

THE ENDOCRINE SYSTEM AND CHANGES IN HUMAN ADOLESCENCE

Grade Level: A Science Unit for Fifth Grade

Presented by: *Deborah Vlad*, Academy of Charter Schools, Denver, Colorado
Lisa Browning, Platte River Academy, Highlands Ranch, Colorado

Length of Unit: Three Lessons (7-10 days)

I. ABSTRACT

- A. The endocrine system and the changes of adolescence are two portions of the Core Knowledge study of the human body. We have combined the two as one mini-unit within the general topic of The Human Body, and have chosen to introduce the Endocrine System prior to Adolescent Changes in an attempt to make the latter information more valid and understandable for students.

II. OVERVIEW

A. Concept Objectives

1. The student will understand that there are many kinds of interactions in chemical and physical systems of the body.
2. The student will understand that feedback is an important feature of interactions in many systems.
3. The students will develop an awareness of the systemic change within the human body over the lifetime.

B. Content

1. “The Endocrine System” and “Changes in Human Adolescence”

C. Skills

1. Summarize the function of the endocrine systems holistically
2. Locate and name the various endocrine system glands
3. List the general functions of each gland
4. Identify the changes which occur during puberty/adolescence as the result of activity within the endocrine system.

III. BACKGROUND KNOWLEDGE

A. For the teacher

1. *The Visual Dictionary of the Human Anatomy* edited by Des Reid (part of the *Eyewitness Visual Dictionary* series)
2. *The Endocrine System* by Marjorie Little
3. *Changes in You and Me* (both boys’ and girls’ editions) by Paulette Bourgeois and Martin Wolfish, M.D.

B. For the student

1. Say to the students: “You probably remember studying certain body systems since first grade. The endocrine system, however, is a system about which you have probably not had previous instruction.” Ask students to recall other systems with which they are familiar and to explain briefly the functions of those systems in order to establish the base knowledge of your particular class group. (Muscular system, circulatory system, nervous system, respiratory system, digestive system, excretory system, etc.)

2. The study of the ENDOCRINE SYSTEM began as early as the 17th century. In England, a scientist named Thomas Wharton was able to disprove the idea that the human brain was just a gland whose job was to secrete mucous. He was also the first to see distinctions between ductless glands and those with ducts (ductile), thus separating the ENDOCRINE and EXOCRINE systems. During the 1660s, Theophile Bordeu, a French scientist generally considered to be the father of modern endocrinology, realized that certain glands and structures within the body produced substances that affected other parts of the body. In the 1690s, a Dutch scientist, Fredrik Ruysch, theorized that the thyroid gland was responsible for pouring “important substances into the blood stream.”
3. By the end of the 18th century, medical scientists were making direct connections between certain physical traits such as “bug” eyes, racing pulse, swollen neck, etc., with swelling in the thyroid gland (goiters), and the research around hyperthyroidism began. In 1849, British scientist Thomas Addison contributed much to the information about the endocrine system through his studies of patients with abnormal or diseased glands. That same year, German doctor A. A. Berthold produced information from his research with roosters proving that hormones traveled freely through the bloodstream. This information also confirmed his theory that the location of the production of the hormone was not the determining factor as to their function, but rather their mobility in the bloodstream enabled normal hormonal function.
4. Now we know that the endocrine system works in tandem with the nervous system in order to provide hormonal secretions throughout our bodies. The hormones produced within the glands of the endocrine system serve as “chemical messengers” in our bloodstream. Conversely, the nervous system is the “electrical” portion of the pair. When paired and working properly, the body constantly monitors the amount of each hormone, and when levels drop or increase significantly, both systems engage so that hormonal levels are again restored to proper levels. It should be noted, however, that while the nervous system works instantaneously with short-lived results, the endocrine system’s hormones act much slower but with longer-lasting results. It is within this system of biological checks and balances that we understand the concept of antagonistic hormones, as well. Hormones such as insulin, produced in the pancreas, belong to this category. When the body’s sensors register that a particular hormone exists in too great a quantity, it signals the producing gland to shut down production, using *negative feedback*. The body, of course, also utilized *positive feedback* in the production of hormones. An example of this is found in the female body with the menstrual cycle. As a female ovulates, or produces an egg once per month, the body begins secreting higher-than-usual amounts of *estrogen*. This release of estrogen signals the *pituitary gland* in the brain to produce yet another hormone, called LH.
5. This LH hormone stimulates the ovary to release the egg, which is then either fertilized (resulting in pregnancy), or is discarded by the body through menstruation.
6. Those are some of the things that happen within our bodies when the endocrine system is functioning properly. However, approximately 10% of the world’s general population will, at some time, suffer from some type of malfunction of the

endocrine system. Such diseases as hyperthyroidism, hypothyroidism, diabetes, and hypoglycemia all result from some dysfunction within the glands of the endocrine system. (The depth of study into these conditions is left to the discretion of the teacher.)

7. This unit will encompass study of the following glands within the endocrine system: the pituitary gland, the thyroid and parathyroid glands, the adrenal glands, the pancreas, the ovaries and testes. A brief summary of the location and function of each of these glands follows.
 - a. **THE PITUITARY GLAND:** Located in the base of the brain. Its primary function is to serve as the “master” gland in our bodies. It is ductless. It helps control growth of the entire body and produces hormones that control most all other glands. Conditions of clinical significance may be caused either by abnormality within the gland itself, or by malfunction of this gland as it relates to regulation of hormone production by other glands.
 - b. **THE THYROID GLAND:** Located in the neck, below the voice box (larynx). It produces a hormone that controls the rate at which the body processes and uses food energy. Conditions of clinical significance may include: hypothyroidism, hyperthyroidism, and goiter (enlarged thyroid gland).
 - c. **THE PARATHYROID GLAND:** Located in the neck, it secretes the hormone necessary for normal bone growth. It also controls the level of calcium in the body. Conditions of clinical significance include hyperthyroidism and hypothyroidism, both of which affect the levels of calcium in bones and plasma.
 - d. **THE ADRENAL GLANDS:** Located on top of the kidneys. It secretes several hormones, one of which, adrenaline, controls the rate of breathing and the pulse when you are scared (adrenaline). Adrenaline is often referred to as an “emergency hormone,” and this verbiage may help to cement the purpose for students. Conditions of clinical significance include Addison’s disease (with symptoms similar to simple anemia), Cushing’s syndrome (with symptoms of increased glucose levels in the blood and breakdown of proteins in the blood), Hyperaldosteronism, which is a depletion of potassium and causes swelling in the body, and adrenal tumors which can produce feminine characteristics.
 - e. **THE PANCREAS:** Located near the liver, this gland is both ductile and ductless. The ductless portion, the Islet of Langerhans, produces insulin and glucagon. Both of these hormones help control the amount of sugar in the bloodstream. Conditions of clinical significance include diabetes.
 - f. **OVARIES:** Located in females in the lower abdominal cavity. Produces estrogen, controls female maturation, pregnancy and the birth process.
 - g. **TESTES:** Located in males within the testicles. Produces testosterone, affects male growth characteristics (body hair, voice change, etc.)

(SEE OUTLINE FOR STUDENT NOTE-TAKING, Appendix A)
8. The endocrine system is also largely responsible for the changes in our bodies throughout our lifetimes. These changes include, but are not limited to, growth

spurts, increased hair growth (underarm and pubic), menstruation in females, voice changes in males, development of breasts in females and in reproductive organs for both, increased production of sweat and sebum (oily secretion by the sebaceous glands that produce pimples), excessive hunger, lethargy, and in later life, female menopause. (Explain at this point that menopause is the point in a female's life when she stops having menstrual periods. Help them remember by saying, "Look at the structure of the word MENOPAUSE. Think "meno" to remind you on menstruation and think "pause" to remind you of stopping. Menopause=menstruation stopping.)

9. SUMMARY: Endocrine system is made up of a system of glands that secrete hormones. These hormones control bodily functions, regulate levels of substances within the body/bloodstream, and regulate growth. Study of this body system began in earnest during the late 17th and early 18th centuries, and continues today.
10. NOTE: The Core Curriculum Science Biography related to this topic is for **PERCY LAVON JULIAN** (b. 4-11-1899 in Montgomery, Alabama). Julian attended DePauw University and graded Phi Beta Kappa and as class valedictorian. His research during the 1940s-50s with soybean oil extracts enabled him to produce sterols such as cortisone (used in the treatment of arthritis) at a cost of about 20 cents per gram. This steroid had previously been cost-prohibitive for consumers at a cost of hundreds of dollars per drop. Julian also produced synthetic versions of the male and female reproductive hormones, progesterone and testosterone, and he developed a foam fire extinguisher still used to snuff gas and oil fires. He died in 1975.
11. MAJOR GLANDS of this system include: Pituitary gland, adrenal glands, thyroid gland, parathyroid gland, pancreas, ovaries, and testes.

IV. RESOURCES

- A. *Puberty* by Jacqueline A. Ball
- B. *Changes in You and Me, A Book About Puberty Mostly for Boys* by Paulette Bourgeois and Martin Wolfish, MD
- C. *Changes in You and Me, A Book About Puberty Mostly for Girls* by Paulette Bourgeois and Martin Wolfish, MD
- D. *Human Body, How it Works* by Michael Gabb
- E. *What Your 5th Grader Needs to Know* by E. D. Hirsch
- F. *The Endocrine System* by Marjorie Little
- G. *The Visual Dictionary of Human Anatomy* by Des Reid
- H. *Human Anatomy and Physiology, Second Edition* by Alexander P. Spence and Elliott B. Mason

V. LESSONS

Lesson 1: The Endocrine System and Changes in Human Adolescence

A. Daily Objectives

1. Lesson Content

- a. Holistic function of THE ENDOCRINE SYSTEM
- b. Locations and function of major endocrine glands

2. **Concept Objective**
 - a. The student will understand that there are many kinds of interactions in chemical and physical systems of the body.
 - b. The student will understand that feedback is an important feature of interactions in many systems.
3. **Skill Objective or Standard(s)**
 - a. The students will demonstrate an understanding of the characteristics of living things and how they function.
 - b. The students will demonstrate ability to take notes and organize information.
 - c. The students will develop vocabulary particular to this unit.

B. Materials

1. Pencils
2. Paper for note-taking
3. Overhead projector and blank transparencies with vis-a-vis markers (also have a moistened paper towel or cloth to clean TPs)
4. HANDOUT: Outline format for Special Needs students (Appendix B)
5. HANDOUT: "Glands of the Endocrine System" for all students (Appendix C)
6. HANDOUT: Outline of body labeling location of endocrine glands (Appendix D)

C. Background notes (see Background Knowledge section)

D. Key Vocabulary

1. **Endocrine system:** a body system of ductless glands responsible for secreting **hormones** that help control certain bodily functions.
2. **Hormones:** chemicals **secreted** by the **endocrine system** which travel freely through the body, controlling and regulating many functions of the body.
3. **Secrete:** to produce a substance (e.g. hormones)
4. **Endocrinology:** the study of the **endocrine system**.
5. **Gland:** a special group of cells which produce substances that the body needs. There are two kinds: EXOCRINE glands produce substances excreted by the body such as saliva and sweat. ENDOCRINE glands produce hormones.
6. **Excretion:** when the body gives out substances such as saliva, sweat and urine.

E. Procedures and Activities

1. Conduct oral review of body systems. Ask students to recall other systems that they have studied and to explain the functions of those systems (e.g., respiratory, digestive, etc.). Review terms: organ, system, cycles (in nature).
2. Introduce ENDOCRINE SYSTEM as a system not studied previously. Tell students that they will take notes in outline form. *This format is considered to be a 5th grade skill in both the writers' schools, but should be modeled by teacher on board or using overhead projector.* See Appendix A. (NOTE: Special needs students will use a cloze format for note taking. See Appendix B.)
 - a. Start by asking students if they have ever ridden a roller coaster or been startled by something. When all have answered that they have, ask them what they noticed about their bodies right after that big drop on the roller coaster or right after being startled. (Most should answer that they breathed heavier and faster and that their heart rates were noticeably

faster.) Explain that these reactions are the result of their ENDOCRINE SYSTEM at work, and that this is one of the body systems that we can sometimes actually FEEL in action.

- b. Another example that could be used to stimulate thinking and discussion would be those instances we have all heard about in which an ordinary person is temporarily super-strong and is able to perform extraordinary feats, such as lifting a car off a person. Tell students that these instances are the result of, among other things, a sudden rush of adrenaline, produced by the adrenal glands of the ENDOCRINE SYSTEM. Ask students to think of other ways they can think of illustrating this system at work. Give historical information/scientist information as appropriate for your class. (See background research)
- c. Explain glands, using the outline provided in Appendix A for teachers. Be sure to highlight the two types of glands, and what characteristics distinguish the two. Give specific information for each of the individual glands we are studying, including the location and function of each. (See background research) Students might find it interesting to have the information provided herein about clinical conditions associated with malfunction of each gland (e.g., diabetes, dwarfism, etc.)
- d. Address the concepts of positive and negative feedback and how these are crucial to the normal function of the ENDOCRINE SYSTEM. Ask students to describe other examples of physiological feedback and how it starts/increases or stops/hinders other bodily processes (e.g. running raises both pulse rate and respiration in order to supply an increased amount of oxygen and other nutrients/energy to the body to support that activity). Review information from this lesson, and provide each student with a list of vocabulary words associated with this lesson. Students will define each word (in context) for a homework assignment due at the end of this lesson (probably Day Two). Ask students to explain or define concepts and vocabulary from the lesson. Encourage them to ask questions to provide clarification and closure (e.g. "Explain again the differences between the endocrine system and the exocrine system.") Tell students that in the next lesson, we will do an activity to further cement this information.

F. Evaluation/Assessment

1. Students will have completed outline with accurate information and proper outline format (for our schools).

G. Standardized Test Connections

1. The student listens attentively and engages actively in a variety of oral language experiences.
2. Students are familiar with outline format and purpose for outlining.

Lesson 2: The Endocrine System and Changes in Human Adolescence

A. Daily Objectives

1. Lesson Content

- a. Changes in Human Adolescence

2. **Concept Objectives**
 - a. The students will develop an awareness of the systemic change within the human body over the lifetime.
 - b. The student will understand that there are many kinds of interactions in chemical and physical systems of the body.
3. **Skills Objectives**
 - a. The students will make a connection between the function of the ENDOCRINE SYSTEM and changes that occur in our bodies, with particular emphasis on adolescence and puberty.
 - b. Students will be able to identify and discuss the physical and chemical changes that occur during puberty.
 - c. Students will compare adolescent changes in males with changes in females.

B. Materials

1. Text “What Every 5th Grader Needs to Know” by E. D. Hirsch
2. HANDOUT Appendix E: Changes during Puberty
3. Markers or colored pencils
4. Pencils
5. 3 sheets of plain/color 8.5”x11” computer paper for each student

C. Background Notes (see Background research section)

D. Key Vocabulary

1. **Puberty:** the physical changes to the body between childhood and adulthood. Also known as **adolescence**.
2. **Menstruation:** in the female, the monthly shedding of the lining of the uterus (if not pregnant).
3. **Sebaceous glands:** oil-making glands of the skin
4. **Sebum:** oily substance made in the sebaceous glands
5. **Mammary glands:** the milk-producing glands in the breast
6. **Ovulation:** the release of a mature egg from the ovary (females)
7. **Sweat glands:** the parts of your body that regulate body temperature by releasing water and salts

E. Procedures/Activities

1. Discuss/review information previously covered regarding the endocrine system and its function within the body. Tell students that the endocrine system is largely responsible for growth and change in their bodies from birth to death.
2. Ask students to define “puberty” and/or “adolescence.” Give notes or a handout including each of the vocabulary words above, discussing each word as it appears in the lecture/discussion to follow.
3. Using the material found in “What Your 5th Grader Needs to Know” (pp.353-354), introduce and discuss the stages of Human Growth.
4. Also on those pages is found information on Adolescence and Puberty. Provide a mini-lecture about this growth stage, emphasizing the role of the endocrine system and hormones at this time.
5. Ask students, “How do you think the changes that take place during puberty affect the rest of your body?” (BE READY FOR ODD ANSWERS.) Hand out

APPENDIX E, “Changes During Puberty” and go through each section. Ask students if they can think of any other changes during this time. Be careful to keep them focused only on those changes that are related specifically to puberty and the endocrine glandular excretions. You may need to steer students along this road carefully, as they may associate some changes that are NOT related to the endocrine system at this juncture. (Questions and associations with reproduction will be addressed in the next section of the Core Knowledge unit on The Human Body.)

6. Provide each student with his/her 3 sheets of computer paper. Demonstrate for the students how to fold and staple these sheets in order to produce a “flip-book”. Be VERY systematic in this instruction, making sure entire class is with you at all times. Instruct students to make ALL initial markings on this booklet in PENCIL so that mistakes may be corrected and changes can be made as students deem necessary. Instruct students to fold the first page from top to bottom to within about one inch of the bottom. Tell them to keep folds straight! Next, place the second sheet of paper behind the first sheet and bring the bottom down until about one inch is left beyond the bottom of the first sheet. Fold. This will make a total of 4 “flip” pages, with bottom margins each about one inch. Repeat this process with the third and final sheet, again keeping folds straight. When all folds and stacks are complete, students should have a total of six “flip” pages. Have students staple top of booklet (usually 3 staples is plenty) to hold it together. Instruct them to label first (shortest) flap “STAGES OF HUMAN GROWTH.”
7. Following the chart on page 353 of “What Your 5th Grader Needs to Know,” write on the board the various stages (we also included Death). Ask students to describe what a human body at each of the stages would look like (e.g., INFANT = BABY). Write each “mini-description” next to its label so that students can use this information to remember what they are to draw in their STAGES OF HUMAN GROWTH booklet. Pages are as follows:
 - a. Page 1: STAGES OF HUMAN GROWTH
 - b. Page 2: BABY and TODDLER (picture of each)
 - c. Page 3: CHILD and TEEN (picture of each)
 - d. Page 4: ADULT and MIDDLE AGE (w/ pictures)
 - e. Page 5: OLD AGE (and picture)
 - f. Page 6: DEATH* (and picture)

*If you choose *not* to use “DEATH” in your booklets, students may use this page to write a short summary of each stage. FOR SPECIAL NEEDS STUDENTS: Modify this activity by providing magazines and scissors for special needs students so that they can cut out magazine pictures for each stage rather than drawing them freehand, if their handicapping condition warrants this.
8. Ask students to share their booklets, discussing some of the physical changes that occur at each stage. This might be an appropriate time to introduce physical changes such as osteoporosis, menopause, etc. Ask students to think about why so many of the physical manifestations of aging occur in females, but not in males. (Prompt: the extra hormonal changes of a body preparing for, experiencing and recovering from childbearing years.)

9. Ask how osteoporosis might be related to the endocrine system. (Regulation of calcium in the body) Allow students to ask questions about growth/aging. Have them discuss (or do outside research) about ways to prevent or lessen some of the physical effects of aging (extra calcium for women, dietary modifications to account for slowed metabolism, etc.)

F. Evaluation/Assessment

1. Students complete booklet correctly, including spelling, and sequence/accuracy of information, neatness, and creativity/aesthetic appearance of pictures.

G. Standardized Test Connections

1. Organizing information
2. Sequencing information
3. Summarization
4. Recalling/Retelling information

Lesson 3: The Endocrine System and Changes in Human Adolescence

A. Daily Objectives

1. Lesson Content

- a. This lesson consists basically of a review of this mini-unit, utilizing a paired activity. Students will test on this material on the next day, culminating what is planned to be a two-week mini-unit (2 35-minute sessions for Lesson 1, 1 or 2 35-minute sessions for Lesson 2, one 35-minute session for Lesson/Review 3, and one 35 minute session for oral presentations by pairs. Test on following day.)

2. Content Objectives

- a. The student will understand that there are many kinds of interactions in chemical and physical systems of the body.
- b. The student will understand that feedback is an important feature of interactions in many systems.
- c. The students will develop an awareness of the systemic change within the human body over the lifetime.

3. Skills Objectives

- a. The students will be able to produce a “map” of the endocrine system from memory or using notes, correctly placing the major organs of the system, and labeling each with its name and general function.

B. Materials

1. Pencils
2. Markers, crayons, colored pencils
3. “Partners at First Glands” (Appendix F)
4. Body-size piece of butcher paper

C. Background Notes (see background research if necessary)

D. Key Vocabulary

There should be no new vocabulary at this point.

E. Procedures/Activities

1. The teacher will have created pairings of students prior to this class. (Avoid ability grouping for this activity, and try to pair students with someone they normally might not work with.)
2. After announcing and assigning student pairings, each pair will be provided a copy of Appendix F, “Partners at First Glands” and a body-size piece of butcher paper. (Remind students that BOTH partners are responsible for providing pencils, markers, crayons, etc., for this project.)
3. Instruct pairs to have one partner lie down on the butcher paper and have the remaining partner trace loosely around the outline of the first student’s body.
4. After the completion of this outline, instruct student pairs to use their “Partners at First Glands” sheet to draw in and label each of the major glands we studied and a brief summary of the function of each.
5. Tell students that they are free to add faces, color, etc., but not until they have completed the labeling of the endocrine system glands. Tell students that this activity MUST be completed during this class period, as pairs will orally present their drawings on the following day.

F. Evaluation/Assessment

1. Students will be given a written test on the endocrine system (Appendix G, key is Appendix H) on the following class day.

G. Standardized Test Connections

1. The students will recall information and be able to communicate that information in written format.
2. The students will be able to select appropriate information from a list.
3. The students will be able to communicate sequence of events.

VI. HANDOUTS/WORKSHEETS

- A. Appendix A: The Endocrine System
- B. Appendix B: The Endocrine System (Special Education)
- C. Appendix C: Glands of the Endocrine System
- D. Appendix D: Endocrine System (body outline)
- E. Appendix E: Changes During Puberty
- F. Appendix F: Project: “Partners at First Glands”
- G. Appendix G: Unit Quiz
- H. Appendix H: Unit Quiz Key
- I. Appendix I: Scoring Rubrics for “Partners at First Glands” and Scoring Rubric for Oral Presentation

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Appendix E

CHANGES DURING PUBERTY

BOYS ONLY

Make Sperm

Get bigger Adam's apples

Get wider shoulders

Voices change (grow deeper)

Develop facial hair (beard)

Shape of skull changes so face is longer and looks more "adult"

GIRLS ONLY

Grow bigger breasts

Start menstruation

Develop wider hips and thighs

Appendix A

THE ENDOCRINE SYSTEM

I. Glands

- A. Found in the bodies of plants and animals**
- B. Secrete, or send out, various chemical substances**
- C. Working improperly can result in illness or death**

II. Two Types of Glands

A. Endocrine glands

- 1. ductless**
- 2. secrete hormones directly into the blood stream
(hormones are chemical messengers)**
- 3. located in various parts of the body**
- 4. they do various jobs**

B. Exocrine glands

- 1. duct glands**
 - a. salivary glands**
 - b. pancreas**
 - c. sweat glands**
- 2. secrete substances onto the surface of body tissues through ducts**

III. Location and Function of the Glands

A. Pituitary gland

- 1. location- at the base of the brain**
- 2. job/function-**
 - a. "master" ductless gland**
 - b. helps control the growth of whole body**
 - c. produces hormones that control almost all other glands**

B. Parathyroid gland

- 1. location- in the neck**
- 2. job/function- produces a hormone necessary for normal bone growth**

Appendix B

THE ENDOCRINE SYSTEM (Sped)

I. Glands

- A. Found in the bodies of _____ and animals
- B. _____ or send out, various chemical substances
- C. Working improperly can result in _____ or _____

II. Two Types of Glands

A. _____ glands

- 1. ductless
- 2. secrete hormones directly into the blood stream
(hormones are chemical _____)
- 3. located in _____ parts of the
- 4. they do various _____

B. _____ glands

- 1. duct glands
 - a. _____ glands
 - b. _____
 - c. _____ glands
- 2. secrete substances _____ of body tissues through ducts

III. _____ and _____ of the Glands

A. Pituitary gland

- 1. location- at the _____ of the brain
- 2. job/function-
 - a. " _____ " ductless gland
 - b. helps control the growth of _____
 - c. produces hormones that control other glands _____

B. Parathyroid gland

- 1. location- in the _____
- 2. job/function- produces a hormone necessary for _____ growth

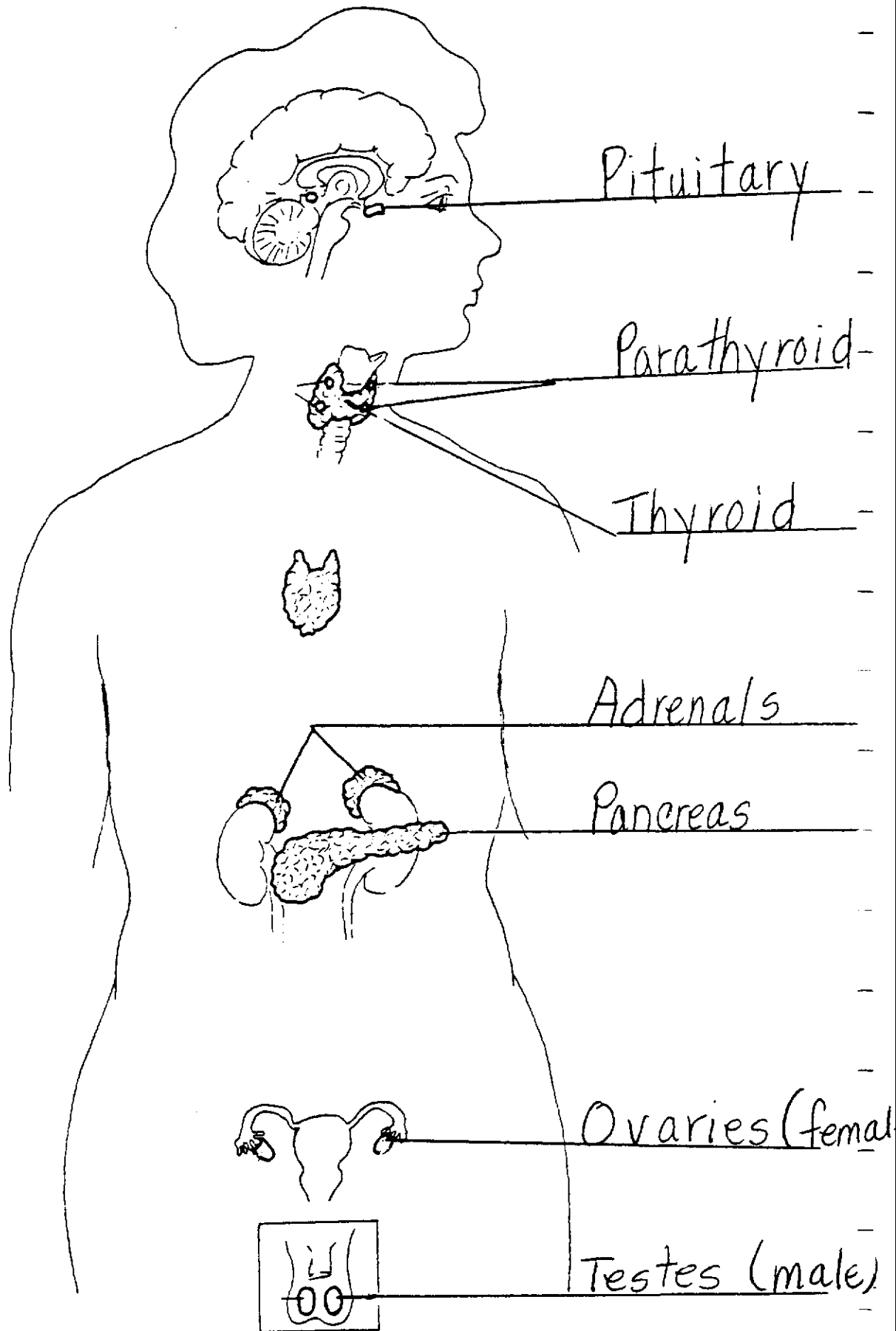
Appendix C

Appendix C

GLANDS OF THE ENDOCRINE SYSTEM

<u>GLAND</u>	<u>LOCATION</u>	<u>JOB/FUNCTION</u>
Pituitary	base of brain	"master" ductless gland; helps control the growth of whole body; produces hormones that control almost all other glands
Parathyroid	in the neck	produces a hormone necessary for normal bone growth; controls calcium level
Thyroid	below the voice box	secretes a hormone that controls the rate at which the body burns and uses food (energy)
Adrenal	on top of the kidneys	secretes many hormones; one called adrenaline controls the rate of breathing and heartbeat when you are frightened or scared
Pancreas (duct and ductless)	near the liver	Islet of Langerhans (ductless) produces insulin and glucagon, two hormones that help control the amount of sugar in the blood
Ovaries	in females	produces estrogen; controls maturation, pregnancy, and birth
Testes	in males	produces testosterone; affects male characteristics (body hair, voice change, etc.)

ENDOCRINE SYSTEM



Appendix E

CHANGES DURING PUBERTY

BOYS ONLY

Make Sperm

Get bigger Adam's apples

Get wider shoulders

Voices change (grow deeper)

Develop facial hair (beard)

Shape of skull changes so face is longer and looks more "adult"

GIRLS ONLY

Grow bigger breasts

Start menstruation

Develop wider hips and thighs

BOTH BOYS AND GIRLS

Get pimples

Have growth spurts

Develop underarm, pubic area and darker leg hair

Sweat more

Get greasier hair and body odor

Have more thought about sex

Eat more, but on a unusual schedule

Tired more often and require more sleep during growth spurts

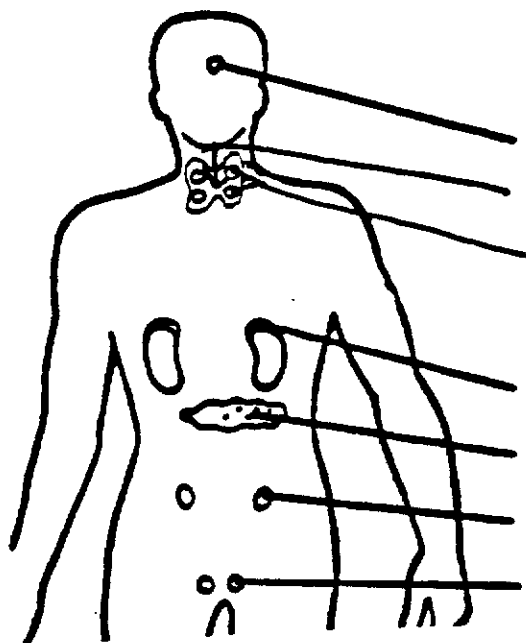
Frequent mood swings (e.g., girls cry for no apparent reason; boys can become more aggressive in nature)

Self-consciousness

Appendix F

Project: "Partners at First Glands"

The endocrine glands are glands that secrete hormones directly into the bloodstream.



Name of Gland	Hormone
<u>Pituitary</u>	ACTH
<u>Thyroid</u>	thyroxin
<u>Parathyroid</u> (2 small dots)	parathormone
<u>Adrenals</u>	cortisone, adrenaline
<u>Pancreas (Islet of Langerhans)</u>	insulin
<u>Ovaries</u>	estrogen
<u>Testes</u>	testosterone

Project Directions:

- Trace a body in pencil.
- Outline body with black marker.
- Draw glands into the body outline. Place them in the correct location and make them the appropriate size.
- Label each gland. (Draw a straight line from the gland to the outside edge of the paper.)
- Below each labeled gland do the following:
 - A. Tell what hormone is secreted
 - B. Then tell all the jobs that this gland does.
- Make more beautiful (Color, colored pencil) 😊

Supplies needed:

- ① Pencil
- ② Markers, Crayons, colored pencils
- ③ "Partners at First Glands" (Appendix F)
- ④ Body-size piece of butcher paper.

Graded (20 pts.)

- ① Neatness.
- ② Spelling.
- ③ Accurate location/labeling.
- ④ All information accurate
- ⑤ Equitable work time

Appendix G

UNIT QUIZ
“The Endocrine System” and
“Changes in Human Adolescence”

NAME _____ **DATE** _____

1. Briefly explain the ENDOCRINE SYSTEM. (4 pts.)

2. Which hormone speeds up the body’s activity (metabolism) when a person is excited or frightened? _____

3. Which of the following hormones regulates the level of sugar in the blood?
A. Adrenaline B. Insulin C. Testosterone

4. Compare the ENDOCRINE and EXOCRINE systems. (Explain the major differences.) (2 pts.)

5. The period of time between childhood and adulthood is known as:
A. Infancy
B. Adolescence
C. Middle age
D. None of the above

6. List in sequence the 8 stages of human growth. (Birth through death)
1. _____ 5. _____
2. _____ 6. _____
3. _____ 7. _____
4. _____ 8. _____

7. Match the gland with its approximate location in the human body.

- | | | |
|-------|----------------|-----------------------------|
| _____ | PITUITARY | a. Near the liver |
| _____ | PANCREAS | b. Below the voice box |
| _____ | TESTES | c. At the base of the brain |
| _____ | THYROID | d. In the neck |
| _____ | PARATHYROID | e. Lower abdomen, MALE |
| _____ | ADRENAL GLANDS | f. Lower abdomen, FEMALE |
| _____ | OVARIES | g. Top of the kidneys |

8. Which gland, also known as the Master Gland, produces hormones that control other glands, regulate growth, and balance the amount of water in the body?

- | | |
|--------------|-------------|
| A. Pituitary | C. Thyroid |
| B. Pancreas | D. Adrenals |

9. Which gland is responsible for production of hormones that are necessary for normal bone growth and for regulating the calcium level in the body?

- | | |
|--------------|----------------|
| A. Thyroid | C. Parathyroid |
| B. Pituitary | D. Ovaries |

10. Which structure is responsible for producing hormones that help maturation, pregnancy and birth in the female?

- | | |
|------------|--------------|
| A. Thyroid | C. Testes |
| B. Ovaries | D. Pituitary |

11. A _____ is a tissue or organ that releases useful chemicals into our bodies.

12. What characteristic makes the pancreas different from any other gland?

13. List three changes males experience during puberty.

- A. _____
- B. _____
- C. _____

14. List three changes females experience during puberty.

- A. _____
- B. _____
- C. _____

15. List three changes experienced by both males AND females during puberty.

A. _____

B. _____

C. _____

16. _____ are chemical messengers produced in the glands which help the body work properly.

UNIT QUIZ - KEY
“The Endocrine System” and
“Changes in Human Adolescence”

NAME Key DATE _____

1. Briefly explain the ENDOCRINE SYSTEM. (4 pts.)

System made up of glands. Glands responsible for secreting hormones

2. Which hormone speeds up the body's activity (metabolism) when a person is excited or frightened? adrenaline

3. Which of the following hormones regulates the level of sugar in the blood?
A. Adrenaline B. Insulin C. Testosterone

4. Compare the ENDOCRINE and EXOCRINE systems. (Explain the major differences.) (2 pts.)

Endocrine = ductless glands
Exocrine = ductile glands

5. The period of time between childhood and adulthood is known as:

- A. Infancy
B. Adolescence
C. Middle age
D. None of the above

6. List in sequence the 8 ^{stages} of human growth. (Birth through death)

1. <u>Baby</u>	5. <u>Adult</u>
2. <u>Toddler</u>	6. <u>Middle age</u>
3. <u>Child</u>	7. <u>Old age</u>
4. <u>Teen</u>	8. <u>Death</u>

7. Match the gland with its approximate location in the human body.

<u>C</u> PITUITARY	a. Near the liver
<u>A</u> PANCREAS	b. Below the voice box
<u>E</u> TESTES	c. At the base of the brain
<u>B</u> THYROID	d. In the neck

- D PARATHYROID e. Lower abdomen, MALE
- G ADRENAL GLANDS f. Lower abdomen, FEMALE
- F OVARIES g. Top of the kidneys

8. Which gland, also known as the Master Gland, produces hormones that control other glands, regulate growth, and balance the amount of water in the body?
- A. Pituitary
 - B. Pancreas
 - C. Thyroid
 - D. Adrenals
9. Which gland is responsible for production of hormones that are necessary for normal bone growth and for regulating the calcium level in the body?
- A. Thyroid
 - B. Pituitary
 - C. Parathyroid
 - D. Ovaries
10. Which structure is responsible for producing hormones that help maturation, pregnancy and birth in the female?
- A. Thyroid
 - B. Ovaries
 - C. Testes
 - D. Pituitary

11. A gland is a tissue or organ that releases useful chemicals into our bodies.

12. What characteristic makes the pancreas different from any other gland?
Pancreas are non ductile & ductless.

13. List three changes males experience during puberty.

- A. Growth of facial hair
 - B. Broader shoulders
 - C. Deeper voice
- make sperm
larger Adam's apple
shape of skull change
face longer & more mature

14. List three changes females experience during puberty.

- A. Onset of menstruation
- B. grow larger breasts
- C. Develop wider hips & thighs

15. List three changes experienced by both males AND females during puberty.

- A. Pimples
 - B. growth spurts
 - C. underarm / pubic hair / armpit hair
- darker leg hair
sweat more
body odor
more thoughts of sex / self-conscious

*Eat more
sweat more
require more sleep
need sunscreen*

16. HORMONES are chemical messengers produced in the glands which help the body work properly.

Appendix I
Scoring Rubrics for "Partners at First Glands"*
 (4=EXCELLENT, 3=GOOD, 2=FAIR, 1=POOR)

***Science Component/Core Content**

CATEGORY	4	3	2	1	Comments/Suggestions
Accurate location and labeling					
All information is accurate					
Equitable work time					
Spelling					
Neatness					

TOTAL POINTS EARNED:

TOTAL POINTS POSSIBLE: 20

GRADE EXPRESSED AS A PERCENTAGE:

Scoring Rubric for Oral Presentation*
 (4=EXCELLENT, 3=GOOD, 2=FAIR, 1=POOR)

***Language Component**

Category	4	3	2	1	Comments/Suggestions
Project voice					
Enunciate (clear pronunciation)					
Eye Contact					
Appropriate gestures & posture					
Rate of Speech					

TOTAL POINTS EARNED:

TOTAL POINTS POSSIBLE: 20

GRADE EXPRESSED AS A PERCENTAGE: