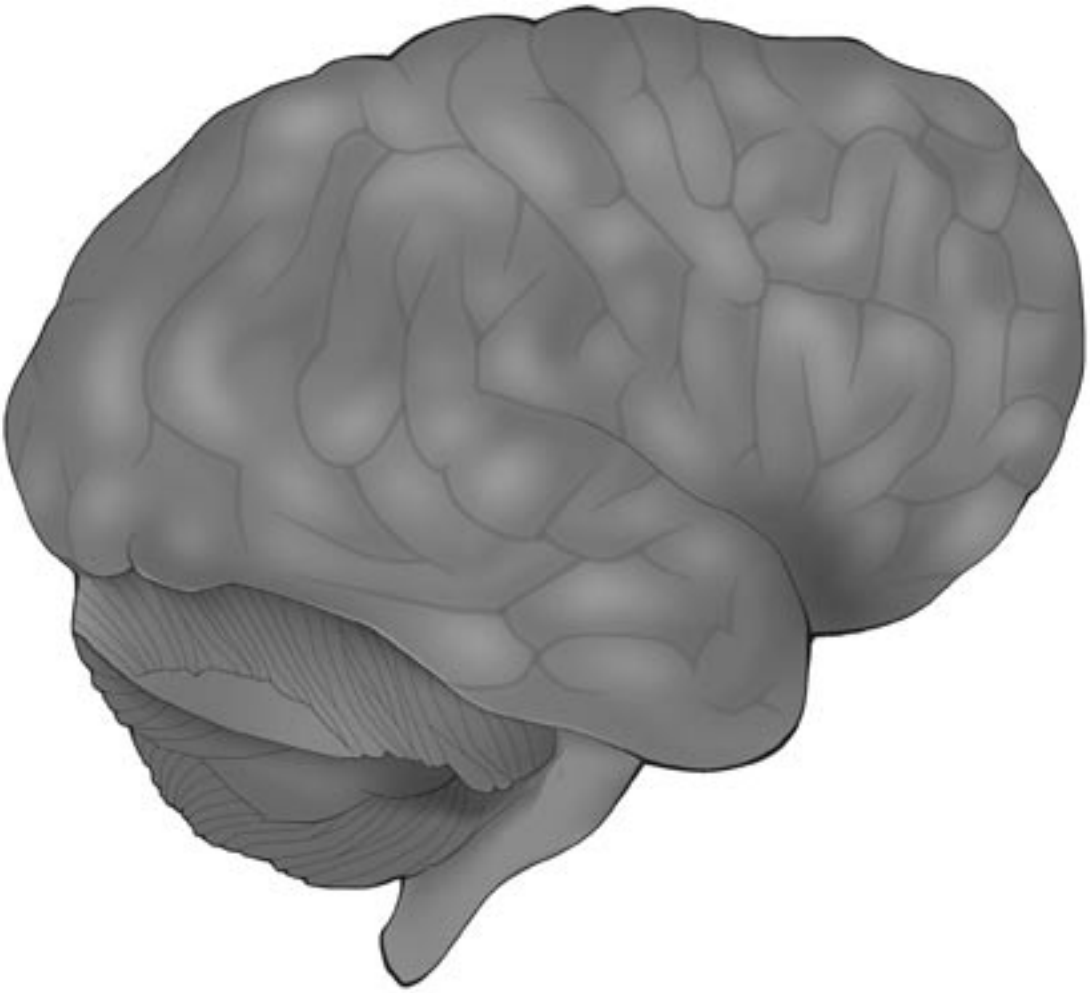
3. The eyes notice the ruler being dropped. They send this message to the brain. In turn the brain processes this information and sends a message to the finger muscles telling them to catch the ruler.

4. Some factors which may slow down reaction time include being very tired, being distracted, or having a cold.

Vocabulary of Healthy Nervous and Endocrine Systems (p. 30)

1. h - central nervous system
2. c - brain
3. f - peripheral nervous system
4. a - concussion
5. j - stroke
6. e - helmet
7. b - endocrine system
8. i - glands
9. d - hormones
10. g - pituitary gland

Assessment and Student Activity Masters



 Name _____

Preliminary Assessment

Directions: Fill in the blank with the correct word. A list of possible answers is provided at the bottom of the page.

1. Smell, touch, and sight are all _____.

2. The _____ nervous system includes the brain and spinal cord.

3. _____ are specialized cells which carry messages in the the nervous system.

4. A _____ is an injury to the brain often caused by a blow or severe shaking of the head.

5. A _____ occurs when there is a lack of blood flow to a part of the brain.

6. Every time you ride in a car buckle your _____ _____ to prevent injury in the event of an accident.

7. You can think of the _____ system as the body's regulator.

8. _____ are structures which produce and release hormones.

9. _____ is a condition in which the body does not correctly regulate levels of sugar in the blood.

10. It is recommended you receive a _____ examination once a year.

diabetes
seat belt
concussion
central
endocrine
glands
senses
stroke
physical
neurons

Preliminary Assessment

Directions: Decide whether the statement is true (T) or false (F).

11. The nervous system is often considered the control center of the human body. T F

12. The brain is encased in the vertebral column. T F

13. If you did not have a peripheral nervous system, the brain would not be able to control the human body. T F

14. The brain is a very complex organ that we are still learning about. T F

15. A concussion occurs when blood flow is cut off to the brain. T F

16. It is not necessary to wear a helmet while bicycling, skateboarding or snowboarding. T F

17. Rabies and polio are examples of nervous system disorders caused by microorganiams. T F

18. Continual exposure to loud sounds such as loud music or machinery can cause permanent hearing damage. T F

19. Hormones are chemicals in the blood responsible for regulating a wide variety of functions. T F

20. The pituitary gland is a relatively unimportant gland which the body does not need. T F

Video Review

Directions: During the course of the program, answer the questions as they are presented in the video. At the end of the video, answer the Video Quiz questions.

You Decide!

1. Where is the information gathered by the senses sent and processed?

You Observe!

2. What is the very important organ located beneath the skull?

You Predict!

3. What can be the consequence of continued exposure to loud sounds?

Video Quiz: Fill in the correct word to complete the sentence.

1. The brain and spinal cord make up the _____ nervous system.

2. Nerve cells are referred to as _____.

3. Sense organs are part of the _____ nervous system.

4. A _____ is an injury to the brain.

5. Whenever you ride in a car, _____ to prevent injuries.

6. When skateboarding or bicycling always wear a _____.

7. The endocrine system is responsible for _____ many different body processes.

8. _____ are responsible for secreting hormones.

9. Diabetes is a condition in which the hormone _____ is insufficiently produced.

10. It is important to rest, eat a balanced diet, and have an annual physical _____.

 Name _____

Post Assessment

Directions: Fill in the blank with the correct word. A list of possible answers is provided at the bottom of the page.

1. A _____ occurs when there is a lack of blood flow to a part of the brain.

2. It is recommended you receive a _____ examination once a year.

3. Smell, touch, and sight are _____.

4. Every time you ride in a car buckle your _____ _____ to prevent injury in the event of an accident.

5. _____ is a condition in which the body does not correctly regulate levels of sugar in the blood.

6. The _____ nervous system includes the brain and spinal cord.

7. _____ are structures which produce and release hormones.

8. _____ are specialized cells which carry messages in the the nervous system.

9. You can think of the _____ system as the body's regulator.

10. A _____ is an injury to the brain usually caused by a blow or severe shaking of the head.

glands	neurons
physical	senses
endocrine	concussion
diabetes	seat belt
stroke	central

 Name _____

Post Assessment

Directions: Decide whether the statement is true (T) or false (F).

11. A concussion occurs when blood flow is cut off to the brain. T F

12. Continual exposure to loud sounds such as loud music or machinery can cause permanent hearing damage. T F

13. The pituitary gland is a relatively unimportant gland which the body does not need. T F

14. Rabies and polio are examples of nervous system disorders caused by microorganiams. T F

15. Hormones are chemicals in the blood responsible for regulating a wide variety of functions. T F

16. The nervous system often is considered the control center of the human body. T F

17. If you did not have a peripheral nervous system, the brain would not be able to control the human body. T F

18. It is not necessary to wear a helmet while bicycling, skateboarding or snowboarding. T F

19. The brain is encased in the vertebral column. T F

20. The brain is a very complex organ that we are still learning about. T F

 Name _____

A Sense of Taste

Background: If you are like most people, you enjoy eating. And you probably have some favorite foods. Maybe you enjoy eating sweets such as cake, or salty foods such as pretzels. But, have you ever wondered what parts of your mouth sense these different tastes? Maybe you aren't aware of it, but the tongue is the part of the mouth responsible for taste. And, different parts of the tongue sense different tastes. In this activity you will identify the parts of the tongue that sense different tastes.

Materials:
3% salt solution
10% sugar solution
10% vinegar solution
nutmeg
cotton swabs
paper towels

Directions:

1. Obtain the materials listed above from your instructor.

2. Study the attached diagram of the tongue. Identify the four areas of the tongue to be tested. Each of these areas senses a different taste. The four general tastes we will test in this activity include salt, sweet, sour, and bitter.

3. Begin by having your partner dip a cotton swab into the 10% sugar solution. **Caution: only dip it in the solution one time.**

4. Extend your tongue and have your partner touch each area (one at a time) on your tongue. Tell your partner the area where you tasted the sweetness of the sugar. Discard the swab when done. Note this area on the data table and tongue diagram on the following pages.

5. Conduct the same test for your partner with a cotton swab and the 10% sugar solution. Identify the part of the tongue that senses sugar. Note this area on the diagram of the tongue.

6. Rinse your mouth out with water.

7. Repeat the same process with the 10% vinegar solution. Record the parts of the tongue which sensed the vinegar. This part of the tongue senses sour tastes. Do the same test for your partner. Note this area on the data table and tongue diagram on the following pages.

A Sense of Taste cont.

Directions continued:

8. Rinse your mouth out with water.

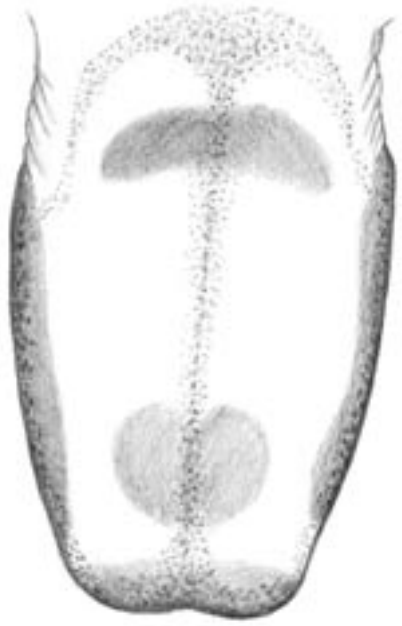
9. Repeat the testing process with the swab dipped in the 3% salt solution. Record the portion of the tongue which senses saltiness. Do the same test for your partner.

10. Rinse your mouth out with water.

11. Repeat the testing process with the swab dipped in the nutmeg. Record the portion of the tongue which senses bitterness. Do the same test for your partner.

Solution	Area of Tongue Sensed
Sugar	
Vinegar	
Salt	
Nutmeg	

A Sense of Taste cont.



Questions:

1. What part of the tongue tastes the sweetness in foods, like candy and cookies?

2. Describe the part of the tongue which senses salty foods such as pretzels and potato chips.

3. Why is food sometimes tasteless when you have a cold?

 Name _____

Reaction Time

Background: Have you ever touched something painful such as a hot or sharp object, and then suddenly pulled away your hand? You may have noticed that you did this so quickly you almost didn't think about it. This very fast, automatic reaction is called a reflex action. A reflex is an involuntary, automatic response to a stimulus. Reflex actions help prevent us from sustaining many severe injuries throughout the course of our lives. Ducking your head to avoid being hit by a ball, blinking when something comes near your eyes, and pulling your hand away from a hot pan are all examples of reflex actions. Reflexes also control many automatic activities in the body such as breathing, gagging, blinking, and the beating of the heart.

Contrasting reflex actions are nonreflex actions. In a nonreflex action behavior is under voluntary control. In other words the brain consciously processes and controls behavior. Information is sent to the brain where it is interpreted and processed. A response is then initiated. Activities such as writing, cooking, playing music, and many sports activities are examples of nonreflex actions.

Reaction time is a measure of how quickly a person perceives a stimulus and reacts to it. Reaction time plays an important factor in many sports, operating machinery, and in many other everyday activities. It is possible to measure reaction time. In this activity you will conduct a simple, fun activity to measure your own reaction time.

Materials: metric ruler, calculator, pencil

Directions:

1. In this activity you and a partner will measure your reaction time. First obtain the items listed in the Materials.
2. Have one person sit next to a table while placing his or her elbow on the table, and their hand extending over the side.
3. Have the other partner hold a metric ruler in the air with the 0-cm line between the persons thumb and index finger.
4. Without telling the person who is to capture the ruler, drop the ruler. The person sitting down should try to capture the ruler between their thumb and index finger as quickly as possible.
5. Measure the point on the ruler where it was caught in centimeters.
6. Record the distance the metric ruler fell next to Trial 1 on the data table.
7. Conduct the same procedure for 5 trials, recording the measurements in the data table.
8. Switch roles so that the other person can have an opportunity to catch the ruler.
9. Compute the average of the five trials by adding them up and then dividing by 5.
10. It is possible to calculate the time it takes for an object to fall a given distance by using the following formula: $t = \sqrt{\frac{2s}{a}}$

    where t = reaction time in seconds, s = distance metric ruler fell in centimeters, a = acceleration due to gravity (980 cm/sec^2)
11. Compute your reaction time by using this formula. Your answer should be in seconds (or fraction of a second).

Reaction Time (cont.)

Reaction Time Data Table

	Distance on Metric Ruler
Trial 1	cm.
Trial 2	cm.
Trial 3	cm.
Trial 4	cm.
Trial 5	cm.

Average Distance _____ cm.

Questions:

1. What was your reaction time and how did it compare to your partner's reaction time?

2. If you practiced this activity do you think your reaction time would improve?

3. Describe some of the features in your nervous system involved in capturing the ruler.

4. Explain some factors which might slow down reaction time.

Vocabulary of Healthy Nervous and Endocrine Systems

Directions: Unscramble the vocabulary words in the first column. Match the words to the definitions in the second column.

____ 1. teacrnl ruesonv ssmeyt _____ _____ _____

____ 2. riban _____

____ 3. rhaeeplirp ruesonv smtyes _____ _____ _____

____ 4. unsooiccsn _____

____ 5. toesrk _____

____ 6. ltmeeh _____

____ 7. cneneodir ymtess _____ _____

____ 8. dasgnl _____

____ 9. oonhresm _____

____ 10. ttiiaurpy ldnga _____ _____

a. an injury to the brain often caused by a blow or shaking of the brain

b. system responsible for regulating many activities in the body

c. part of the central nervous system; the most complex organ in the body

d. chemicals released into blood responsible for triggering a wide variety of functions in the body

e. should always be worn when engaging in activities where a head injury may occur

f. all the nerves in the body not including brain and spinal cord; senses information and sends it to the brain

g. gland located at the base of the brain; sometimes referred to as the "master" gland

h. consists of the brain and spinal cord.

i. structures which make and release hormones

j. a problem in which blood flow is cut off to a portion of the brain