Energy Drinks-Teenagers & The Harmful Effects In Their Bodies

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Whitewater Middle School

This curriculum unit is recommended for:
Science/ESL Inclusion for 8th Grade

Keywords: Energy drinks, harmful effects, chemical interactions, drinks components, market & media, side effects, young adolescents, advertising and products labelling

Teaching Standards: See Appendix 1 for Common Core teaching standards addressed in this unit. See Appendix 2 for WIDA 6-8 Grade Standards

Synopsis: This unit seeks to engage English Language Learners (ELs) in the exploration of Science and the chemical reaction that energy drinks have in young adolescence bodies. English Language Learners will explore the different beverages in the market, examine the media that advertise these products, analyze data from medical resources, and complete surveys to collect information about students in our middle school about the intake of energy drinks and their harmful consequences in their health. During this curriculum unit the teacher will develop differentiated and scaffolding strategies to master reading, speaking, listening and writing skills to improve the acquisition of the English language in the Science content area. The unit components will be divided in 5 individual lessons and a bonus lesson with mini-lectures. Students will work on a variety of activities geared towards newcomers and intermediate ELs.

I plan to teach this unit during the coming year with 25-30 students in Science/ESL inclusion class, grade 8th.

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Introduction

As an experienced teacher working closely with teenagers and English Language Learners, I have observed an increase in their consumption of energy drinks. In my interactions with the students, I was surprised to find that the students were unaware of the major ingredients in these drinks, and the harmful consequences of consuming these drinks over time. My major goal is to implement lessons outlined in this unit in a middle school science inclusion class. As the full time English as a Second Language (ESL) teacher at Whitewater Middle School, I support the instruction of content teachers in the classroom as they work with English Learners (ELs). ELs are students who speak a language other than English at home and are in the process of gaining proficiency in English. Though referred to as ELs, the students may be at varying levels of English proficiency. Some of the ELs are newcomers from other countries. However, it may come as a surprise, but a large group of ELs consist of Long Term ELs. These students were born in the country and have spent six or more years receiving English services.

Every time I observed students or a teacher having an energy drink at my school, it has become a habit to ask them why and how often they drink them. I have received many different answers like it "Makes me feel focused in my job", "I didn't sleep well last night, "I need caffeine to help me", and "I didn't eat breakfast". These responses piqued my curiosity and in conjunction with this seminar (Chemical Interactions in the Body) were the inspiration to examine this topic. The lessons in the unit will foster an understanding among students about the harmful effects of energy drinks. A second goal is for the teachers and the students to become spokespersons to motivate others to avoid or reduce the consumption of energy drinks.

I recall doing some research prior to enrolling at the *Charlotte Teachers Institute,* and found out that based on The Journal of Nutrition, Education and Behavior, "urgent care units in hospital across the nation have reported that since 2011 the number of young adolescents taken to urgent care after drinking energy drinks has tripled, and in some cases they had mixed the energy drinks with alcohol, which makes it even more complicated and dangerous". As an adult, mother and teacher I feel obligated to caution teenagers around me about these harmful effects, and sometimes lethal consequences.

Along with building awareness, another important aspect of this curriculum unit is to foster the consumption of healthier beverages among students. Through the knowledge that the students gain by engaging in the activities in this curriculum unit they will be able to advocate for the regulation of laws that control the marketing, advertising, and labelling of energy drinks. In addition, the students will advocate for restrictions on convenience stores to sell energy drinks to minors.

School Setting

Whitewater Middle is located in West Charlotte, almost outside the city limit. Whitewater Middle is a 54 classroom prototype school which opened in 2009. The school was opened to alleviate overcrowding at Coulwood and Wilson Middle School, it has three Elementary feeders. Tuckasegee, Allenbrook, and Whitewater Elementary. It is also a late school with hours of operation from 8:45 am to 3:45 pm.

The population of the school is approximately 60.4% African-American, 20.8% Hispanic, 8.5% Asian 0.5 American Indians and 7% White students. 95% of the students at Whitewater Middle receive free and reduced lunch services. 10% of all students at Whitewater Middle are considered to have limited English proficiency, which is much higher than the median across all reported middle schools in North Carolina (3%). Males outnumber females at Whitewater Middle, where the student body is 53% male and 47% female. The socio-economical level of the majority of our school is low, but that has not been an impediment for Whitewater Middle to be:

- 1 of 42 schools in CMS that exceeded growth the last three consecutive school years.
- 1 of only 9 middle schools in CMS that exceeded growth.
- Have the 8th highest 8th grade science growth index in CMS (out of 45 schools).
- Have the 5th highest math growth index in CMS (out of 48 schools).
- 1 of only 2 Title I middle schools that exceeded growth in CMS last year.

In our school, teachers apply lessons plans that involve real-life situation, and social problems. That is the second reason why the consumption of energy drinks came to my interest to develop this curriculum unit. Teachers at my school have observed the increase in consumptions the last five years too.

The unit itself will focus on the idea of the consumption of energy drinks at younger ages and the harmful consequences that this causes specially in teenagers.

Curriculum/Goals

The North Carolina and WIDA standards (WIDA stands for advances academic language development and academic achievement for children and youth who are culturally and linguistically diverse through high quality standards, assessments, research, and professional learning for educators) course of study in English as a Second language and Science provides the framework of goals and objectives for this curriculum unit.

This unit will address different goals stipulated in each lesson that build upon content and English proficiency skills.

Background

What are energy drinks?

Energy drinks are beverages that contain ingredients that offer to increase energy and mental performance immediately after its intake.[1] The first energy drink in the market was invented in Japan in the year of 1960, this drinks was created to target the increase of concentration and energy in humans. The product was introduce in the market as a tonic medical beverage.[2] These drinks contain different vitamins and metabolic agents that boots energy for short, sometimes long periods of time. Twenty seven years later in Austria, Dietrich Mateschitz invented the most famous drink nowadays, well-known as Red Bull.[3] After Red Bull, many other drinks were invented, and the sale of the drinks has improve considerably since their introduction in the US.

Energy drinks components

According to Dr. Pearson, PhD.RD "Energy drinks contain ingredients marketed to increase energy, alertness and concentration." The chemical composition of energy drinks is based on: Caffeine, taurine, vitamins and glucose.[4] Energy drinks typically contain other ingredients as, guarana, ginseng, amino acid derivatives and herbal extracts. After compare Red Bull one of the most popular drinks with the other popular energy beverages in the market it can be state that caffeine, taurine and glucosamine are the most commons components among them.

Caffeine

A bitter alkaloid, $C_8H_{10}N_4O_2$ found especially in coffee, tea, cacao, and kola nuts and used medicinally as a stimulant and diuretic.[5] Caffeine is a vital ingredient in energy drinks, and its levels in each brand can vary widely. Energy drinks do not fall under the same regulatory category as sodas or fruit juices and often have higher levels of the alkaloid in them.

Taurine

An amino acid, $C_2H_7NO_3S$ not found in proteins that is synthesized in the liver from cysteine is found in bile and other body fluids and tissues, and has a variety of physiological functions.[6] Taurine is a chemical that is a required to building block of protein in the body. Several studies mentioned that the amount of taurine consumed from energy drinks is higher than that in a normal diet. There is no evidence of this been unhealthy for the consumers.

Vitamin B

Any of various organic substances that are essential in minute quantities to the nutrition of most humans, animals and some plants, act especially as coenzymes and precursors of coenzymes in the regulation of metabolic processes but do not provide energy or serve as building units, and are present in natural foodstuffs or sometimes produced within the body.[7] Studies suggest that B vitamins can improve mood and even fight heart disease and cancer, but the amount contained in each energy drink isn't enough to have any meaningful effect.

Glucose

A crystalline sugar, $C_6H_{12}O_6$ specifically: the sweet colorless soluble dextrorotatory form that occurs widely in nature and is the usual form in which carbohydrate is assimilated by animals.[8] The sugar content in energy drinks is very high, usually higher than a regular drink.

Guarana

A dried paste that is made from the seeds of a South American climbing shrub (Paullinia cupana) of the soapberry family that contains caffeine and tannin, and that is used as a stimulant.[9]

The major problem for adding guarana to energy drinks is that its content of caffeine is not included in the total caffeine of the drinks.

Ginseng

A Chinese perennial herb (Panax ginseng synonym P. schinseng of the family Araliaceae, the ginseng family) having five leaflets on each leaf, scarlet berries, and an aromatic root used in herbal medicine especially in eastern Asia. Ginseng has been studied as a way to improve mood and boost endurance that is why their used in energy drinks, as well as treat different diseases as: cancer, heart disease, fatigue, erectile dysfunction, hepatitis C, high blood pressure, menopausal symptoms, and other conditions. While some of these uses are promising, the evidence isn't conclusive.[10]

Amino Acids

An amphoteric organic acid containing the amino group NH2; especially :any of the various amino acids having the amino group in the alpha position that are the chief components of proteins and are synthesized by living cells or are obtained as essential components of the diet.[11]

Energy Drink Side Effects

Concerns over the safety of energy drinks continue to grow each day, many researches outline important evidence regarding the content, harmful consequences, and risks of the beverages that each day are gaining more popularity in adolescents and young adults.

Data on the consumption of energy drinks – statistics and graphs. Focus on younger kids (similar to middle scholars). See Appendix 4

According to the DAWN report (Drug Abuse Warning Network):

- The number of emergency department (ED) visits involving energy drinks doubled from 10,068 visits in 2007 to 20,783 visits in 2011
- Among energy drink-related ED visits, there were more male patients than female patients; visits doubled from 2007 to 2011 for both male and female patients
- In each year from 2007 to 2011, there were more patients aged 18 to 39 than patients in other age groups involved in energy drink-related visits; however, the largest increase

was seen among patients aged 40 or older, for whom visits increased 279 percent from 1,382 visits in 2007 to 5,233 visits in 2011

- In 2011, more than half of energy drink-related ED visits involved energy drinks only (58 percent), and the remaining 42 percent involved other drugs

And based on the Official Journal of the American Academy of Pediatrics Published online 2011 Feb 14. "Energy drinks are consumed by 30% to 50% of adolescents and young adults. Frequently containing high and unregulated amounts of caffeine, these drinks have been reported in association with serious adverse effects, especially in children, adolescents, and young adults with seizures, diabetes, cardiac abnormalities, or mood and behavioral disorders or those who take certain medications. Of the 5448 US caffeine overdoses reported in 2007, 46% occurred in those younger than 19 years. Several countries and states have debated or restricted energy drink sales and advertising."[12]

Several investigations indicate that energy drinks may contribute to various harmful consequences especially in teenagers. Hospitals are seeing increased incidents of those 18 and younger teenagers having dangerous side effects from consuming too many energy drinks at one time of regularly.

Caffeineinformer.com list the fourteen major consequences of consuming energy drinks are young ages.

Top major risks of energy drinks:

1. Cardiac Arrest
2. Headaches and Migraines
3. Increased of anxiety
4. Insomnia
5. Type 2 diabetes
6. High blood pressure
7. Vomiting
8. Allergic reactions
9. Niacin overdose
10. Stress hormone release
11. Jitters and nervousness
12. Drug interaction
13. Addiction
14. Risky behavior [13]

Social Issues Around Energy Drinks

Energy drinks were at the beginning marketed only for people who practice sports and needed that extra strength to performed better in different disciplines, but unfortunately that is not the case as we can observe on television commercial, energy drinks claim that these beverages won't solely boost energy, however additionally increase concentration, increase immunity, and improve your overall health, etc.

As we can observe in these ads, See Appendix 3 they are offering in the commercials to make us smarter, to be successful with women, to become super heroes, and even using children video games images as motivation for becoming faster and popular.

Teaching Strategies

Academic Vocabulary

Academic vocabulary is a key area in ESL (English as a Second Language) instruction. ELs (English Language Learners) can be challenged with the use of the academic vocabulary in the content areas like science. Unlike native English speakers, ELs need more time and practice with key vocabulary to get a better understanding of the lesson. In the first part of this teaching unit the main goal is to teach ELs the specific vocabulary related to the topic divided by tiers 1, 2 and 3 that goes to the simple words to complex ones. Students will learn and apply specific vocabulary based on their English language proficiency. Tiers refers to vocabulary that goes from basic words to content area cognates.

Academic vocabulary is essential to understand the content of the unit and the acquisition of a second language. Since this is a Science unit in an English as a Second Language inclusion class, some of the vocabulary words will not be familiar to the students, so vocabulary will take a whole lesson. English Language Learners often struggle with science terminology, is important to introduce new words. Vocabulary development will be master with bilingual dictionaries, short definitions and flash cards.

Reading

Students will engage in reading using articles based on their Lexile levels to introduce content, re-inforce concepts, analyze outcomes and predict future applications of concepts to areas such as health, harmful effects and chemical components. Students will use tools such as annotation, “talking to text” and academic conversations to derive meaning, engage in discussion, complete charts and develop critical thinking skills.

Writing

Students will complete writing activities placing importance on English writing skills that will be useful for English Language Leaners in a variety of situations, and will help them develop well-rounded communication breakdowns in different forms. Good writing skills allow ELs to communicate with clarity and ease to different audiences.

Listening

Developing Listening skills seems like it should be simple, or secondary to other more active language skills, but listening to a foreign language is difficult. The strategy of playing a video with no sounds the first time and with sound, the second time will give students and advantage of looking for background knowledge and apply it to their task.

Speaking

One of the hardest skills to develop in the acquisition of a second language is speaking. This challenge makes it imperative to provide several opportunities during each lesson for students to interact, especially with native speakers. In this unit students will have pair and group activities to develop speaking skills and master this skill.

Interactive Strategies

To engage students in the exploration of new concepts and thinking critically about the harmful effects of energy drinks in adolescents. The teacher will use video clips, charts, and surveys to help students to make connections and explore applications of the concept.

Dual video clips

Students will develop listening proficiency and background knowledge on a topic while viewing a video twice. The first time the video plays with no volume and students brainstorm ideas. The second time the video is played with sound and students compare their previous ideas.

Compare and Contrast

The compare and contrast strategy strengthens students' writing skills by providing a simple structure that helps them organize information and develop their ideas with greater clarity and precision. This strategy also improves comprehension by highlighting important details, making abstract ideas more concrete, and reducing the confusion between related concepts.

Survey Data Analysis

Surveys are a meaningful way for students to uncover answers, evoke academic discussions in the classroom, take decisions on objectives and first-hand information, and compare results of thoughts, opinions, and comments about the target survey population. Providing the students with ownership of the data will make students’ work more meaningful.

Curriculum Unit Lessons

Lesson 1: Objective

Students develop reading, listening, and speaking proficiency by matching academic vocabulary Science terms with correct definitions in an interactive game of Vocab Go Fish.

Teaching

A short lecture using PowerPoint will provide content material and essential vocabulary, making sure students are familiar with the words and their meanings. Teacher will introduce students to the rules of the game and model a round with a volunteer from the class. Then students move into partner groups where, after shuffling index cards, they play while the teacher circulates to provide support. Last students will gather for a closing and reflect on the words. Which words were easy for most? Were there words that many struggled with? Make note and review the challenging words in subsequent lessons.

Practice

Students, play Go Fish using index cards with vocabulary words about energy drinks *Appendix 4* on one set and their definitions on another. During the game, students choose a word in their hand and ask their partner if they have the definition to match. Depending on whether there is a match, they either get to make a pair of cards, putting that pair to the side by taking their partner's card, or have to Go Fish by taking a new card from the deck. In the end, the student with the most matches wins the game.

Lesson 2: Objective

Students will be able to define the concept of energy drinks and its components.

Teaching

Reading and article about energy drinks and its components teacher will discuss information with students. Teacher will use a PowerPoint presentation that will contain pictures illustrating the different components of energy drinks as caffeine, taurine, guarana, glucose, etc.

Practice

Students will illustrate a mini book creating a foldable with illustrations and definitions of all the components of energy drinks, and their chemical formulas, annotate the article and discuss about the topic. See Appendix III for article.

Lesson 3: Objective

Students will develop listening proficiency and background knowledge on a topic while viewing a video two times.

Teaching

A short introduction for the students will ensure they understand the context of the two video clips containing advertisements about energy drinks. During the short lecture, teachers will provide specific look-for during viewing that align information with the content goals. The main focus will be about advisement, marketing and labelling the products.

Practice

Teacher will proceed with the first viewing of the clip, encouraging students to focus on the look-for specified. Then release students to discuss their observations and complete the first part of the chart. Lastly, the second viewing of the clip, this time with sound, teacher will pause the clip periodically to encourage students to digest, and discuss what they saw and fill in the chart.

Further Steps:

Pay careful attention to the silent viewing of the clip, keeping in mind your teacher's advice about what to look for. Discuss your observations with your partner. Watch the video a second time, this time with sound. Consider: What changed for you as a viewer once sound was included?

Lesson 4: Objective

Compile and analyze data using surveys.

Teaching

A day or two ahead teacher will provide students with a survey (See English and Spanish versions). Each student will administer the survey to a least 3 students or teachers around the school.

Practice

In addition the students will compile the data from their surveys to get a sense of the energy drink consumption in the school. Later on teacher and students will discuss these results as a class and isolate the popular energy drinks for closer examination. Tally the data, write the response. Be sure to use evidence to support how the decision creates a positive or negative effect and use appropriate cause-effect signal words. Be respectful and work hard when working with a partner. Be prepared to share each writing.

Lesson 5: Objective

Objective: Students will practice speaking in extended messages with connected sentences as they present multiple sides of an issue. Pros and Cons of energy drinks.

Teaching

The main goal on the second lesson is teaching the ELs about the most popular energy drinks consumed by teenagers in the US and their advantages and disadvantages.

A short lecture will introduce the topic and guide students through a brief Know, Want to know Learned graphic organize activity. Teachers will model the activity by conducting a read-aloud and think-aloud, taking notes for all to see before moving to independent practice.

Practice

Students engage in a fast-paced and fun improvisation of presenting more than one perspective on an issue. During the improvisation, a student must present support of an issue (Pro). Upon another student, the Director, indicating switch time, the same student uses connecting contrast language (e.g. “on the other hand,” “however,” “then again,” etc.) to present one opposing piece of evidence (Con). The student is directed to switch back and forth a number of times, or to call on a peer for support/relief. Lastly all students complete chart with the most meaningful pieces of information discuss in class as pros and cons.

Extra Lesson

Objective

Students will explore alternative healthier options to energy drinks by comparing and contrasting energy drinks with natural drinks.

Teaching

By showing two different drink labels, teacher will show students how to identifying important nutritional labeling aspects that consumers should examine at the time of purchasing. Then students will draw conclusions that provide important information for the food processors about consumer behavior in related to food nutritional aspects and the purchasing intention deciding as a class which are the three best healthier options to avoid energy drinks.

Practice

Using various QR codes, previously prepared by the teacher, student will use their iPad to examine different drink labels and compare their ingredients.

Final Unit Assessment

Students will be challenge to apply what they have learned about energy drinks in a formal assessment.

Students will be informally assessed in vocabulary the following days of the first lesson.

Appendix 1: Implementing Teaching Standards for North Carolina Standard Course of study.

8. P.1.3 — Compare physical changes such as size, shape and state to chemical changes that are the result of a chemical reaction to include changes in temperature, color, formation of a gas or precipitate.

Students know:

- That physical and chemical properties can be used to identify substances.
- How to distinguish between physical properties (i.e., shape, density, solubility, odor, melting point, boiling point, and color) and chemical properties (i.e., acidity, basicity, combustibility, and reactivity).
- How to determine the identity of an unknown substance by comparing its properties to those of known substances.
- How to compare physical changes (including changes in size, shape, and state) to chemical changes that are the result of chemical
- Reactions (including changes in color or temperature and formation of a precipitate or gas).
- That matter can undergo physical and chemical changes. In physical changes, the chemical composition of the substances does not change. In chemical changes, different substances are formed. Students know that when a substance is broken apart or when substances are combined and at least one new substance is formed, a chemical reaction has occurred.
- how to differentiate between physical and chemical properties:
- Physical properties can be observed and measured without changing the kind of matter being studied.

Appendix II: Implementing WIDA Standards

https://www.wida.us/standards/CAN_DOs/Booklet6-8.pdf

Appendix III: Links to advertisements, Academic Vocabulary, Teacher Resources, Students Resources, Assessment

https://www.youtube.com/watch?v=p47iF4yF6Sc

https://www.youtube.com/watch?v=LzdghqtUp6U

https://www.youtube.com/watch?v=9cPbfTPC_Sg

https://www.youtube.com/watch?v=dQpK-0vWBU4

https://www.youtube.com/watch?v=6Mx5snnod78

Academic Vocabulary

Tier 1 Simple words	Tier 2 Polysemous words	Tier 3 Content areas, cognates & false cognates words
Total	Vitamin	Decease
Energy	Chemical	Illness
Body	Ginseng	Potassium
Brain	Guarana	Carbohydrate
Effect	Taurine	Glucose
Drink	Intake	Stimulant
Sugar	Consume	Protein

Pros and Cons of Energy Drinks

Pros of Energy Drinks	Cons of Energy Drinks
Energy drinks give you a good energy boost Quick pick me up Vitamin B: improves mood and can fight cancer and heart disease B12: Keeps your red blood cells and nerves healthy. Helps regulate the nervous system and maintain a healthy digestive system. B6: helps body with cardiovascular, immune and nervous system function Niacin: Helps relieve arthritis pains and lower blood lipids Pantothenic Acid: Helps with allergies, stress, and anxiety and skin disorders. Riboflavin: Can treat muscle cramps and blood disorders.	Energy drinks carry a lot of Caffeine and sugar. Energy drinks are NOT good for exercising. They will dehydrate you giving you less energy to workout. Can become addicting Causes headaches/Migraines due to withdrawal from caffeine Insomnia: Energy drinks can cause lack of sleep. Too much caffeine will definitely keep you awake. Jitters: Energy drinks can make you jittery and anxious High Blood Pressure: Caffeine has the ability to raise a person's blood. Niacin: Although it has its benefits, niacin can cause dizziness, and rapid heart.

Surveys

The Beverage Survey

1. Your name: _____ 2. Your age: _____ 3. Grade: _____

4. Choose your favorite beverage

   a. Soda

   b. Coffee

   c. Tea

   d. Energy Drink

5. How many times a day do you consume your favorite beverage?

   a. 1-3

   b. 4-6

   c. 7-10

   d. More than 10

6. How many glasses of water do you drink a day?

   a. 1-3

   b. 4-6

   c. 7-10

   d. More than 10

7. Do you consume Energy drinks?

   a. No

   b. Yes

   c. Yes – Less than three a week

   d. Yes – More than three a week

   1. Which Energy Drink is your favorite?

   10. Why do you consume Energy Drinks?

Encuesta de Bebidas

1. Tu nombre: _____ 2. Tu edad: _____3. Grado: _____

4. Elije tu bebida favorita

a. Soda

b. Café

c. Té

d. Bebida energética

5. ¿Cuántas veces al día consumes tu bebida favorita?

a. 1-3

b. 4-6

c. 7-10

d. Más de 10

6. ¿Cuántos vasos de agua bebes al día?

a. 1-3

b. 4-6

c. 7-10

d. Más de 10

7. ¿Consume bebidas energéticas?

a. No

b. Sí

c. Menos de tres a la semana

d. Más de tres a la semana

8. ¿Qué bebida energética es tu favorita?

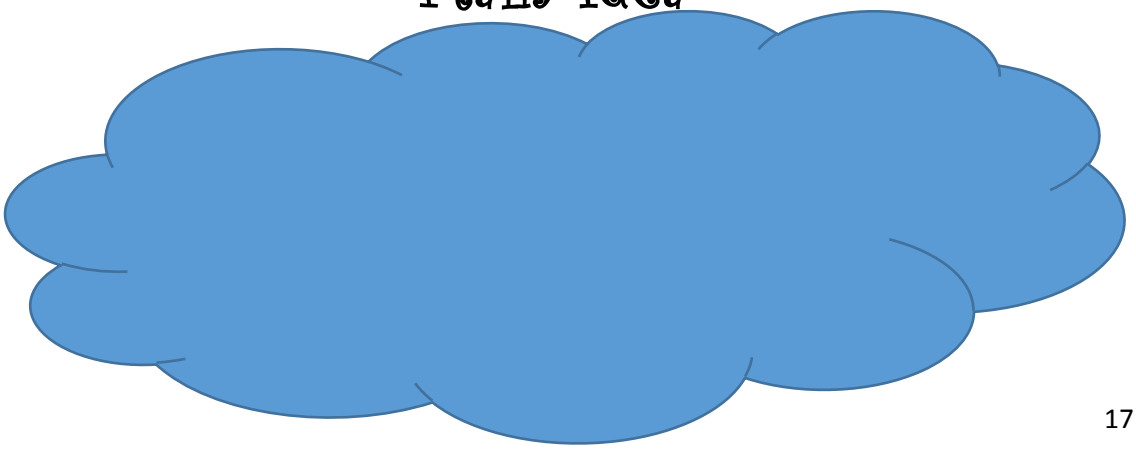
11. ¿Por qué consume bebidas energéticas?

DOUBLE VISION VIDEO WORKSHEET

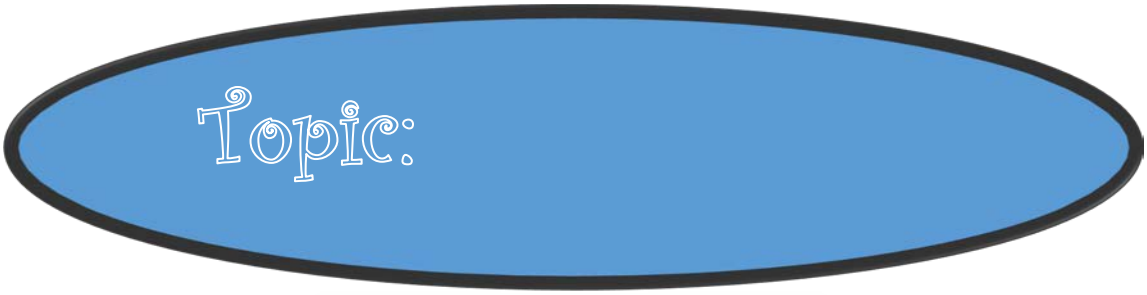
Topic:

Silent viewing - Sound viewing

Main Idea



Pros & Cons



PROS

CONS

Formal Assessment Questions

1. What is an energy drink?
2. Mention the three main components of energy drinks?
3. What is caffeine?
4. Provide other name for glucose?
5. Mention at least two natural components of energy drinks?
6. Write three major risks consuming energy drinks causes in teenagers?
7. Mention five vocabulary words you learned in this unit?
8. Provide two healthier choices to intake instead of energy drinks?
9. Write the chemical component of glucose?
10. Using the following graph write at least three post and cons of energy drinks?

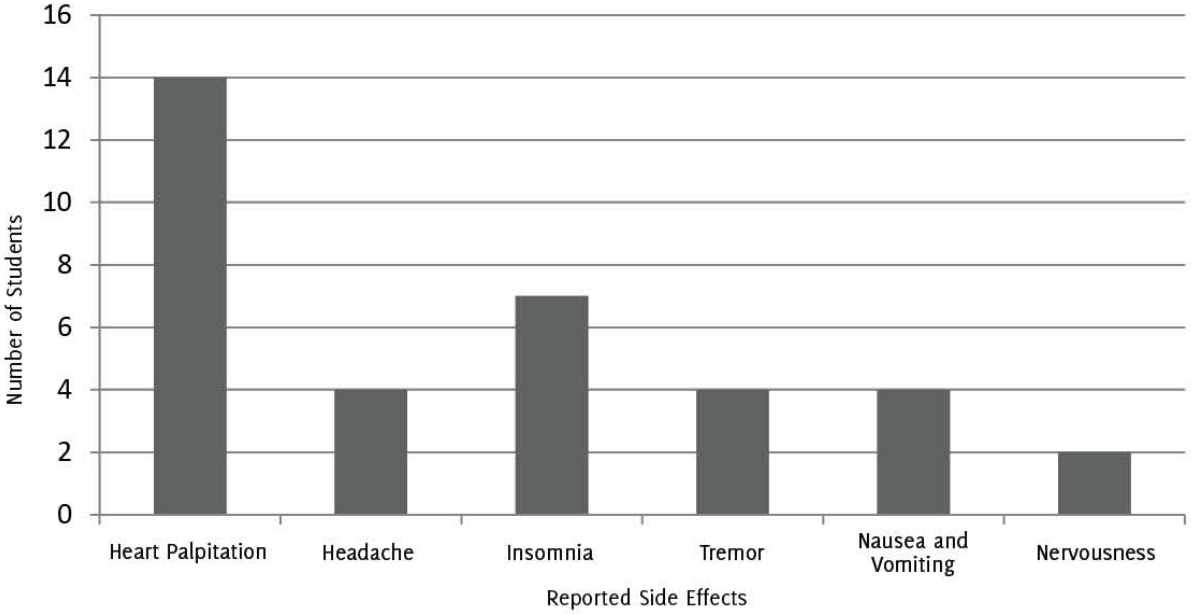
PROS	CONS
1. 2. 3.	1. 2. 3.

11. How can you tell what are the components in the drink (product)?
12. How can you energize yourself without soft drinks, coffee, etc.?
13. Are energy drinks harmless?
14. What can you do if you've noticed a friend's increased consumption of energy drinks?
15. What can you advice your younger siblings about energy drinks?

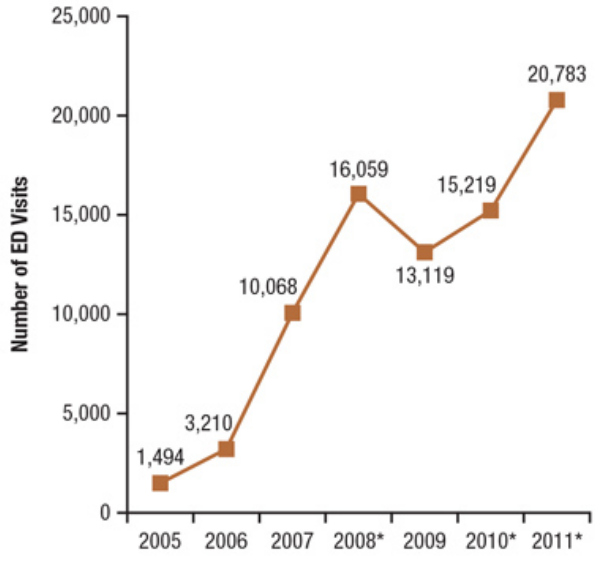
Appendix 4: DATA

Graph 1:
Side effects

Figure 3. Reported Symptoms of Caffeine Intoxication after Energy Drink Consumption among Medical Students in Clinical Years.



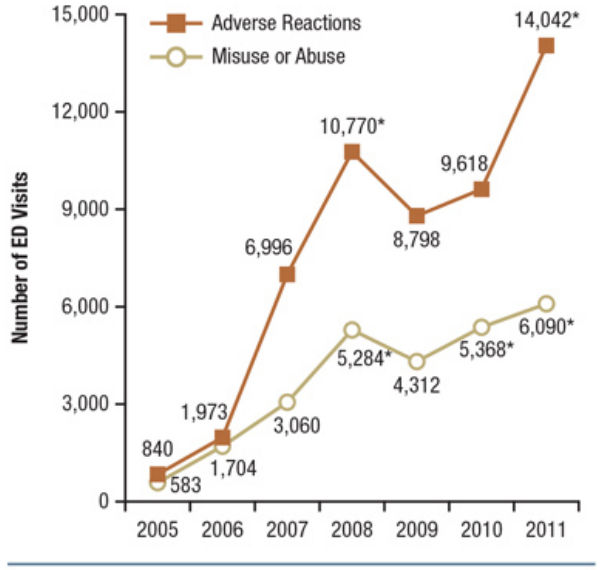
Graph 2:
Emergency Department Visits



* Compared with the number of visits in 2007, the difference was statistically significant at the .05 level. The number of visits in years prior to 2007 were not used in statistical tests because of low numbers; the number of visits in 2004 was not shown because of low statistical precision.

Source: 2011 SAMHSA Drug Abuse Warning Network (DAWN).

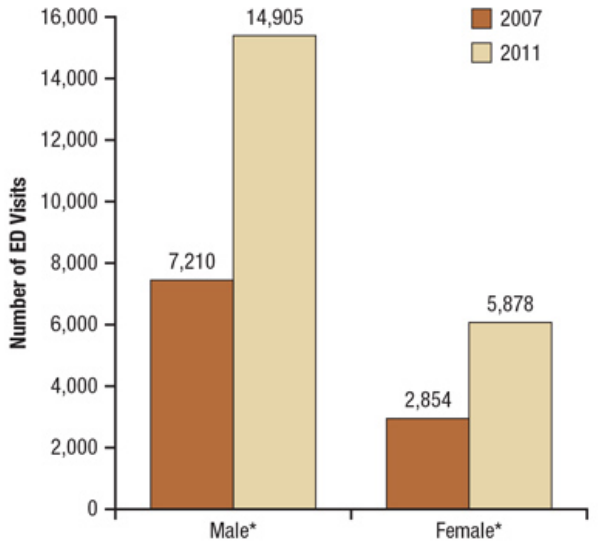
Graph 3:
Adverse Reactions vs. Misuse or Abuse



* Compared with the number of visits in 2007, the difference was statistically significant at the .05 level. The number of visits in years prior to 2007 were not used in statistical tests because of low numbers; the number of visits in 2004 was not shown because of low statistical precision.

Source: 2011 SAMHSA Drug Abuse Warning Network (DAWN).

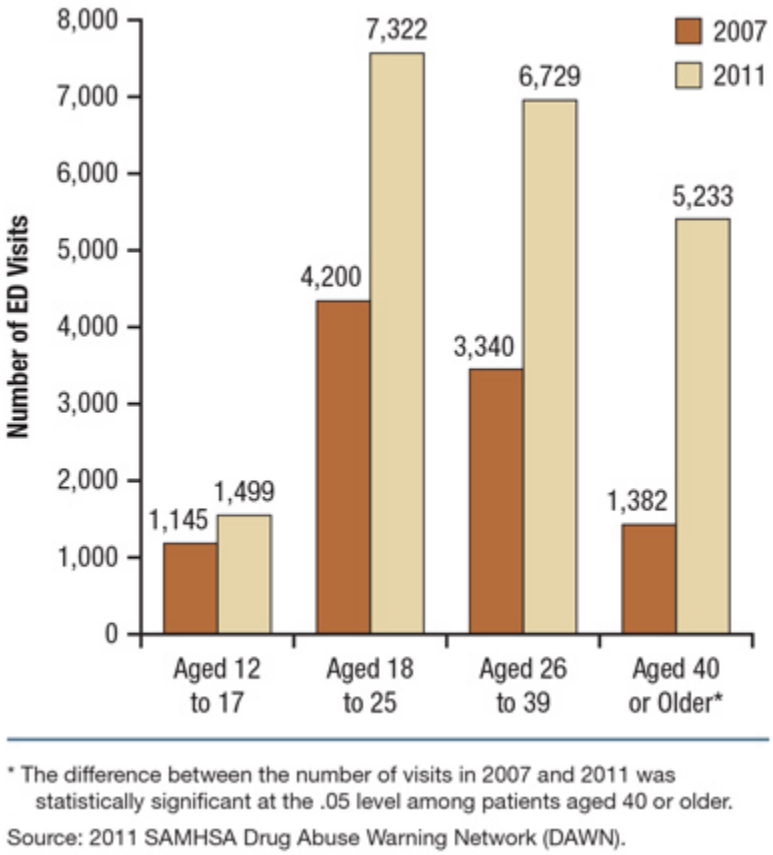
Graph 4:
ED Visits by Gender



* The difference between the number of visits in 2007 and 2011 was statistically significant at the .05 level among both males and females.

Source: 2011 SAMHSA Drug Abuse Warning Network (DAWN).

Graph 5:
ED visits by Age



* The difference between the number of visits in 2007 and 2011 was statistically significant at the .05 level among patients aged 40 or older.

Source: 2011 SAMHSA Drug Abuse Warning Network (DAWN).

Notes

[1] (Thesciencedictionary.com)
[2] (Preceden.com)
[3] (NYtimes.com)
[4] (Eatingwell.com)
[5] (Merriam-Webster's Concise Dictionary of English Usage 2002)
[6] (Merriam-Webster's Concise Dictionary of English Usage 2002)
[7] (Merriam-Webster's Concise Dictionary of English Usage 2002)
[8] (Merriam-Webster's Concise Dictionary of English Usage 2002)
[9] (Merriam-Webster's Concise Dictionary of English Usage 2002)
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