



Curriculum Units by Fellows of the Yale-New Haven Teachers Institute  
2012 Volume III: Anatomy, Health, and Disease: From the Skeletal System to Cardiovascular Fitness

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## **Help! My Body Is Changing!**

Curriculum Unit 12.03.08  
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### **Prospectus**

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I joined the Teach for America movement in Connecticut because I wanted to be a leader in the fight to change the status quo - ending the idea that where a person is born determines the quality of their education, health care, and life. In the few short months that I have been a teacher in the New Haven School District, I have seen how high the stakes are for "our" kids in this state, which holds the largest achievement gap in the nation. In order to create transformational change in the classroom, I believe teachers need to impact all areas of their students' lives, from academics and self-awareness, to health and nutrition. Creating a curriculum unit focusing on puberty, a period of major physical and psychological changes will allow for a combination of all of these skills. Academically, my students will gain a deeper understanding of how specialized organ systems interact with each other to maintain dynamic internal balance, a content standard for 7<sup>th</sup> grade. They will also gain awareness about their stage of life. Also, students will see how closely related health and nutrition are to the science behind how and why their bodies work the way they do. This unit fits in perfectly with the age of my students; as adolescents, my middle school students are experiencing the ups and downs of puberty each and every day.

The New Haven 7<sup>th</sup> Grade General Science Curriculum focuses heavily on life systems, including lessons on the reproductive, skeletal, cardiovascular, muscular, and digestive systems. However, the curriculum seeks to give student's breadth, rather than depth. The "Help! My Body is Changing!" curriculum unit will allow students to pull together the skills and knowledge they have gained over the course of the year. It will also serve as a way to look holistically at the body as a unit that works together in order to function, and this will be accomplished through the lens of puberty. This lens is perfect for curious middle school students, who want to know more about their stage of life. Anatomy, health, and disease are topics that are already of interest to my students and I hope to invest them in this new topic by harnessing the questions they already have in their own bodies. The heart of this unit lies in teaching students about healthy habits, disease, and the body. The "Help! My Body is Changing" curriculum unit will tie in all three of these areas and do just what the students are asking - help them understand about their bodies, answer the tough questions they are embarrassed to talk about with peers, and give them the tools they need to create and maintain healthy habits.

The unit will tie together a variety of body systems by looking at the changes the body goes through during puberty using three essential questions: 1) "Why are middle school girls usually taller than middle school

boys?" 2) "When will I finally be able to buy a pair of sneakers that will fit me forever?" 3) "Why do some girls get their first period earlier than others?" or "Why do some boys get their first erection earlier than others?"

Students will be able to answer the three above questions by the end of the unit, which will focus on that fact that puberty is triggered by the release of hormones, which are chemical messengers that tell the body to start or stop growing. This generally occurs in girls between age 8 and 13 and in boys between ages 9 and 14. Some of the most noticeable changes include growth spurts and changes in the brain. During puberty students experience changes in their brains that give them more control over their impulses, better judgment, and reasoning skills. Boys experience these growth spurts later than girls, but they grow for a longer period of time. After growth spurts are over, students will reach their full adult height. Many students have the misconception that bones are hard and so they don't change in size. But they will quickly learn that ossification actually allows the bones to get longer and this makes them taller. Bones grow until ossification is complete, and it is at this point that things like shoe size remain the same. Students will also learn that everyone grows at different rates; the genetic make-up along with food intake determines growth rate and size. Muscular and skeletal systems stop growing during early adulthood and it's important to get proper exercise and eat well so the body can grow during it's peak growth stage, puberty. So to make a long story short... yes, your mom was correct when she told you, "if you don't eat your fruits and veggies, you won't grow up big and strong." Puberty is also marked by changes emotionally and adolescences often want to fit in with their peers. My students encounter peer pressure on a daily basis and it's important for them to understand the implications that unhealthy habits, like smoking and the desire to be too skinny, can have on their bodies.

## Why Puberty? Why Now?

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Puberty is both an exciting and nerve-racking time for adolescents, parents, and teachers. It is essential that children going through these stages of changes have access to information so they can be knowledgeable about their body. This unit focuses on changes that happen during puberty and is not intended to serve as a sexual education unit.

The goal of this unit is to meet a need that is currently not addressed in the New Haven Public Schools curriculum: Puberty Education. My goal is to provide kid-friendly, accurate information on a wide variety of topics that allow students to view the human body through the lens of puberty, including physical changes, biological events, and social issues. And in addition to providing the facts about puberty I hope my students will move beyond the wall of embarrassment that is often but up when students hear words like penis and vagina. By breaking down this wall together my class can talk about the human body as scientists and scholars. Overall, I want students to walk away from my class with a healthy and positive attitude about their bodies because they possess the knowledge of how and why they work the way they do.

Rather than creating a 10-day puberty "talk," I choose to structure this as a unit that would carry itself over the course of 10 weeks. The 7<sup>th</sup> grade curriculum focuses on several human body systems, aside from the reproductive system, which undergo a variety of unique changes during puberty. I believe puberty is a great hook that teachers can use to get students invested in learning about how their body works. They have so many questions about this stage of their life because they are living puberty each and every day.

## The Moody Middle-Schooler

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Anyone who has worked with middle school students understands what a ride of emotions middle school can be. However, teenagers shouldn't have to deal with the emotional change in attitude associated with their changing body. The transition from childhood to adulthood should, ideally, be a comfortable and fun time. Students should not be mortified by the idea of growing hair in places that never had hair before, developing breasts, and having their first period. Educating students early enough about the changes that are going to happen and explaining why they happen seems to reduce the shock factor that puberty gives many children.<sup>1, 2</sup>

While teaching a genetics and reproduction unit this year I was reminded how easy it is for students to get caught up on very small details and questions related to their bodies. This unit will be a way to reassure my middle schoolers that what is happening to them is the same thing that is happening to young teens all around the world; they are not alone.

## An Overview of Puberty

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Puberty is a time marked by many changes. During this time a young girl's body changes into a woman's body and a young boy's body changes into man's body. And going from childhood to adulthood without a road map can be pretty scary.<sup>1, 2</sup>

### **Growth Spurt**

Take a walk down the hallways of a K-8 school and it is easy to tell the difference between a 1<sup>st</sup> grader and a 6<sup>th</sup> grader. The first thing many students would point out is the difference in height. Childhood is a huge period of growth and development, but it is during puberty that a child grows at a faster rate than they have ever grown before. Many children who have entered this growth spurt complain to their parents that the brand new sneakers they got just last month are already too small or the hip new jeans they got a few months ago are now "high-waters." This puberty growth spurt is just that, a period of extremely fast growth.

The puberty growth spurt can be broken up in several parts including the height spurt, weight spurt, and changes in shape of the face and body. Because so many aspects of the body are growing and developing during puberty it is extremely important to eat healthy and exercise. Nutrients and exercise are essential for the development of strong bones that will carry a child into adulthood. Lack of bone mass can lead to serious health problems later in life.<sup>14</sup>

### *Height Spurt*

The height spurt begins at different ages depending on the child, but females typically hit this growth spurt earlier than their male peers. It is for this reason that middle school girls are often taller than middle school boys. However, males tend to have a longer growth spurt than females explaining why men are often taller than women. This puberty growth spurt lasts for a few years after which growth slows down again and then

stops.

Girls grow on average two and a half inches per year, prior to puberty. During puberty a girl's growth can double to up to four inches per year. This growth spurt typically lasts about three years adding on average nine inches to a girl's height. <sup>8</sup> The first menstrual period often marks the sign that growth has slowed down to one or two inches each year. A girl will usually reach her full adult height one to three years after her first period. <sup>8</sup>

As mentioned above, boys tend to start their height spurt later than girls. For girls a noticeable change in height is one of the first changes, and for boys it is one of the last, occurring two years after girls. Boys also grow about two and a half inches per year prior to puberty. Once puberty begins a boy can grow up to four inches per year. Boys typically add nine to eleven inches during their puberty growth spurt, which last three to four years. Boys continue to grow until they are about nineteen years old, but not as fast as before. <sup>9</sup>

The basis for the height spurt is that bones in the lower part of the body, especially the legs grow longer. Some of the first bones to grow are in the feet. It's no surprise that the feet reach their adult size long before a person has reached their adult height. In middle school a child's feet often look too big for the rest of their body, but rest assured everything will eventually proportion out and the awkward phase of tripping over one's feet will pass.

### *Weight Spurt*

Puberty is marked by a period of growth lengthwise and widthwise. The body tends to get heavier as it gets taller. This is in part due to the growth of internal organs, muscles, and bones. Boys increase their weight more during puberty than any other stage in their lives. A boy can gain twenty pounds or more in a single year during this time. The average total weight gain during this time is forty-five to fifty-five pounds. Much of this weight gain comes from muscles. Boys also go through a strength spurt during puberty as their muscles grow bigger and more of the hormone testosterone is produced. <sup>7</sup> Girls also tend to put additional weight on due to fat tissue that builds up in their hips. This weight spurt lasts about three years and then slows down. A girl typically gains forty-five pounds over the course of the puberty weight spurt. <sup>8</sup>

There is nothing wrong with gaining weight during puberty and it's important that teens continue to get the proper vitamins, minerals, and proteins so the body can continue to grow. Many teens worry that they are putting on too much weight and try dieting, which can be extremely dangerous for their health. Bones need minerals like calcium and zinc to support growth. Vitamin D is also important because it brings calcium to the bones. Without these essential ingredients in the diet, bones can be weakened and growth may be stunted. In addition to a healthy diet exercise is important for a healthy body. Lack of exercise is one of the leading causes of obesity. Physical activity also helps to strengthen a growing heart and lungs. These two organs allow oxygen to be sent to all the cells in the body and increase energy levels. <sup>10</sup>

### **Changing Body Type**

There is a marked difference between the body of a baby and adult. During the growth spurt the proportions of the of body change. For example, the head of a baby is one-fourth of the height, while an adult head makes up one-eighth of the total height. Additionally, a baby's legs make up a small part of the height, while an adult's legs account for about half of the height. The face also undergoes some reconstruction as it lengthens and narrows. <sup>7, 8</sup>

## Hair and Sweat

Hair begins to grow under the arms and in the pubic region during puberty. Boys also start to grow hair on their faces in the form of mustache, sideburns, whiskers, and beards. <sup>7</sup> Underarm hair tends to appear a year after pubic hair. Hair also darkens on the arms and legs. Many boys are excited and proud of their first hairs, marking their manliness. <sup>7</sup> Girls on the other hand feel pressure to remove this unwanted hair, shaving being one of the most popular methods. <sup>8</sup> There is no right or wrong answer as to what to do with the hair. It is best for students to have a conversation with their parent or guardian about their decision.

Sweat and oil glands also undergo some changes during puberty causing the body to develop body odor and trapped oil on the face is likely to result in pimples. Sweat glands are the body's natural air conditioning system. The skin is covered with millions of sweat glands; by releasing sweat, which is made up of 99% water, the glands prevent us from overheating. Once the water is on the skin it evaporates causing the body to cool down. It is during puberty that the amount of sweat released by these glands increase and in addition, sweat glands located on the underarms and public region become activated. <sup>7, 8</sup>

The activation of sweat glands in these new areas also causes a change in the smell of the body itself. Sweat alone does not cause an unpleasant smell. Bacteria that live on the skin break down the sweat that causes the odor. Skin bacteria particularly like dark, moist places like underarms and pubic regions. Although there is nothing wrong with sweating and the body odor that comes with it, there are several ways to keep your body feeling clean and fresh. Teenagers should wash daily, wear clean clothes, and perhaps choose a deodorant or antiperspirant. <sup>7, 8</sup>

### *Spots and Dots*

Acne is the most commonly used term for common skin problems during puberty, including zits, pimples, whiteheads, and blackheads. These skin conditions are caused by oil glands, which become overly active during puberty. This excess oil becomes trapped under the skin and clogs pores. Acne is most commonly found on the face, chest, back and neck. Although these spots and dots are neither fun nor attractive there is light at the end of the tunnel. The best way to get rid of acne is by using over the counter products containing benzoyl peroxide and/or salicylic acid. Benzoyl peroxide fights the bacteria that cause acne and salicylic acid removes whiteheads and blackheads. <sup>7, 8</sup>

## Sex Organ Changes

While the bones are busy growing during the puberty growth spurt so are the reproductive organs. A boy's testicles are held within a sac of skin known as the scrotum. During puberty the testicles become larger in size and the skin of scrotum gets longer and thinner allowing the testicles to hang lower. Doctors measure the size of the testicles using a tool called an orchidometer. <sup>7</sup> This instrument contains a series of egg-shaped ovals strung together. Each oval has a number, which tells its size based on its volume (measured in milliliters). The skin of the scrotum also becomes redder and darker in color. The penis also grows longer and wider during puberty. It is difficult to determine the size of the average soft penis because the size changes often. Fear, cold, or nerves can reduce blood inside the penis making it smaller in size by up to two inches. Relaxation or warmth can increase the size of the penis. It is thought though when erect the variations among sizes tend to disappear, as smaller penises grow more during an erection and larger penises grow less. It is estimated that most men's penises are between 5  $\frac{1}{4}$  and 6  $\frac{3}{4}$  inches when erect. And the angle at which the penis sticks out from the body can also vary. <sup>7</sup>

A woman's vagina doubles in size to become three to five inches in length. The ovaries become the size and shape of an almond and the Fallopian tubes are three to four inches in length and the thickness of a spaghetti noodle. The shape and the position of the uterus change as well to prepare for childbirth. In childhood the uterus is shaped like a tube, but in adult it takes on the shape of an upside down pear. The uterus of a young girl is upright, while a woman's uterus is tilted forward. <sup>8</sup>

## **Hormones**

This growth spurt of the reproductive organs is caused by the release of hormones, or chemical messengers, from the pituitary gland, located at the base of the brain. In fact, hormones are responsible for many of the changes that occur during puberty including pubic hair, acne, body odors, and the growth spurt. <sup>7, 8</sup>

In males, the pituitary gland releases a hormone that travels through the blood stream to the testicles. This hormone causes the testicles to produce another hormone called testosterone. Testosterone is responsible for growth of the penis, facial hair, pubic hair, body hair, and muscle tissue growth. <sup>7, 14</sup> Although testosterone is called the male hormone, females also have it too, but only in small amounts. <sup>8</sup>

In females, the pituitary gland releases a hormone that travel through the blood stream to the ovaries. This hormone causes the ovaries to make another hormone called estrogen. Estrogen, the female hormone, travels to different parts of the female body and causes breast development and fat tissue to deposit around the hips. While estrogen plays a large role in the changes that take place during puberty, estrogen is also responsible for the menstrual cycle. As more estrogen is made in the ovaries a developing ovum is released. The level of estrogen also rises in the bloodstream and in turn cause the uterus to develop new blood vessels it is this lining. Should a male sperm fertilize the woman's ovum, it is this lining will serve nutrients for the growing baby. If fertilization does not occur then the lining will be shed during menstruation. Another hormone, progesterone, is produced in the ovaries and it is this hormone which causes the uterus lining to remain thick, to nourish the growing baby, or breakdown and leave as menstrual flow. The drop in progesterone levels triggers the pituitary gland to start the cycle over again. Although a typical cycle lasts 28 days some cycles are longer or shorter. <sup>8</sup>

## **Boys**

Boys begin puberty at different ages. Some begin around the age of nine, while others don't begin until they are fourteen or fifteen. Much of this has to do with family backgrounds, as boys tend to take after their fathers and other men on their dad's side of the family. Although there is no exact time that a boy should begin puberty it is a good idea for boys who start puberty before they are nine to see a doctor. Similarly, boys who haven't started puberty by the age of fifteen should visit a physician. It is better to catch problems sooner, rather than later and doctors can help boys continue on the track to healthy development. <sup>7</sup>

The most noticeable signs of puberty are the growth and development of a boys testicles and scrotum. These organs go through their own growth spurt during puberty, as mentioned above. Boys also begin to develop pubic hair during puberty. The first hairs are usually light in color and begin growing in the area where the penis joins the body. Over time they become darker and curly and grow above the penis, on the lower abdomen, and toward the thighs. <sup>7</sup>

### *Genital Development*

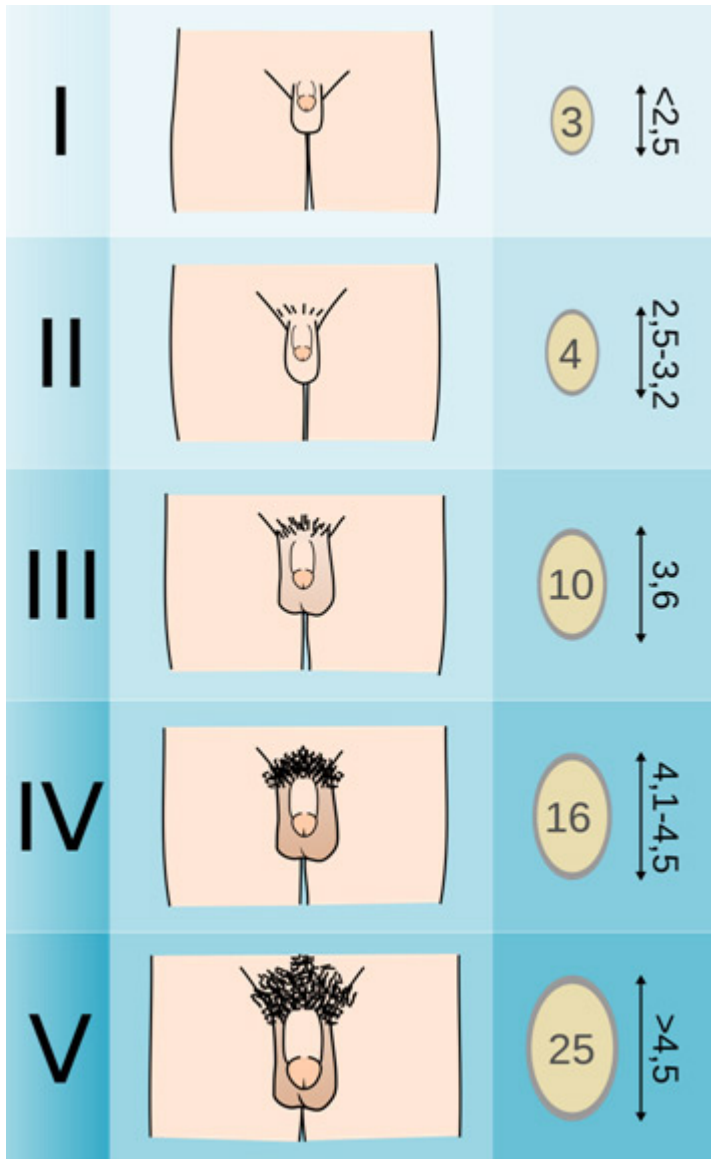


Figure 1. The five stages of genital development and the five stages of pubic hair growth. Illustration by: Michal Komorniczak (Poland)

Doctors divide the growth and development of the male sex organs into five main stages (See Figure 1).<sup>7</sup>

**Stage I: Childhood** - The childhood stage occurs before puberty begins. Because the male sex organs are located outside the body they do grow a little bit with the rest of the body during childhood. Though his growth takes place over many years and most testicles remain less than 3 ml in size.

**Stage II: Testicles and Scrotum Enlarge** - Boys reach this stage at the start of puberty when the testicles and scrotum increase in size. These organs have their own growth spurt during puberty and they grow at a faster rate than ever before. Testicles are typically 4 ml or larger in size at this point. The penis however remains around the same size as it was during childhood. As the testicles grow the skin of the scrotum grows longer and thinner allowing the testicles to hang lower from the body. As the scrotum loosens it begins to look baggy and wrinkled and also appears red or dark in color. Most boys reach this stage between the ages of ten and twelve and remain in this stage for a year.

Stage III: The Penis Grows Longer - During this stage the penis increases in length. The testicles and scrotum also continue to grow. Most boys are between the ages of ten and fourteen when they reach this stage which can last anywhere from a few months to a year and a half.

Stage IV: The Penis Grows Wider - In the last stage the penis grew in length and it is this stage that the penis also grows in width. The tip of the penis, known as the glans, also becomes more developed. In addition, the testicles continue to grow and the scrotum hangs lower. Most boys begin this stage at either thirteen or fourteen years old and remain in it for six months to two years.

Stage V: Adult Stage - When a male reaches this stage he is no longer a boy, but instead, a sexually mature adult. At this point the testicles are fully grown and between 14 and 27 ml in size (about 1 ¾ inches long). The scrotum and penis are fully developed and deep in color. Most males reach this sexual adulthood when they are fourteen to sixteen years old.

### *Pubic Hair*

Doctors also divide the growth of pubic hair into five stages. However, these stages do not always align with male genital growth (See Figure 1).<sup>7</sup>

Stage I: Childhood - Prior to puberty there is no pubic hair. Any hair that is in the genital region is short, fine, and soft, a sharp contrast to pubic hair, which is curly, thick, and coarse.

Stage II: First Pubic Hairs Appear - The first pubic hair appears during this stage and they are usually straight and lack color. They are however longer than childhood hairs and grow around the area where the penis attaches to the body.

Stage III: Growth Continues - Pubic hair is curly, coarse, and dark in color during this phase. The hair also covers a larger area and may extend to the scrotum.

Stage IV: Almost Adult - The pubic hair now looks like adult hair and there is much more hair than the previous stage. The hair takes on a triangular shape, but it remains around the genitals.

Stage V: Adult - At the adult stage the pubic hair is coarse and curly. The hair also extends to the edge of the thighs and up towards the lower abdomen.

### *Voice Cracks*

During puberty a boy's voice becomes lower and deeper. This change occurs because the vocal cords, held inside the larynx, grow thicker and longer, which changes the tone of the voice. Most boys experience this change around fourteen or fifteen year of age. As the larynx grows some boys experience high pitch cracks and squeaks.<sup>7</sup>

### *Erections*

Sexual stimulation causes the male penis to become erect. This stimulation can be physical or mental. Although erections are usually thought of in a sexual nature, during puberty erections can occur when a male isn't doing or thinking about anything sexual. Many men have erections while they sleep. During puberty the male body makes testosterone, which causes the penis to be particularly sensitive. The penis is filled with spongy erectile tissue, which resembles a mesh of tiny chambers. Normally, these chambers are empty and



flat. However, during an erection, blood flows to the penis and fills these tiny chambers causing the spongy tissue to swell. This swollen tissue causes the penis to become hard, rise up, and stick out from the body. An erection usually goes away on its own or after a man has ejaculated. Once blood flow returns to normal the excess blood trapped in the chambers can drain away and the penis can return to its soft state. <sup>7</sup>

## **Girls**

Girls' bodies go through many changes during puberty including the development of breasts, growth of pubic and underarm hair, increased height, and a curvier shape. Doctors have identified many explanations for why some girls begin the process of changing into a woman before others. Where one lives, what one eats, how much one weighs, and when one's mother started are some common explanations. For example, girls who live at higher altitudes tend to start puberty later. Also, young girls who are malnourished develop later than their peers. On the other hand, obese girls tend to begin puberty earlier than girls of average weight. Genetics plays an important role in puberty, as girls tend to follow in the footsteps of their female relatives. <sup>8</sup>

There is also growing evidence that girls are beginning puberty at an earlier age. Ten and even twenty years ago girls began breast and pubic hair development around the age of eleven or twelve. Today, Caucasian girls are beginning at the age of ten and African-American girls are starting at ages eight and nine. <sup>8</sup> Doctors however, are not sure as to why the differences between racial groups exist. Most argue that these two groups of girls tend to start within a few months of each other, explaining the year difference. Although there isn't a "normal" time to begin puberty, girls who show signs before the age of six or seven and girls who do not show signs by their thirteenth or fourteenth birthday should consult a doctor. There could be nothing wrong with this early or late start, but it is always better to catch a medical issue sooner rather than later. <sup>8</sup>

### *Breasts and Curves*

During puberty a girl's body changes its shape. The breasts begin to swell and grow out from the chest and the hips and thighs widen out. With these new additions to the figure a child's body takes on the rounder, curvier shape of woman. The size of the pelvic bones increase and fat cells are deposited to give the hips cushion. These new additions will allow for a woman to bear a child later in life. <sup>8</sup>

Each breast is made up of a nipple and an areola. Only the nipple is raised prior to breast development. But during puberty the breasts blossom and get ready for a time when they may need to produce milk after childbirth. <sup>8</sup>

*There are five main stages of breast development (See Figure 2):*

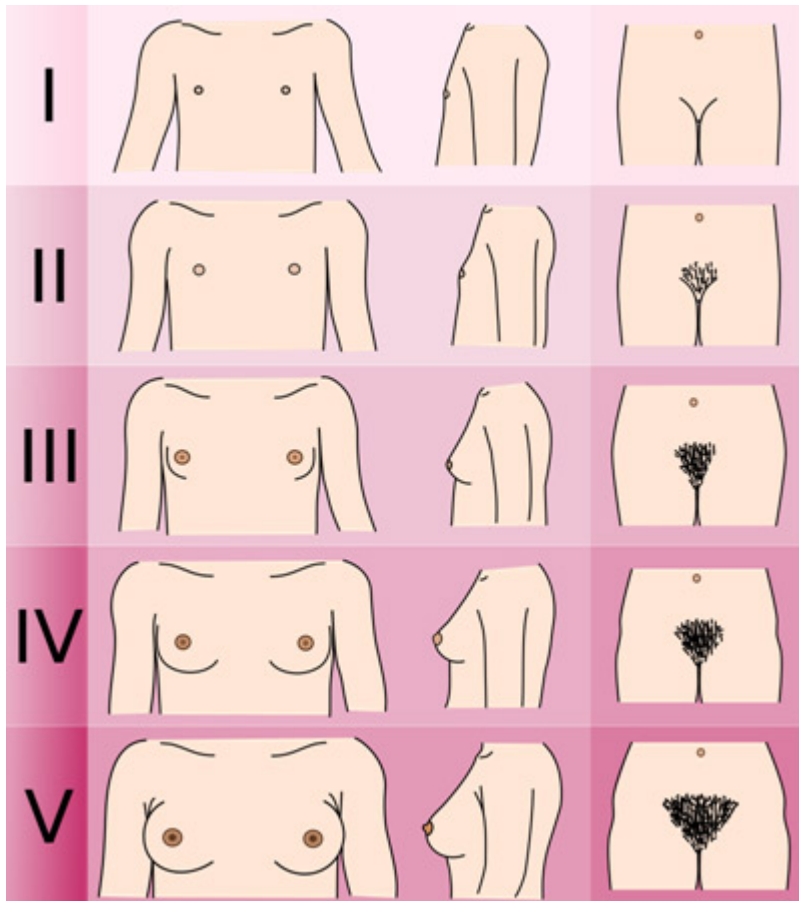


Figure 2. The five stages of breast development and the five stages of pubic hair growth. Illustration by: Michal Komorniczak (Poland)

Stage I: Childhood - This stage classifies girls who have not yet entered puberty. The breasts are flat in this stage and only the nipples are raised above the body.

Stage II: Breast Buds Develop - A tiny, flat breast bud begins to form under each nipple. This breast bud contains tissues, fat, and milk glands. The areola also increases in width during Stage 2, which can begin as early as seven or as late as fourteen.

Stage III: Development Continues - The breast itself, as well as the nipples and areolas grow larger. The breasts take on the shape of adult breasts, but they are much smaller in size.

Stage IV: Nipple and Areola Form Mound - The areola and nipple form a separate mound on the breast during this stage. Breasts in this stage are pointy or cone-like. Most girls reach this stage between the ages of twelve and fourteen.

Stage V: Adult - The nipple and areola are no longer separated. At this point this point the breasts are fully developed, although some woman's breasts may continue to fluctuate in size. During pregnancy the breasts become enlarged, as milk glands get ready to produce milk to feed the baby.

Breasts come in all shapes and sizes. And women also vary greatly in their timing and rate of development. Girls' bodies develop at the right time for them. There isn't one "right age" for the body's development. And when a girl starts to develop has nothing to do with how big her breasts will become. It is common for breasts

to be itchy, tender, sore, or painful at times during development. Sometimes breast feel lumpy and this is also completely normal. One breast may develop faster than the other causing breasts to look uneven. And finally, one or both of the nipples may point inward, called an inverted nipple. <sup>8</sup>

### *Pubic Hair*

Many girls experience their first sign of puberty when they see little hairs developing "down there." During puberty pubic hair begins to covers a woman's pelvic bone and takes on a triangular shape. Hair often becomes darker and color, coarser, and curlier over time. However, much of this depends on genetics. This hair is completely normal and there is no need to pluck the hair, as this is painful and it will just grow back. The hair also comes in a variety of colors and some women have more or less than others. <sup>8</sup>

Just like breast development, pubic hair growth generally occurs in five stages (See Figure 2). It should be noted that although public hair growth is divided up into five stages it does not mean that a woman will be at the same stage of breast development and public hair growth. These stages do not always align. <sup>8</sup>

Stage I: Childhood - In this stage there is a lack of pubic hair.

Stage II: First Pubic Hairs Appear - The first public hairs that appear are usually straight and fairly light in color. It is often found on the edges of the outer lips of the vulva. Most girls enter this stage between the ages of eight and eleven.

Stage III: Growth Extends to Mons - Pubic hair continues to grow on the outer lips, but it also begins to grow on the mons, a pad of fatty tissue on top the pubic bone. The hair also begins to darken and get curlier during this stage.

Stage IV: Growth Continues - Pubic hair continues to cover more space in the pelvic region. A triangular shape begins to take shape and the hair is now dark, curly, and coarse.

Stage V: Adult - At the adult stage the pubic hair touches the edges of the inner thigh and forms a noticeable triangle. The hair might also grow up towards the stomach or onto the thighs.

### *Periods*

In addition to noticeable changes taking place on the outside there are also some special things going on inside the body. The sex organs inside the body, called the reproductive organs. Two of the biggest changes that take place during puberty are the first ovulation and the first menstrual period. The first period called menarche tends to occur for most girls when they are in Stage 3 or 4 of breast development and/or in Stage 3 or 4 of pubic hair growth. Menstruation generally occurs two weeks after ovulation and this cycle is referred to as the menstrual cycle. Young girls often menstruate without ovulating, as it takes several months for the cycle to become regular. Once regular, this cycle occurs once a month and continues into late adulthood. The only time a woman doesn't ovulate is when she is pregnant. <sup>8</sup>

Note: This unit is designed to supplement the New Haven 7<sup>th</sup> Grade Science Curriculum. The current curriculum covers the roles of the female reproductive organs (including the ovaries, Fallopian tubes, uterus, uterine lining, cervix, cervical canal, and vagina) and the male reproductive organs (including the testicles, scrotum, testicles, epididymis, sperm ducts, seminal vesicles, ejaculatory ducts, prostate, Cowper's glands, penis, urethra, and urinary opening). As a result, background material on these topics has been omitted from

this unit. Background material on how people reproduce (including, fertilization, pregnancy, and birth) has also been omitted because it is covered in the reproductive portion of the New Haven curriculum.

## Explanation to Students

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Hello students,

Today we start our puberty unit. This unit will be stretched over the course of ten weeks. You will learn about your body through the lens of puberty:

1. Reproductive parts
2. Ch-ch-ch-changes
3. Males + puberty
4. Females + puberty
5. Males + Females = ?
6. Got bones?
7. Muscle builder
8. The brain... controls puberty!
9. Hormones highway
10. Digesting the right foods during puberty

There are two main reasons why we are studying this puberty unit.

First, you need to know the science about your body's changes.

Second, you need to have all the right information so that you can make healthy choices about your body.

You are a beautiful person. Right now, your body is going through some important changes that can be both exciting and uncomfortable. You are changing from a child into a young adult. You are becoming young men and women.

You should not be afraid of the changes going on in your body. You should not be ashamed of the changes going on in your body. Your body is nothing to be afraid or ashamed of. Your body is sacred because you are sacred. Your body is beautiful because you are beautiful. Your body is yours and yours alone. Be proud of your body, and learn to keep your body healthy and safe.

## Teaching Strategies

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### Puberty Changes Challenge!

Puberty is a time marked by many changes. Some students may know about many of the changes that occur during puberty, while others may have very little background knowledge. A good way to see how much your students already know about a topic is by giving a diagnostic assessment. However, if your students are like mine they don't like taking tests. A fun way to disguise a diagnostic is by giving them an activity to complete.

For this activity a class can be divided into teams of three or four. Each team receives an outline of the male and female body and markers. The object is for each team to write on the body as many changes as they can think of for both girls and boys. The outline allows students to organize the changes based on where they happen. The teacher calls time and the team with the longest list wins. This is a great activity to have students try again on a unit assessment instead this time instead of just listing the changes they can incorporate them into a story about a boy or girl who goes through puberty and describe ten changes they may experience.

Exemplar female list of changes: get breasts, pubic hair, growing really fast, more body fat, wider hips, hair under your arms, darker hair on arms and legs, start shaving legs, sweat more, body odor changes, zits/pimples/acne, discharge, get your period, get cramps, changes in your private parts, ovulate, female organs mature

Exemplar male list of changes: pubic hair, growing really fast, bigger muscles, wider shoulders, hair under your arms, darker hair on arms and legs, penis grows, testicles develop, mustache grows, beard grows, start shaving, sweat more, voice changes and cracks, body odor changes, zits/pimples/acne, more erections, begin to ejaculate, wet dreams.

### Coloring the Sex Organs

Talking about sex, penises, and vaginas often causes a "big commotion" in the classroom. Students, especially middle-schoolers, act silly and giggly. I've learned one of the best ways to approach the topic now is being silly as well. Pass out copies of the male and female reproductive organs and two colored pencils to each student. While describing the main reproductive organs you can ask the students to color them in using different colors and even stripes or polka dots. By the time you are done talking about the different parts the students will have heard the words penis, vagina, and scrotum about a dozen times. Students no longer go crazy after hearing words that aren't usually said out loud in the classroom. The pictures the students create also look funny. The laughter this exercise creates makes it easier to deal with any embarrassing feelings or nervous energy. By coloring the reproductive organs, students also better remember the names of the organs. Coloring requires the students to pay attention and spend time focusing on a specific organs. At the end of this exercise students will also have a much better idea where these body parts are located. <sup>7,8</sup>

## **Slang Words**

Another topic to cover while the students are coloring is slang words. People often don't use the medical names for body parts and it's important to address slang words. Ask students to list slang words used for the penis, testicles, clitoris, and vagina. This exercise will prevent students from disrupting the class later on with slang words. <sup>7,8</sup>By bringing slang words out in the open right away students no longer feel the need to impress other classmates with these words later on in the unit. It is also a good idea to have a discussion with your students about these words and explain that they going to use the "medical terms" because they are the terms scientists, doctors, and other professionals use to talk scientifically about the human body. Students can also discuss what terms they would use with a friend, doctor, or parent. This may be a good time to discuss people's reactions to slang words. Many people object to these words or find them offensive and it's important that everyone in the class feels safe and respected.

## **Modeling the Size and Shape of the Sex Organs**

Since the female reproductive organs are internal it is often difficult for students to imagine these organs. To help students get a vivid picture of the size and shape of these organs it is great to show them things in everyday life that they can relate them too. Bring in almonds to represent the size and shape of the ovaries, spaghetti to serve as the thickness of the Fallopian tubes, a pear to show the shape of a uterus after puberty.

## **Math and the Menstrual Cycle**

The length's of a woman's menstrual cycle is easy to determine with the help of a calendar. The first day of a woman's period represents Day 1 of the cycle. The cycle continues until the next menstruation begins. The day of the next period marks the first day of the next cycle. The length of a complete cycle can be measured by the number of days between periods; this is typically any where between 21 and 35 days. Periods usually last two to seven days.

You can use two calendars to have students identify important parts of the menstrual cycle. Mark a calendar with an X this will mark the day the first day of the period. Mark several more X's on consecutive days (between two and seven) to represent bleeding. On the next month mark another X and several more consecutive X's. Students can use the calendar to identify: The date of the first day of the woman's period, the number of days she bleeds, and the length of her menstrual cycle. For an extension activity students can identify what is going on inside the body at these different points.

## **Puberty Unit Vocabulary Ring**

I have found a great teaching strategy that empowers my students to use scientific language and put concepts into their own terms by creating vocabulary card rings. Each vocabulary word gets its own note card, which can then be punched and strung on a ring. This is a great reference tool for students to have when they ask a question that relates to a word they should be able to recognize and understand. The student is able to find and eventually recall word and it's meaning rather than having the teacher tell them the answer. This is also a great exercise for students to do if they finish an assignment early.

One of my favorite models for creating vocabulary cards is the Frayer model in which the card is broken up into four squares (See Figure 3). <sup>4</sup>In the middle, the vocabulary word is written and circled. In the top left square, the student writes the definition in his or her own words. In the top right square, facts or characteristics of the word are written. In the bottom left, the student writes examples and in the bottom

right, the student writes non-examples. I also ask my students to draw a picture to help them remember the word on the back. This also provides a way for them to quiz themselves using the picture they drew. <sup>4</sup>


<b>Definition:</b> <b>Facts:</b> Caused by excess oil getting stuck under the skin and clogging pores	<b>Facts:</b> - Common in teenagers - Can be treated with benzoyl peroxide
 Acne	
<b>Examples:</b> Blackheads, whiteheads, pimples,	<b>Non-examples:</b> Freckles, scars, and scabs

Figure 3. A sample Frayer Model vocabulary card.

Acne - occur when oil gets trapped under the skin and clog the pores

Areola - the ring of skin around the nipple that gets larger and darker during puberty

Benzoyl peroxide - a lotion that can be found at most drugstores that helps clear up acne

Body Odor - products of sweat glands in the underarm, pubic region, and feet that aren't exposed to light or air and are broken down by bacteria into a smell

Calcium - a nutrient found in dairy products that helps bones grow strong

Circumcision - an operation that removes the foreskin on the penis

Ejaculation - the process of semen leaving the body through the tip of the penis

Erection - the name for the penis when it is filled with blood and becomes hard

Foreskin - a special part of skin on the penis that covers the foreskin

Glans - the wide tip at the end of the penis

Growth Spurt - a time of really fast growth that occurs during puberty

Menstruation - the breaking down and shedding of the lining of the uterus

Menstrual flow - the blood fluid that leaves a woman's body during puberty

Ovulation - when a mature egg pops off the ovary

Penis - male sex organ that has a shaft where semen and urine exit the body

Perspiration - sweat that increases particularly in the underarm and genital area during puberty

Premenstrual syndrome - a group of signs, or symptoms, that woman may have before or during their periods

Puberty - a special time in life when a child's body changes into an adult body

Scrotum - a loose sac of skin that hangs behind the penis and holds the testicles

Semen - a white fluid that contains both sperm and body fluids

Sperm - the male sex cell (gamete)

Testicles - two egg-shaped male sex organs found inside the scrotum, where sperm is produced and testosterone is released

Testosterone - the male sex hormone that is made in the testicles

Vagina - one of the female sex organs found inside the body

Vaginal Discharge - a clear or white fluid that comes from the vagina to keep the vagina moist and clean

Voice Change - the time when a boys voice gets deeper because the vocal cords are growing thicker and longer

Vulva - the female sex organs found outside the body

### **How Tall Will I Be?**

My students are always asking me how tall they are going to be when they get older. Others question why the 7<sup>th</sup> grade girls are taller than the 7<sup>th</sup> grade boys. A child's height before their growth spurt is one indication of the height they will likely be as an adult. A short child is likely to be a shorter adult, and a tall child is likely to be on the taller side as an adult. Although there is no magic formula to calculate exactly how tall someone is going to end up there is an exercise to estimate adult heights. This activity is not only a great way to engage the students in the topic of puberty by talking about something they are already inquisitive about, but it also is a great way to bridge math and science as it requires some simple calculations. Students can also talk to their parents and guardians about what they are learning about in school because it requires them to gather some background information.

By following a few simple steps a student can get a pretty good idea how tall they might be as an adult. First however the child needs to know the height of their birth mother and father.

Step 1. Subtract 5 inches from your father's height.

Step 2. Add your mother's height to the answer you got in Step 1.

Step 3. Divide the answer you got in Step 2 by 2. This is your estimated adult height.



Another great extension activity is ask the students why the height of a guardian, foster parent, or adoptive parent will not give you accurate results. The students learned earlier in the curriculum that heredity is the passage of genetic information from one generation to other and genetic information is organized in genes on chromosome. Each human cell has 46 chromosomes or 23 pairs of chromosomes. One chromosome from each pair comes for each parent. This explains why children generally exhibit a combination of characteristics from both birth parents.

### **Digesting the Right Stuff**

My students love spending time in the computer lab and there is a great website that allows students to enter their age, gender, height, weight, and level of physical activity and it calculates the amount of each type of food they should eat. <sup>3</sup>

Have students visit [www.choosemyplate.gov/myplate/index.aspx](http://www.choosemyplate.gov/myplate/index.aspx) and enter their personalized information. They can then print a Meal Tracking Worksheet to keep track of what they eat and how much they exercise. <sup>3</sup>

## **Books to Add to Your Classroom Library** <sup>7,8</sup>

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### **Books for Boys**

*Then Again, Maybe I Won't*

By: Judy Blume

*The Amazing Life of Birds: The Twenty-Day Puberty Journal of Duane Homer Leech*

By: Gary Paulsen

*Mercy on These Teenage Chimps*

By: Gary Soto

### **Books for Girls**

*Are You There God? It's Me Margaret*

By: Judy Blume

*Tilly's Birthday: A Young Girl's Introduction to Menstruation*

By: Lorell Gordon

*Period.: A Girl's Guide*

By: JoAnn Loulan and Bonnie Worthen

## Appendix A. Implementing District Standards

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### Current Connecticut Standards

#### Content Standards

Heredity and Evolution - What processes are responsible for life's unity and diversity?

8.2 Reproduction is a characteristic of living systems and it is essential for the continuation of every species.

- a. Heredity is the passage of genetic information from one generation to another.
- b. Some of the characteristics of an organism are inherited and some result from interactions with the environment.

#### CMT Expected Performances

C.25 Explain the similarities and differences in cell division in somatic and germ cells

C.26 Describe the structure and function of the male and female human reproductive systems, including the process of sperm and egg production.

C.27 Describe how genetic information is organized in genes on chromosomes, and explain sex determination in humans.

### Current New Haven Curriculum Standards

#### Grade-Level Expectations

1. Relate the continued existence of any species to its successful reproduction and explain in writing the factors that contribute to successful reproduction.
2. Describe the structure, location and function of chromosomes, genes, and DNA, and how they relate to each other in the living cell.
3. Illustrate and chart the purpose, cell type (somatic and germ) and resulting chromosome count during cell division in mitosis and meiosis.
4. Identify the major structures in human male and female reproductive systems and where meiosis and gamete formation take place.
5. Investigate and report on the role of hormone production as it initiates and regulates the creation of male and female germ cells from birth through adolescence and into adulthood.
6. Compare and contrast the events and processes that occur when a human egg is fertilized and not fertilized.
7. Demonstrate the relationship of corresponding genes on pairs of chromosomes to traits inherited by offspring.
8. Describe in writing the role of the germ cells in the formation of the human zygote and its

resulting 23 pairs of chromosomes, the 23<sup>rd</sup> of which determines gender and the other 22 of which determine the characteristics of that offspring.

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<sup>2</sup> "Brain's Puberty Switch: Neuroendocrinologists Unlock Chemical Trigger to Puberty," Daily Science, last modified May 1, 2006, [http://www.sciencedaily.com/videos/2005/0512-brains\\_puberty\\_switch.htm](http://www.sciencedaily.com/videos/2005/0512-brains_puberty_switch.htm). Researchers believe that a chemical trigger in the brain could be the trigger for puberty.

<sup>3</sup> "Daily Food Plan," United States Department of Agriculture, last modified March 1, 2012, <http://www.choosemyplate.gov/myplate/index.aspx>. A kid-friendly, interactive website that allows students the opportunity to receive a custom food plan based on their age, height, weight, and physical activity using the government dietary guidelines.

<sup>4</sup> Allen, J. *Inside Words: Tools for Teaching Academic Vocabulary, Grades 4-12*. Portland: Stenhouse Publishers, 2007. See pages 43-47 for background on the Frayer Model, as an instructional strategy for teaching academic vocabulary.

<sup>5</sup> Madaras, L. *On Your Mark, Get Set, Grow! A "What's Happening to My Body?" Book for Younger Boys*. New York: New Market Press, 2008. A book written for boys ages 8 to 11 that does a fantastic job answering the questions and clarifying misconceptions that younger boys might have about puberty.

<sup>6</sup> Madaras, L. *Ready, Set, Grow! A "What's Happening to My Body?" Book for Younger Girls*. New York: New Market Press, 2003. A book written for girls ages 8 to 11 that addresses concerns and questions that young girls have about their changing bodies.

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<http://www.mayoclinic.com/health/exercise/SM00109> (last modified December 1, 2011). An article describing calorie expenditure for various exercises.

<sup>11</sup> Neinstein L.S. and Kaufman F.R., chapter 1: Normal Physical Growth and Development from Neinstein L.S. *Adolescent Health Care: A Practical Guide*, 4th edition,

[http://www.usc.edu/student-affairs/Health\\_Center/adolhealth/content/a1.html](http://www.usc.edu/student-affairs/Health_Center/adolhealth/content/a1.html)

<sup>12</sup> "Puberty: Brain Changes, Strange Changes." PBS Kids Go! It's My Life (CastleWorks, Inc., 2005), <http://pbskids.org/itsmylife/body/puberty/article6.html> (accessed May 4, 2012). This article addresses the moods and emotions of young teenagers and the relation to hormones in the brain. Other articles under the puberty section might be helpful to read.

<sup>13</sup> "Sexual Health," Sexual Health (The Nemours Foundation, 2012), [http://kidshealth.org/teen/sexual\\_health/](http://kidshealth.org/teen/sexual_health/) (accessed April 23, 2012). A puberty site for teens. This site is great for students who are at or above reading level.

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<sup>15</sup> "What's Happening to My Body?," The American Academy of Pediatrics, last modified May 1, 2012, <http://www.healthychildren.org/English/ages-stages/gradeschool/puberty/pages/Whats-Happening-to-my-Body.aspx> Information on puberty handout from American Academy of Pediatric.

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