Grade 7: Healthy Habits

Lesson 6: Sleep and Health

Objectives:

1. Students will explain the five stages of sleep, REM and Non-REM sleep.
2. Students will explore the ways in which sleep is necessary for health.
3. Students will explore the major effects of sleep deprivation.
4. Students will explain what circadian rhythm is and how it affects the body.
5. Students will explain the two respiratory system-related sleep disorders.
6. Students will research the effects of sleep differences on motor skills and mental alertness.

Materials:

- Sleep Questionnaire **(See Figure 1)**

Activity Summary:

In this lesson students will explore what sleep is, two different sleep rhythms, five stages of sleep, the benefits of sleep in health, effects of sleep deprivation, and strategies for creating good sleep.

Background Information for the Teacher:

Overview:

Sleep is more important than most young people think. Once a youngster grows past the age of a mandatory bedtime, sleeping may become an afterthought, taking a backseat to all other activities and demands in their life. But sleep, a required restorative for the body and brain, is absolutely vital to a person's health and well-being.

Getting sufficient amounts of sleep is necessary for maintaining the ability to stay alert and engaged throughout the day. Lack of adequate sleep, both in terms of quantity and quality, may contribute to a person's susceptibility for sickness and even accidents. Children 11-12 years old need 9.5 hours of sleep a night, while 10 to 11 hours is optimum. Children who don't get enough sleep often have difficulty with school, their emotions, and may even develop a lowered immune system response to infections. Sleep deprivation may also affect growth.

What are we doing when we sleep?

During sleep the body and brain repairs muscle, consolidates memory, releases growth and appetite hormones, and replaces vital chemicals, including cortisol.

Our sleep follows a five-stage sequence of REM (rapid eye movement) and NREM (non-rapid eye movement) in a cycle that repeats every 90 minutes.

Non-REM Sleep: Making up about 75% of each 90-minute cycle, non-REM sleep occurs in four stages:

- **Stage 1 – Transition:** The interim stage between waking and sleeping, we are engaged in light sleep in this stage as our muscles begin to relax.

- **Stage 2 – Sleep Onset:** In this stage our breathing and heart rates slow down, and our body temperature drops. Sleep in this stage tends to be light, and we can easily be startled awake.

- **Stages 3 and 4 – Deep Sleep:** Our blood pressure drops, our breathing continues to slow down, and our muscles relax. During this time the blood supply to the muscles increases, tissue growth and repair takes place, and our energy is replenished. This stage is particularly crucial for young people, as this is the stage during which **growth hormones** are released.

  In the latter stage, when our sleep is deepest, it becomes difficult to wake up. This stage is sometimes called **slow-wave sleep**, and is the stage where people often sleep-walk and/or talk in their sleep.

REM Sleep:

- **Stage 5 – Final stage:** Making up 25% of the complete cycle and occuring at the end of the 90-minute sequence, in this stage **dreaming occurs**, the eyes move back and forth, the body is generally immobile, and energy is provided to the body and brain.

Our Body Clock and Sleep Rhythms: We have two body rhythms or systems that regulate our sleep:

- **Sleep/Wake Homeostasis**
  - Balances sleep and wakefulness
  - Accumulates the need for sleep through the day
  - Maintains enough sleep at night to be able to be used throughout the day.

- **Circadian Biological Clock**
  - Regulates the timing of sleepiness and wakefulness through a 24-hour period.
  - Rises and dips at different times for adults and teens:
    Adults: Strongest sleep drive between 2-4 a.m.and 1-3 p.m., with periods of increased alertness even though the sleep/wake homeostasis might otherwise make us sleepy.
    Teens: Changes in the circadian rhythm occur in adolescence. Sleep delay occurs, causing teens to be more alert later at night than when they were younger.

Falling asleep before 11 p.m. becomes more difficult, making it harder to get the 8.5 – 9.5 hours of sleep needed each night. The strongest dips occur between 3-7 p.m. and 2-5 p.m., but if there has been insufficient sleep the morning dip may last longer, even until 9 or 10 a.m.

The circadian rhythm is controlled in the hypothalamus of the brain, the cells of which respond to light and dark signals. They send signals to other parts of the brain that control hormones, body temperature and other functions relating to states of sleep- or wakefulness.

Melatonin is one of the hormones that promotes sleep onset. Melatonin levels naturally rise later at night for children or adults.

- **Jet lag:** Sometimes known as circadian dysrhythmia, this occurs when circadian rhythms are disturbed by travel and time changes. Light and dark cues are altered by travel to different locations, and the sleep/wakefulness brain responses are disrupted, impacting the body systems. Significant effects of jet lag are daytime sleepiness, insomnia, poor concentration, slower reaction time, and gastrointestinal distress. Jet lag increases with the number of time zones crossed (i.e. the more times zones the greater the jet lag.) Flying east towards the sun causes a more pronounced jet lag than flying west, which follows the sun's direction.

Changes in a teenager's body make it difficult for them to fall asleep as early as they did when younger. A key to compensate for this natural shift is to maintain a regular pattern of sleep, allowing sufficient time and creating an environment that promotes sleep rather than continued wakefulness.

Creating Quality Sleep

A. Work with your Body

- Understand what *your* circadian rhythm is.
- Work with it to your advantage for both the periods of alertness and sleepiness. Don't fight it. Instead, use it to your advantage.
- Pay attention to how much sleep you need. Figure out the ideal time for going to sleep and for waking up.

B. Wind Down 30 Minutes Before Bed

- Create a pattern for yourself in getting ready for bed. This cues your body and brain to move into the resting part of your day.
- Turn down/off the music, video, television, cell phone, and especially the computer.
- Allow the mind and the body to slow down.

- Stop studying, writing and searching the Internet. Instead, sketch, write about the day in your journal, read something light and entertaining, and keep background music soft.
- Let the physical body slow down as well. Sit down, stretch, take a shower or bath, change into comfortable sleeping clothes, and begin focusing on your breathing.

C. Set the Environment

- Climb into a comfortable warm bed. Make it inviting physically and visually by clearing the books, computer, phone, all electronic gadgets, games, and other distractions from the bed.
- Turn down the lights and sounds around you for a short period of time.
- Finally, turn lights and sounds off.

D. Consistency is Important

- Head towards bed at the same time every night, *even if you don't feel sleepy.*
- Set your bedtime and stick to it.
- Do the things listed above that promote rest.
- Create a habit of winding down and making space for sleep.
- Be consistent. Do this *every* night.

Dreaming

Sometimes your dreams may seem quite bizarre, and they are if we think about them in the same way as we think about the events in our waking day. In the world of sleep, resting and reorganizing daily information and experiencing dreams have a logic all their own.

Dreams have fascinated people for a very long time. Dreams have been the subject of myths and supposition (Plato and Aristotle), psychoanalysis (Freud and others) and research (Jouvet and Dement, among others.)

Even though we know that we dream, we still don't understand *why* we dream. One hypothesis is that dreams help us incorporate memories, solve problems, and work with our emotions.

Dreams are interesting. Many people record their dreams and write about possible meanings for the dream. Some people believe that understanding what is happening in their dreaming life helps them better understand the events and people in their waking life. Numerous books have been written in the last couple of decades about dream symbology. Using a process called "lucid dreaming" allows people to become actively aware of their dreams *while they are occurring,* enabling them to deliberately change the events and activities in the dream.

Sleep Deprivation

Being asleep is as important a part of your day as being awake. We all need lots of sleep, children AND adults. We need sufficient amounts of quality sleep every night in order to have the **best** day we can.

Sleep deprivation results in a broad range of harmful affects. It impairs:

- Attention
- Communication
- Abstract thinking
- Creativity in communication, problem-solving and innovation
- Mental alertness
- Long-term memory retrieval
- Mood and motivation.

During sleep the brain organizes and stores information. Sufficient sleep is vital for students who are challenged on a daily basis to learn a wide variety of new information and skills.

Sleep deprivation also impairs athletic performance and physical activity.

- Motor function is slowed
- Visual and auditory reaction times are delayed.
- Cardiovascular functioning is reduced so endurance and speed are diminished as well
- Tire more easily
- Mood dips and swings

Respiratory System-Related Sleep Problems

Snoring:

Caused by a partial blockage of the airways, noise is created from the vibration at the back of the throat. Nasal congestion, enlarged adenoids or tonsils can block airways. Although snoring is usually associated with adults, it is not uncommon in children.

Sleep apnea:

A more serious disorder than simple snoring, typically in sleep apnea there are pauses in the rhythm of breathing, which can also be caused by blocked airways and is often associated with snoring. Restless sleep and daytime sleepiness may be experienced. Enlarged tonsils, adenoids, allergies and weight problems may contribute to sleep apnea.

Sleep apnea can be treated and should be addressed by a medical professional.

Vocabulary:

REM
NREM
Sleep cycle
Circadian rhythm
Circadian disrhythmia
Sleep deprivation
Cortisol
Melatonin
Snoring
Sleep apnea

Engage:

1. Three or four days before Lesson 5 begins, assign students to keep a dream journal. Have each student create a simple journal by stapling together five or six sheets of paper. Put these headings on each paper:
    - Date
    - Time I Went to Sleep
    - Notes on What Happened Today
    - Dreams

2. Have students entitle the first page **"Dream Journal."** Ask students to keep the journal right next to their bed.

3. Instruct the students to do the following **right before they go to sleep:**
    - Write the date and time on a Journal page.
    - Briefly note what happened that day. These notes should relate to events at school, at home, and other places and people encountered during the day. Keep notations brief, but even if they something seems insignificant the events should be summarized.
    - When they wake up, write a few notes about dreams in the journal. Write down any dream bits that are remembered even if the whole dream isn't recalled.

Bring the Dream Journals to class and tell dream stories. Students can work in three or four large groups to share dreams.

Ask: What is your dream telling you? Does it relate to anything in your "awake" life? Are dreams helpful to us? How? Have students explore these and other questions about dreams.

Ask: What is happening to us when we dream? Why do we dream? What is our body doing when we are dreaming?
Answers:

REM Sleep:
Stage 5 – Last stage.

This is 25% of the complete sleep cycle.
Occurs at the end of the 90-minute sequence.
Dreaming occurs.
Eyes move back and forth, body is generally immobile, energy is provided to the body and brain.

Even though we know we do dream, we still don't understand why we dream. One hypothesis is that dreams help us incorporate memories, solve problems, and work with our emotions.

Explore
Have the students complete the Sleep Questionnaire.
Have the students work together to compile the answers.
Make a chart that quantifies the information for the class and by gender. Draw conclusions about factors contributing to hours of sleep, sleep quality, and factors affecting sleep in the questionnaire.

Ask: How many hours of sleep do you get a night?

Explain
Ask: What does your body and mind feel like when you have had a good night's sleep? What does your body and mind feel like when you haven't had enough sleep?

Ask: How many hours of sleep is best each night? (9.5 hours of sleep a night, while 10 to 11 hours is optimum)

Ask: What happens when you don't get enough sleep consistently? (Difficulty with school studies, emotions, and a lowered immune system response to infections, can also affect growth.)

Ask: What is the name for not getting enough sleep? (Sleep deprivation)

Ask: What body systems and processes are helped and restored during sleep? (Muscle system: repairing muscle, Brain and nervous system: consolidating memory, organizing and storing information, Endocrine system: releasing growth and appetite hormones, replacing needed chemicals including cortisol.)

Ask: If you don't get enough sleep and your body can't be sufficiently restored, how will body systems be affected?
Brain and nervous system - slower thinking processes that lowers ability to:
- Pay attention
- Do abstract thinking
- Be creative in communication and problem-solving
- Be mentally alert

- Retain new information
- Access long-term memory retrieval, and
- Increase mood dips and swings

Sleep deprivation also impairs athletic performance and physical activity.

Muscular system:

- Slower motor function
- Visual and auditory reaction times
- Body tires more easily
- Diminished endurance and speed

Heart and Circulatory system functioning is reduced.

Have students do a quick write listing some situations in school work, athletics, and other activities that they have not been able to do their best because of sleep deprivation? Ask students to share their situations. Discuss which body system was impaired because of sleep deprivation.

Use information from the Sleep Questionnaire results and class discussion to clarify that there are ways to create good sleep. Ask the students to suggest ideas.

Sleep has a five-stage sequence.
Ask: What is one of the stages? (REM sleep, stage 5, is last stage, and dreams occur.)

There are four stages that happen before stage 5. The entire sleep cycle lasts about 90 minutes.

<u>Non-REM (Non Rapid Eye Movement) Sleep</u>

Stage 1 – Transition.

Light sleep between being awake and falling asleep.
Muscles begin to relax.

Stage 2 – Sleep Onset.

Breathing and heart rate slow down
Body temperature drops.
Light sleep, can easily be startled awake.

Stage 3 and 4 – Deep Sleep.

Blood pressure has dropped
Breathing is slower
Muscles are relaxed
Body is restored -

Blood supply to the muscles increases
Tissue growth and repair happens
Our energy is replenished
Growth hormones are released. Particularly crucial for young people.

Sleep is deepest and it is hard to wake up.

Sometimes called slow-wave sleep.
Sleep walking and talking can happen in this stage.

Ask: Do our sleep rhythms only happen when we are asleep? Have students give answers and explain their reasoning.

We have two body rhythms or systems that regulate our sleep:

- Sleep/wake homeostasis
  - Balances sleep and wakefulness
  - Accumulates the need for sleep through the day
  - Maintains enough sleep at night to be able to be used throughout the day.

- Circadian biological clock
  - Regulates the timing of sleepiness and wakefulness through a 24-hour period.
  - Circadian rhythm controlled in the hypothalamus of the brain.
  - Rises and dips at different times
    - Dips - Strongest sleep drive between 2:00 – 4:00 am, and 1:00 – 3:00 pm (adults)
    - Rises – Periods of increased alertness even though the sleep/wake homeostasis might otherwise make us sleepy.

    Teens
    - Changes to circadian rhythm occur in adolescence.
    - Sleep delay occurs causing teens to be more alert later at night than when they were younger.
    - Falling asleep before 11:00 pm more difficult.
    - Difficult to get 8 ½ to 9 ½ hours of nightly sleep.

    - Dips – Strongest between 3:00 – 7:00 am, and 2:00 – 5:00 pm. If insufficient sleep has occurred the morning dip can last longer, even until 9:00 or 10:00 am.

Ask What are two common sleep disorders that involves the respiratory system?

Snoring –
- Partial blockage of the airways.
- Noise is created from the vibration at the back of the throat.

Sleep apnea –
- A more serious disorder.
- Pauses in the breathing rhythm.
- Can be caused by blocked airway
- Often associated with snoring.
- Restless sleep and daytime sleepiness may be experienced. Enlarged tonsils, adenoids, allergies and weight problems may contribute to sleep apnea.

Sleep apnea can be treated and should be addressed by a medical professional.

Extend

Have student work individually and do a quick write on the following questions:

1. What is jag lag?
2. How does it affect us?
3. Why does it occur?
4. What creates more jet lag, flying east or west? Why?

When they have completed the answers have the students count off numbers from one to six or seven. Ask all the students who counted “one” to work together, the “two’s” to work together and so on. Each group should have a maximum of five students.

Have students discuss their answers to each of the questions. Decide as a group what the correct answer should be. Write the group’s response to each one of the four questions on a piece of paper. Collect the papers.

Read each group’s answers. Do not say which group gave which answers. Have the class decide which group(s) gave the correct answers.

Answers:

Circadian disrhythmia.
Light and dark cues are altered by being in different locations.
Sleep/wakefulness brain responses are disrupted.
Significant effects of jet lag are daytime sleepiness, insomnia, poor concentration, slower reaction time, and gastrointestinal distress.
Jet lag increases with the number of time zones crossed, Flying east, towards the sun, causes more pronounced jet lag.

Evaluate

Activities in Explain can be used for assessment.

Have students create a graphic organizer to summarize the key information about the five stages of sleep, circadian rhythms, and the two common sleep disorders. Information about the following categories should be included:

Name the five stages of sleep,
Describe each stage
Major activity occurring in each stage
Circadian rhythm description
Names of two circadian rhythm cycles
Activity occurring in each cycle
Two common sleep disorders
Description of each disorder

Optional Enrichment Activity
Have the students design and conduct a sleep research study.
Research the effect on motor and mental skills between students who consistently get 9.5-10.0 hours of sleep every night and an "unregulated" sleep group.

Divide the class into four groups: two research teams and two groups of research subjects.

Each research team works together to design their study. They should consider if they want to evaluate a hypothesis or question, the research methods, their motor and mental skill evaluations (pre- and post), sleep logs and questionnaires, how the results will be recorded and reported.

The research subjects should be kept uninformed about the research project that each team has designed. Each research team is assigned a group of subjects that can be subdivided into the two smaller study groups.

At the conclusion of the studies, each group should make a presentation report to the whole class.

Additional Web Resources
Sleep Foundation
http://www.sleepfoundation.org/hottopics/index.

Sleep for Kids
http://www.sleepforkids.org/

Kids health
www.kidshealth.org

Missouri Standards
Health and Physical Education Frameworks
II. Health Maintenance and Enhancement
A. Personal and Family Health
What All Students Should Know
1. There are seven behaviors that if performed regularly can contribute to a healthy lifestyle. They include…sleeping six to eight hours each night…

What All Student Should Be Able To Do
a. Analyze the relationship between behaviors and health
b. Assess personal health needs during adolescence and apply strategies to address those needs or problems

Figure 1

Sleep Questionnaire

1. What time do you go to sleep?_____
2. What time do you wake up?_____
3. Do you feel rested when you wake up? Yes No
4. When is the best time for you to go to sleep and wake up so you feel your best?

Go to sleep_____Wake up_____

5. Do you go to bed at the same time every night even if you don't feel sleepy?

   Yes No

6. Do you start to wind down at least 30 minutes before bed?
   Yes No
7. Do you have a pattern or habit of things you do before you go to bed that help you go to sleep? Yes No
8. Do you turn off your music, video, television, cell phone and computer at least 30 minutes before you go to bed? Yes No
9. Do you stop studying, writing and searching the Internet at least 30 minutes before your go to bed? Yes No
10. Do you do any things to calm your mind, like sketch, write in your journal, read something light, at least 30 minutes before you go to bed? Yes No
11. Do you do any things for slow your body down, like stretch, take a shower or bath, change into sleeping clothes, do breathing exercises, at least 30 minutes before you go to bed? Yes No
12. Is you bed comfortable, warm, and inviting to sleep in? Yes No
13. Do you clear your books, computer, phone, all electronic gadgets, games, and all the busy stuff off the bed? Yes No
14. Do you turn the lights and sound off when you go to sleep? Yes
    No