Sleep

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ZZZZZZZZZZZZZZZZZ....
Why do we need sleep?

Myth #1:  
*Sleep = body and brain rest.*

- **Reality**
  - Body systems do not shut down.
  - Some brain activity increases (Delta waves).
  - Some hormone secretions increase (growth and prolactin).

http://www.zoologie-skript.de/neuca/neuron21.jpg
Class Research Activity

- The class will break into six groups.
- Each group will:
  - research one of the adjacent topics
  - prepare a 5 minute oral presentation
  - explain the topic and explore its effect on teens and sleep
  - Include a written bibliography of 4+ acceptable sources.

Research Topics
- Circadian clock
- Growth hormones and sleep
- Serotonin and sleep
- Nightly sleep brain events
- Physiological differences during NREM and REM sleep
- Melatonin and sleep
  - Melatonin
  - DANA.org- brainweb and brain information-sleep
  - Sleep disorders
  - Sleep and the brain (Gray Matters)
  - Glossary of sleep-related terms
  - Hot Topics in Current Research
  - The processes underlying sleep regulation
Myth #2:
I need less sleep than my 8 year old sibling.

- Reality
  - Because of rapid growth, teens tend to need the same amount of sleep as pre-school children.
  - Nine+ hours of sleep per night!
Myth #3: 
It’s not a big deal if I get an hour less of sleep at night.

• Reality
  – Each time segment of lost sleep accumulates as sleep debt.
  – Focus, performance, speed of thought and mood are affected.

http://www.worldwebmall.com/TSI/atomic_alarm_clock.jpg
Myth #4:  
*I can change my sleep requirements and schedule.*

- **Reality**
  - The body’s biological clock times and controls a person’s normal sleep/wake schedule.
  - Light exposure, eating and exercise patterns can affect the biological clock.

http://www.heroinhelp.net/images/teenager%2010.jpg
Why Sleep?
Can’t I get more done without it?
In life, quality wins out.
Be your best!

http://www.kent.edu/photoessays/Sept2004/images/010HECMLKdance1.jpg
Sleep is a **natural** behavior.
1/3 of life is spent sleeping because it’s essential to health!
Sleep is **required** for survival

- Rats deprived of sleep die within 2-3 weeks of continued sleep deprivation.
- Rats with sleep debt live about five months compared to the normal 2-3 years.
- Humans deprived of sleep can become paranoid and hallucinogenic.
- 100,000 auto deaths per year are attributed to sleepiness—especially among teens.
The Delicate Balance:
Teen sleep needs versus teen sleep behaviors…

Small shifts in behaviors or motivations can have significant biological repercussions.

http://rock-on-rock-on.com/gallery-more-four.html
Teens face a biological conflict

Opposing forces are at work.

http://www.photo.net/philg/digiphotos/200109-nikon-d1x/tug-of-war-from-raw.half.jpg
Teen body at war!

- Night-time competition of the body’s physiological functions
- Greater teen sleep requirements
- Morning teamwork of the body’s physiological functions
Night-time competition

- Melatonin secretion is delayed causing a natural urge to stay up later.
Teens need 8.5-10 hours of sleep per night!

9.25 hours is optimal for most teens!
Caution!!!

- Be careful about choosing to delay your sleep cycle!
- A later bed-time urge ≠ less sleep requirements!
- Once a later sleep cycle is established, it is difficult to reverse!
- Exposure to light has a direct effect on your circadian clock!
- Arousing activities (telephone, computer use, video games, TV, etc.) make it easy to ignore feelings of sleepiness!
In the morning, the opposite biological effect is dominant!

- The later sleep cycle + increased sleep needs win over in the morning.
- The natural urge pushes teens to sleep in later in the day.
If one does not sleep in....

- Sleep debt will accumulate.
- A feeling of jet lag occurs.
Question

• How much sleep debt accumulates after one week if a person who needs 9 hours of sleep per night gets eight hours of sleep per night?

• Seven hours of sleep debt occurs in just one week!
Are you in debt?

Class Activity

- Each member of the class will record their personal sleep data in a sleep diary.
- **interactive sleep diary**
- **sleepiness diary**

Question

• Does sleeping in on the weekend help you “catch up on sleep?”

• Yes and no…
• Making up for lost sleep on weekends unfortunately just continues the cycle.
• Just as the body adjusts to the earlier retiring/rising schedule by the end of the week, the body is then subjected to a late night/sleeping in situation on the weekend.
Early bed-times are possible!

• Even with delayed melatonin levels, you **can** resist the biological urge to stay up late
  – Keep your circadian clock maintained.
    • Be consistent with your sleep patterns.
  – Avoid bright lights before retiring.
    • The absence of light signals melatonin release.
  – Engage in calming activities before retiring.

http://pictures.ask.com/pictures?q=calm+night&qsct=31&c=0
Evidences of Sleep Deprivation

• Irritability
  – Can cause increased anger.
  – Can cause increased impatience.
  – Can increase moodiness.
  – Can lead to relationship difficulties

• Difficulty in focusing
  – Decreased performance
    • In school
    • In athletics
    • In driving ability
Effects of Sleep Debt

- Increased death and injury caused by accidents—especially car accidents.
- Poor grades and school performance.
- Increased anger, fear and sadness.
- Decreased ability in controlling emotions and behavior.
- Decreased ability to focus, sit still, and complete work.
- Increased use of stimulants—especially caffeine and nicotine.
Sleep debt can mimic ADHD

- Symptoms are similar
  - Memory problems
  - Mood changes
  - Focus problems
  - Restlessness
  - Poor performance

- [Adolescent ADHD: Sleep, Symptoms and Medication](http://www.youthchg.com/swivel.gif)
- [Renew - Sleep and Stress: Children’s Sleep Patterns Related to Behavior-Study](http://www.youthchg.com/swivel.gif)
- [Neurocognitive Consequences of Sleep Deprivation](http://www.youthchg.com/swivel.gif)
- [Sleep Patterns and Sleep Disruptions in School-Age Children](http://www.youthchg.com/swivel.gif)
Sleep debt can cause weight gain

- Sleep loss decreases leptin levels
  - an appetite depressor hormone
- Sleep loss increases ghrelin levels
  - an appetite stimulator hormone

- Is obesity associated with poor sleep quality in adolescents?
- Gene expression profiles in gastric mucosa of sleep deprivation rats
- Sleep loss may equal weight gain
- Rhythms of ghrelin, leptin, and sleep in rats: effects of the normal diurnal cycle, restricted feeding, and sleep deprivation
- Sleep the Fat Off
- Brief communication: Sleep curtailment in healthy young men is associated with decreased leptin levels, elevated ghrelin levels, and increased hunger and appetite.

http://www.obesityonline.org/slides/slideimgs/talk034__s010_f.gif
Try a new *phenomenal* weight loss plan!

Go to bed!

http://www.poster.net/van-gogh-vincent/van-gogh-vincent-bedroom-at-arles-2802134.jpg
Sleep debt decreases performance

- Teen *driving* performance is lowered.
  - Concentration is required for safe driving.
  - Morning crashes occur as well as evening ones.
  - Teens hold the majority of sleep related car accidents.
  - [Ask Mr. Traffic - sleep and driving](http://www.edmunds.com/media/ownership/driving/drivers.ed.online/teen.driving.2.500.jpg)
  - [Drowsy Driving: Detection and Prevention](http://www.edmunds.com/media/ownership/driving/drivers.ed.online/teen.driving.2.500.jpg)
Sleep debt decreases performance

- Teen **athletic performance is lowered**.
  - Concentration and focus are required for optimal physical exertion.
  - Athletes require quick reaction times.
  - A rested recovered body will perform best.
  - Good athletic performance requires good attitudes.
  - Peak performance requires rehearsals.
  - Peak performance requires energy!

Sleep debt decreases performance

- Teen academic performance is lowered.
  - Memory and learning require sleep.
  - Concentration and focus are required for optimal mental exertion.
  - A rested mind will perform at its best.
  - Good academic performance requires good attitudes.
  - Peak performance requires rehearsals.
  - Peak performance requires energy!

http://www.psy.ohio-state.edu/psy312/images/cogbrain.gif
Create an experiment!

- Design a simple method to test some aspect of sleep related performance.
- You can choose reaction rate, memory, coordination, etc.
- Test students.
- Create an Excel graph which compares performance data with sleep diary data for each student tested.

http://www.joe-ks.com/images/EarlyTransportationStudies.gif
Nine easy ways to keep your sleep cycle intact…

http://www.healthylivingintl.com/images/sleepguyhay.jpg
#1

Maintain consistent bed-times and rising times.
Be aware of your personal circadian rhythm

http://www.effinchamp.org/clock.jpg
Limit caffeine and nicotine intake after 2:00 p.m.

http://www.carl.n1.pl/1/coffee.jpg
Limit arousal activities 1-2 hours before bedtime.

(Avoid TV, video games, exercise, phone, IM, etc. before bed.)
Limit light intake an hour before retiring.

http://www.rockefeller.edu/images/clock2.gif
#6

*Keep your sleeping area for sleep - not rousing activity!*

http://stuff.mit.edu/people/ec_mok/www/henry/jordan's%20bed%20008.jpg
An hour before retiring, engage in calming or relaxation activities

http://store.chopra.com/uploads/1%20wi%20yoga.jpg
Avoid jobs that require late hours

Expose yourself to bright light in the morning stimulate waking.

http://homepage2.nifty.com/kenkitagawa/Hopper-morning-sun.jpg
Final Thoughts…

- Experience life more fully—without the fog of a sleepy brain.
- Experience peak performance skills and learning abilities.
- Experience mental and physical challenges with a positive attitude.
**NSTA Standards for Science**

**Standard 1: Content**

Teachers of science understand and can articulate the knowledge and practices of contemporary science. They can interrelate and interpret important concepts, ideas, and applications in their fields of licensure; and can conduct scientific investigations. To show that they are prepared in content, teachers of science must demonstrate that they:

a. Understand and can successfully convey to students the major concepts, principles, theories, laws, and interrelationships of their fields of licensure and supporting fields as recommended by the National Science Teachers Association.

b. Understand and can successfully convey to students the unifying concepts of science delineated by the National Science Education Standards.

c. Understand and can successfully convey to students important personal and technological applications of science in their fields of licensure.

d. Understand research and can successfully design, conduct, report and evaluate investigations in science.

e. Understand and can successfully use mathematics to process and report data, and solve problems, in their field(s) of licensure.

C.2.a. Core Competencies. All teachers of biology should be prepared to lead students to understand the unifying concepts required of all teachers of science, and should in addition be prepared to lead students to understand:

9. Behavior of organisms and their relationships to social systems.

10. Regulation of biological systems including homeostatic mechanisms.

12. Applications of biology in environmental quality and in personal and community health.


20. How to design, conduct, and report research in biology.


**Standard 3: Inquiry**

Teachers of science engage students both in studies of various methods of scientific inquiry and in active learning through scientific inquiry. They encourage students, individually and collaboratively, to observe, ask questions, design inquiries, and collect and interpret data in order to develop concepts and relationships from empirical experiences. To show that they are prepared to teach through inquiry, teachers of science must demonstrate that they:

a. Understand the processes, tenets, and assumptions of multiple methods of inquiry leading to scientific knowledge.

b. Engage students successfully in developmentally appropriate inquiries that require them to develop concepts and relationships from their observations, data, and inferences in a scientific manner.

**Standard 4: Issues**

Teachers of science recognize that informed citizens must be prepared to make decisions and take action on contemporary science- and technology-related issues of interest to the general society. They require students to conduct inquiries into the factual basis of such issues and to assess possible actions and outcomes based upon their goals and values. To show that they are prepared to engage students in studies of issues related to science, teachers of science must demonstrate that they:

a. Understand socially important issues related to science and technology in their field of licensure, as well as processes used to analyze and make decisions on such issues.

b. Engage students successfully in the analysis of problems, including considerations of risks, costs, and benefits of alternative solutions; relating these to the knowledge, goals, and values of the students.

**Standard 5: General Skills of Teaching**

Teachers of science create a community of diverse learners who construct meaning from their science experiences and possess a disposition for further exploration and learning. They use, and can justify, a variety of classroom arrangements, groupings, actions, strategies, and methodologies. To show that they are prepared to create a community of diverse learners, teachers of science must demonstrate that they:

a. Vary their teaching actions, strategies, and methods to promote the development of multiple student skills and levels of understanding.

**Standards 8: Assessment**

Teachers of science construct and use effective assessment strategies to determine the backgrounds and achievements of learners and facilitate their intellectual, social, and personal development. They assess students fairly and equitably, and require that students engage in ongoing self-assessment. To show that they are prepared to use assessment effectively, teachers of science must demonstrate that they:

a. Use multiple assessment tools and strategies to achieve important goals for instruction that are aligned with methods of instruction and the needs of students.