

MINI-PROJECT: PAPER VERSUS PLASTIC

For this science project, you will work with your group members to conduct research, create a product, and present your findings to the class.

QUESTIONS:

- What are the advantages or disadvantages of using paper grocery bags?
- What are the advantages or disadvantages of using plastic grocery bags?
- Which of the two do you think is best to use and why?
- Is there a third alternative that would be better than paper or plastic?

MATERIALS:

- Assignment sheet
- Articles concerning the use of paper and plastic

POSSIBLE PRODUCTS:

- Lesson
- Game
- Presentation (PowerPoint)
- Simulation
- Demonstration
- A product of your group's choosing

To complete this project, you should figure out how to divide up tasks among your group members and stick to the schedule:

- _____ minutes for inquiry, exploration, and research
- _____ minutes to create a product
- _____ minutes for each group to present

You will have to be focused as you research and create your product, and you will need to be concise when you present. Be respectful of other groups as they are making their presentations. In class discussions, be sure to offer criticism in a constructive way and be receptive to others' suggestions.

PROJECT STRUCTURE: SINGLE SUBJECT

Here is the structure I used in my fifth- and sixth-grade science classes. I break the structure down into four phases for students so that it is not so overwhelming. This same structure would work well for students in high school, but if you are teaching younger students, you may wish to break down the structure even further to provide additional guidance.

PHASE I: SETUP

This is where students will decide what projects they will be working on and how much time they will give themselves to complete their projects. There are two aspects of the setup phase: rubrics and calendars.

Students can choose from the following products:

1. Demonstration
2. Electronic portfolio
3. Essay
4. Exhibition
5. Journal
6. Research paper
7. Presentation
8. Portfolio
9. Performance
10. Test

Each student has to create and provide a rubric that will be used to evaluate the selected product. The calendar will plot out the day-by-day course of the project and will include checkpoints and deadlines. Both the rubric and the calendar must be approved before the student can begin.

PHASE II: RESEARCH

This is the part of the project where students go into more depth and address the learning standard(s), seeking a true understanding of the topic. Students will use books and the Internet to compile information needed to understand the various objectives.

Every day there will be conferencing sessions during which notes will be checked and questions can be answered.

PHASE III: PRODUCT

Students will spend this time creating the products they have chosen to show what they have learned.

Products students may choose include the following:

1. Demonstration
2. Electronic portfolio
3. Essay
4. Exhibition
5. Journal
6. Research paper
7. Presentation
8. Portfolio
9. Performance
10. Test

PHASE IV: ASSESSMENT

Here, students will demonstrate what they have learned with their products. They must also include an evaluation. The student should either complete a self-evaluation or select an option from the following list of parties who might evaluate the student:

1. Another teacher
2. A student peer
3. A panel
4. A parent or relative
5. A mentor
6. An expert

PROJECT STRUCTURE: MULTIPLE SUBJECTS

This is the project structure that I developed for the Ivy Program, a one-day-a-week gifted pullout program for third and fourth graders. Because I only got to see students once a week, I was very purposeful about the calendar and making sure students that were working on their projects for at least 15 minutes every day. I knew from experience that without this link to their projects, students would forget about them from week to week and would lose their enthusiasm. For examples of projects I have used, see pages 112–122.

STEP 1

- Each student should select a project that he or she finds interesting.
 - At any given time, there are 20 projects to choose from.
 - Projects vary across different content areas, most of them containing elements from multiple disciplines.
 - Different students can be working on the same project, either together or independently.
 - Projects will be rotated every couple of weeks or so to ensure there are always fresh ones available for students.

STEP 2

- Have students locate the standards their projects will cover.
 - Rather than dictating the standards to the students, have them look through the standards and identify which ones they will be working to meet as they complete their projects.
 - It will be obvious to students how some standards are connected to projects, while the links between projects and other standards might be subtler.
 - Students will record the standards they intend to meet on a project sheet.

STEP 3

- Each student should determine the goals, skills, and products of the project.
 - Each student will fill out a project contract and gain teacher and parent/guardian approval.
 - The contract should specify the student's goals and what the final product will look like.

PROJECT CONTRACT

Student Name: _____

Project Name: _____

Estimated Time of Project (Attach Calendar): _____

Standard(s) Covered: _____

Skills Learned:

- _____
- _____
- _____
- _____

Overall Goal of Project: _____

Product of Project: _____

How Project Will Be Evaluated (Attach Rubric): _____

Student Signature: _____

Teacher Signature: _____

Signature of Parent or Guardian: _____

STEP 4

- Students should plot out on calendars how they will execute their projects.
 - This will help organize the students on a day-to-day basis so they know what they must accomplish and by when.
 - This is particularly helpful for visual learners.

STEP 5

- Students should create their own rubrics describing how their projects and products will be evaluated.
 - Because students create these rubrics themselves, the expectations will be absolutely clear to them.
 - A workshop at the beginning of the year or project will show students how to create their own rubrics.
 - Students will review their rubrics with the teacher to ensure that they have made useful, reasonable rubrics.

STEP 6

- Students will complete their daily tasks and will fill out logs.
 - This will keep students focused on their goals and will help their organization.
 - This will help students who tend to get distracted or lose track of their goals.

PROJECT LOG

DAY 1

Goal that I will accomplish by the end of the day:

How I will achieve this goal:

Verification that I achieved this goal:

Signature of teacher or advisor

DAY 2

Goal that I will accomplish by the end of the day:

How I will achieve this goal:

Verification that I achieved this goal:

Signature of teacher or advisor

DAY 3

Goal that I will accomplish by the end of the day:

How I will achieve this goal:

Verification that I achieved this goal:

Signature of teacher or advisor

STEP 7

- At the end of the project, students present the products they decided on at the beginning of the project.
 - Students can present these products to:
 - the teacher,
 - parents,
 - fellow classmates,
 - fellow students,
 - community members, and
 - experts in the field.

EXAMPLES OF PROJECTS

The 10 projects that follow are examples of projects I developed for students over the years. Because this was a pullout program, the projects I used with students were meant to supplement what they were already working on in the classroom.

I posted project sheets on the wall 20 at a time. There were four math projects, four science projects, four language arts projects, four social studies projects, and four general projects, which could be applied to any one of the core subjects.

I posted new projects every 6 weeks so that students had fresh choices. I also posted these projects on a website so that if students missed a week of school, they could check the website for reminders and new projects. At the beginning of the year, I showed parents and students the website and gave a short tutorial on how to download projects, calendars, contracts, and logs. This way, everybody—myself, students, and parents—had a clear understanding of what was expected and how it would be accomplished.

Students had complete choice regarding what projects they did. However, if your situation calls for more structure (e.g., if you have very specific learning objectives, if your students need more guidance), then you can easily simply assign projects to students.

All of the learning standards used in these projects are based on the Ohio standards developed by the Ohio Department of Education (2002).

WHAT IF CINDERELLA'S SLIPPERS HAD BEEN GOLD INSTEAD OF GLASS?

Brief description: Folktales have been around for hundreds of years, but different cultures have different variations on the same story. For instance, in the Disney version of Cinderella, the heroine has a magical fairy godmother. In the Iraqi version, the godmother takes the form of a red fish, while in the Egyptian version, the godmother is a god. What do these stories indicate about the cultures they come from? You will read an American folktale and compare it to a corresponding version from a foreign country, analyzing what each story's events, characters, and moral(s) indicate about the country it comes from.

Product: You will write an analysis comparing the American version of the story to the foreign one, explaining what the differences in the stories say about the differences in the cultures. You might even want to rewrite the folktale to give it a perspective specific to your state or town.

Content areas: English and Social Studies

Standards:

- English-Reading 5-2
 - Identify the influence of setting on the selection.
- Social Studies 2-1
 - Describe the cultural practices and products of various groups.

Inspiration starting point: Read the two versions of Cinderella from different cultures.

Estimated time of project: 2 weeks

Suggested materials:

- Books with folktales from a foreign country
- Books on that country's culture



CONSTRUCT A FORT

Brief description: Design and construct the ultimate fort for you and your friends to play in.

Product: For this project, you will have the chance to design the perfect fort, complete with everything you think you might want or need. You will first design the fort on paper, and then you will create a model of the fort. (If you are feeling really ambitious, you may build the fort at home, provided you are supervised by your parents.) You should make sure to include considerations such as area and perimeter. Make sure that your design is structurally sound and mathematically correct before building.

Content area: Math

Standards:

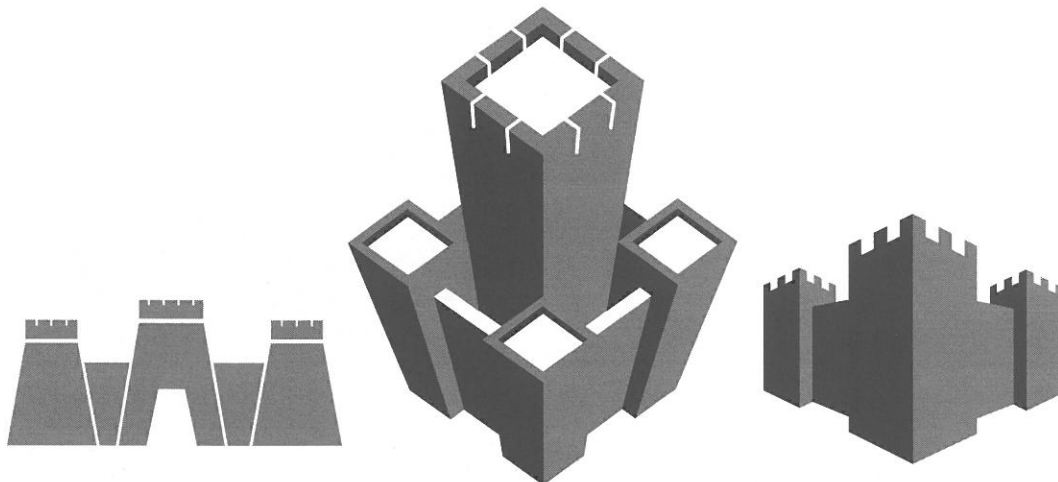
- Math 2-3a
 - Identify and select appropriate units to measure perimeter.
- Math 2-3a
 - Identify and select appropriate units to measure area.

Inspiration starting point: Visit <http://thetreehouseguide.com> to read about and look at photos of the amazing tree houses of the world.

Estimated time of project: 2–3 weeks

Suggested materials:

- Graph paper
- Materials to use for a model, such as popsicle sticks and toothpicks
- Ruler
- Compass



THE THEORY OF FLIGHT

Brief description: The art of making paper airplanes is a complicated one. What makes one plane fly farther than another? What aspects of different designs make one plane better than another?

Product: Here, you will design and construct paper airplanes and fly them to see which of the designs makes the most aerodynamic plane. Through trial and error, you will record the flights of these planes and compare them to those of the other planes. You may determine which design is the most successful, or you may create your own design and test it against the others. Compare and contrast your results with the results in the book (see Inspiration starting point).

Content areas: Science and Math

Standards:

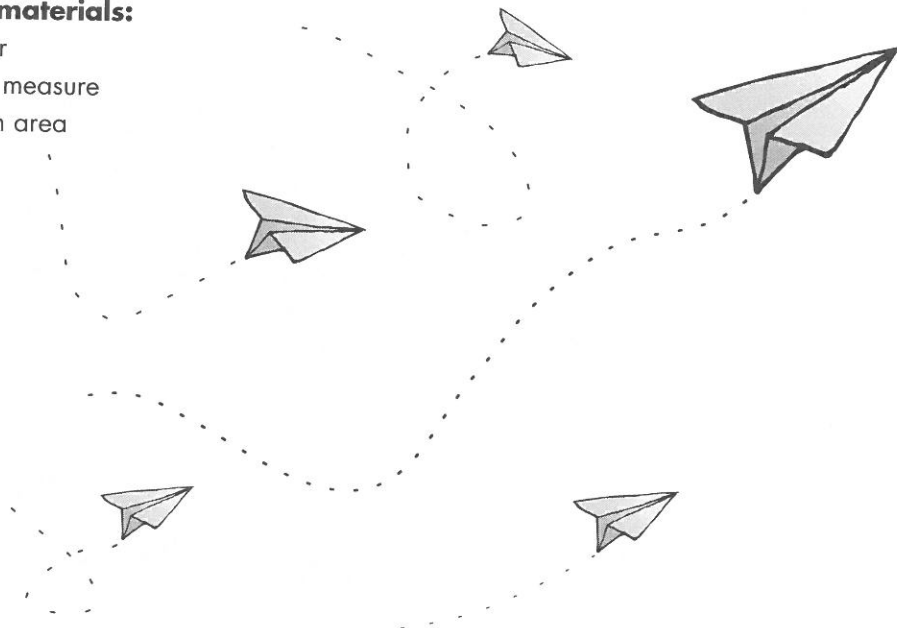
- Science 5-1
 - Select the appropriate tools and procedures to measure and record length.
- Science 6-2
 - Record the results and data from an investigation and make a reasonable explanation.
- Math 5-1
 - Create a plan for collecting data for a specific purpose.

Inspiration starting point: *The Klutz Book of Paper Airplanes* by Doug Stillinger

Estimated time of project: 1–2 weeks

Suggested materials:

- Paper
- Tape measure
- Open area



THE LEMONADE STAND

Brief description: Businesses are formed in order to sell products or services to make a profit for the person owning the business. Businesses also provide valuable products or services that some members of the public need or want.

Product: If you were to start your own business, what sort of business would you create, and why? What are some things you could do to ensure success and avoid failure? How would your business compete against other similar businesses? Why would people buy your product or services over those of other businesses?

Content area: Social Studies

Standards:

- Social Studies 4-1
 - Identify the productive resources needed to produce a good or service and suggest opportunity costs for the resources involved.
- Social Studies 4-3
 - Explain how entrepreneurs organize productive resources to produce goods and services and that they seek to make profits by taking risks.

Inspiration starting point: Play Lemonade Tycoon, a simulation game available at <http://www.gamehouse.com/download-games/lemonade-tycoon>.

Estimated time of project: 2–3 weeks

Suggested materials:

- Local phonebook
- Internet access



I'M JUST A BILL

Brief description: How do certain laws come to be? Why are there different rules for different communities? How did your city's laws become laws? Are any of these laws unfair, or are some laws that should exist missing?

Product: You will look at how the town council functions and what powers it has. This may involve a visit to a council meeting. You could also examine your school rules. Do you think these rules make sense and are fair? How were these laws or rules passed? Most importantly, why do you suppose these laws or rules exist?

Content area: Social Studies

Standard:

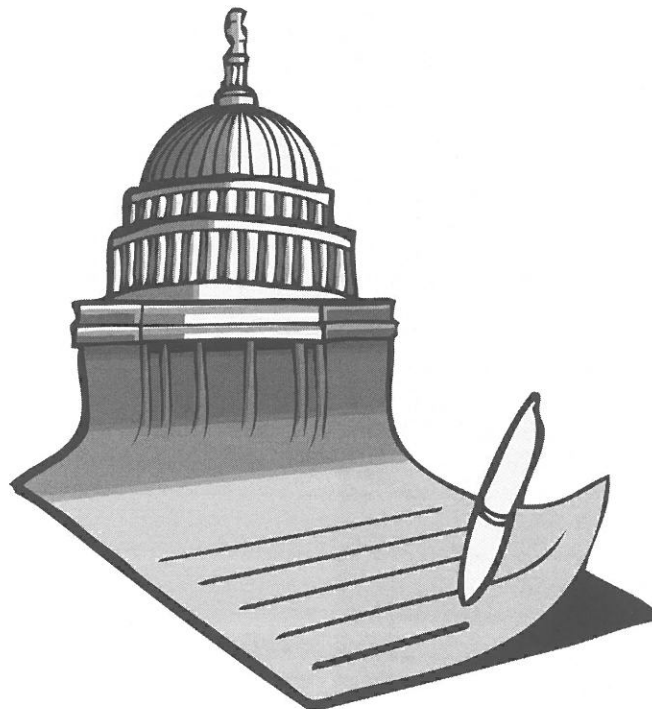
- Social Studies 4-4
 - Explain the major responsibilities of the legislative branch.

Inspiration starting point: Watch the Schoolhouse Rock video "I'm Just a Bill."

Estimated time of project: 1–2 weeks

Suggested materials:

- Relevant websites
- A copy of your city's laws or your school's rules



IT'S ALL FUN AND GAMES

Brief description: People use some board games for educational purposes, such as to increase their vocabulary knowledge (Scrabble) or to show off their knowledge of history (Trivial Pursuit).

Product: Here, you will create a board game that is fun to play while at the same time teaching a skill from one of the four core subject areas. Your game should include instructions for how to play and be designed so that people would want to play it.

Content area: Any

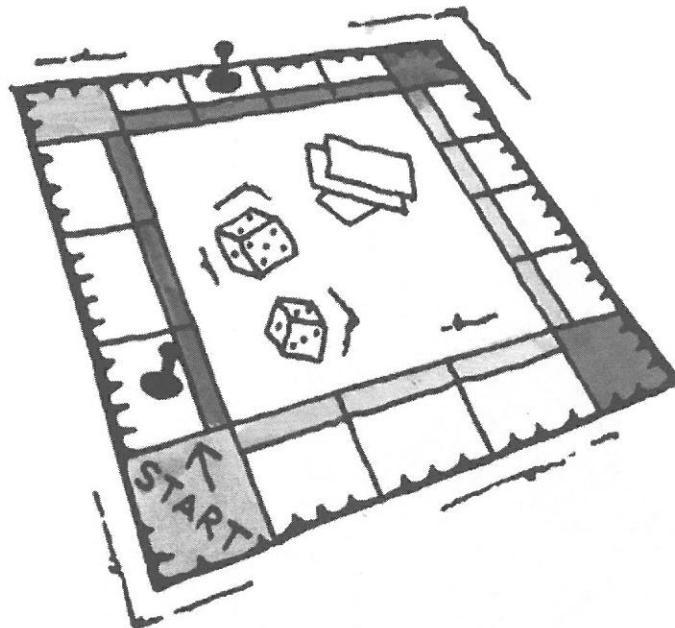
Standards: You must choose a single learning standard on which the game will be focused.

Inspiration starting point: Play Scrabble or another educational game on the computer.

Estimated time of project: 2–3 weeks

Suggested materials:

- Materials to create your game board and pieces
- Players to try your new game and offer feedback



A PICTURE IS WORTH A THOUSAND WORDS

Brief description: It is often said that a picture is worth a thousand words—in other words, that an image tells the viewer a lot about many different aspects.

Product: Take any piece of artwork, such as Edward Hopper’s “Nighthawks” or “Two Sisters” by William-Adolphe Bouguereau and create a short story that tells the story behind the painting. You will have to develop the setting of the story using the clues in the painting and include the people in the painting as characters. Your story should be around 1,000 words and should have a clear plot (beginning, conflict, rising action, resolution).

Content areas: English and Art

Standard:

- Reading and Comprehension 4-11
 - Add descriptive words and details.

Inspiration starting point: Look at William-Adolphe Bouguereau’s work “Two Sisters” and imagine where the girls are and what their relationship is like.

Estimated time of project: 2–3 weeks

Suggested Materials

- Piece of art
- Paper and pencil or computer



Two Sisters
by William-Adolphe Bouguereau

YOUR RECOMMENDED READING LIST

Brief description: Everyone has an opinion when it comes to books. One person may love a book that others dislike. There are various reasons for this—a book might strike a certain reader in a certain way, or a reader may identify with a certain character or situation in the book, for instance.

Product: Create your own recommended reading list of 10 or more books. For each book, make sure to include the author and title, give a brief summary of why you selected the book, and then explain why you think others should read the book.

Content area: English

Standard:

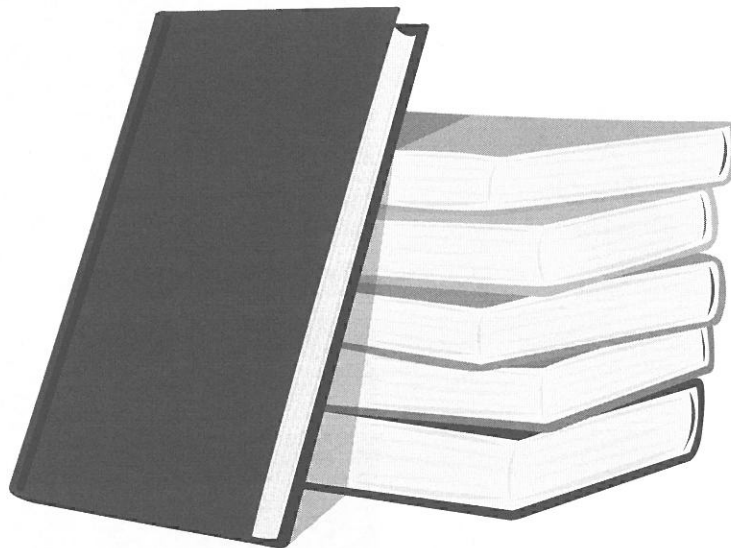
- Independent Reading 2-9
 - Use criteria to choose independent reading materials.

Inspiration starting point: Look at the recommended reading list for your public library. See if you agree with the library's selections.

Estimated time of project: 2–3 weeks

Suggested materials:

- Library
- Books
- Websites of reading lists



TAKE ME OUT TO THE BALLGAME

Brief description: Baseball is a game involving statistics, percentages, and decimals. This information is figured out in many different ways through various mathematical formulas.

Product: You will follow a specific player or team for a period of time, figuring out things such as batting average, slugging percentage, on-base percentage, and so on. You will track and chart the statistics of the player or team. Then you will analyze this information to determine potential performance for this player or team.

Content area: Math

Standards:

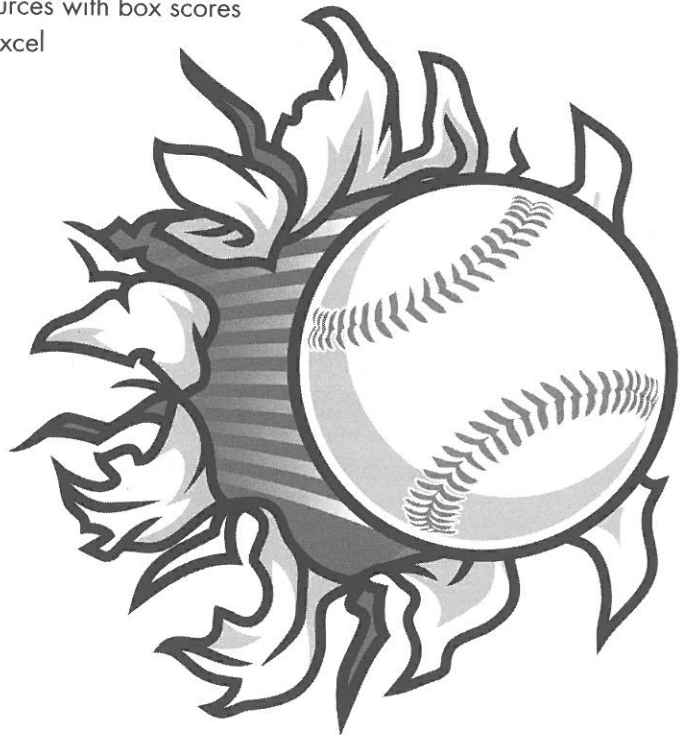
- Number, Number Sense, and Operations 4-7
 - Recognize that division may be used to solve different types of problem situations, and interpret the meaning of remainders.
- Number, Number Sense, and Operations 4-14
 - Demonstrate fluency in adding and subtracting whole numbers and in multiplying and dividing whole numbers by 1- and 2-digit numbers and multiples of 10.

Inspiration starting point: Find books and websites about your favorite players or teams.

Estimated time of project: 3–4 weeks

Suggested materials:

- Newspaper or Internet resources with box scores
- Graph paper or Microsoft Excel



A HERO AIN'T JUST A TYPE OF SANDWICH

Brief description: Spider-Man was created when a radioactive spider bit Peter Parker on the hand. The Fantastic Four got their amazing powers when they were exposed to a cosmic storm in space. The Hulk was exposed to gamma rays that made him turn into a monster every time he got angry. Science has been used in the creation stories of many of the superheroes we have come to enjoy.

Product: You will create a new superhero and draw a comic book chronicling his or her adventures. This superhero must have gained superpowers from a scientific accident. The origin story that you create must explain what scientific principles caused the superhero to gain powers, as well as how those powers work. The superpower demonstrated by your hero must be one of the following:

- the ability to control the wind or other weather patterns;
- the power to cause physical or chemical changes in some way;
- the power to change into different states (i.e., solid, liquid, gas); or
- the power to raise or lower temperature.

Content areas: Science, English, and Art

Standard: You must choose a single learning standard on which the comic book will be focused.

Inspiration starting point: Read Spider-Man or another comic book.

Estimated time of project: 2 weeks

Suggested materials:

- Drawing paper
- Art supplies
- Comic books



LESSON: TAKING GOOD NOTES

This note-taking lesson, which you could use in a social studies or language arts class, is appropriate for middle school and high school, although you could also modify it for younger students. You will need an overhead or an LCD projector, and it is a longer lecture, so you may wish to break it up.

Students are presented with various methods of taking notes and choose the ones they feel best complement their own learning styles.

Step 1. Distribute Tips on Taking Good Notes and discuss it with students.

Step 2. Describe note-taking methods for students, showing them the included examples (or your own examples based on what your students are currently learning).

- **The outlining method** involves taking notes in an outline format, putting down a main topic in the far-left margin as the top of the outline and indenting related subtopics. When a new topic is introduced, the student goes back to the far-left margin. This way, students can easily tell which information and evidence are associated with which topic.
- **The Cornell method** involves taking notes using columns. The column on the left, where main ideas and terms should go, should be narrower, about 2–3 inches wide. This way, a column of about 6 inches will remain, in which students will write notes about the main ideas and terms. Students should skip a line or two in between main ideas or terms to further separate them. This is an effective method for taking notes on information that will be on a test. The key words and phrases in the left-hand column act as triggers for remembering more detailed information.
- **The mapping method** involves drawing blocks or circles containing main points and important terms, with mapping evidence in connected boxes or circles. This style of note taking is usually attractive to visually oriented students. It does take up a lot of time, which is something that must be taken into account.

Step 3. Once you have introduced the three methods, lecture on a topic your class is learning about—or even show a short educational video—and have the students take some time to practice all of the different methods.

Step 4. You might walk around the room and offer suggestion to students who are missing information, writing down too many facts, and so on.

TIPS ON TAKING GOOD NOTES

Here are some helpful hints on how to write concise notes.

- Don't use complete sentences: Think Tarzan talk.
 - Eliminate articles (e.g., the, a, of).
 - Don't worry about correct punctuation or spelling (except for words you will need to know how to spell).

- Use abbreviations.
 - Native Americans = NA
 - United States = US
 - Because = b/c
 - Environment = Env

- Use symbols.
 - = for definitions
 - / for or
 - + for and

- Use charts.
- Don't assume when it comes to names and dates.
- Combine sentences and information.
- Organization is important. Don't cram all of your notes into a single paragraph. Come up with a system that allows the notes to flow, so that you will be able to find notes easily.
 - Use headings for new aspects or ideas, just as you would make a new paragraph.
 - Outlining is a good way to organize your notes, with numbers, letters, and symbols.

- Don't be too messy, or you won't be able to read your notes later.

EXAMPLE OF THE OUTLINING METHOD OF NOTE TAKING

- The shot heard around the world
 - First battle of the American Revolution
 - British troops attacked Lexington and Concord
 - Wanted to seize weapons at armory
 - The American Minutemen
 - Ready at a moment's notice
 - Took place before America declared Independence

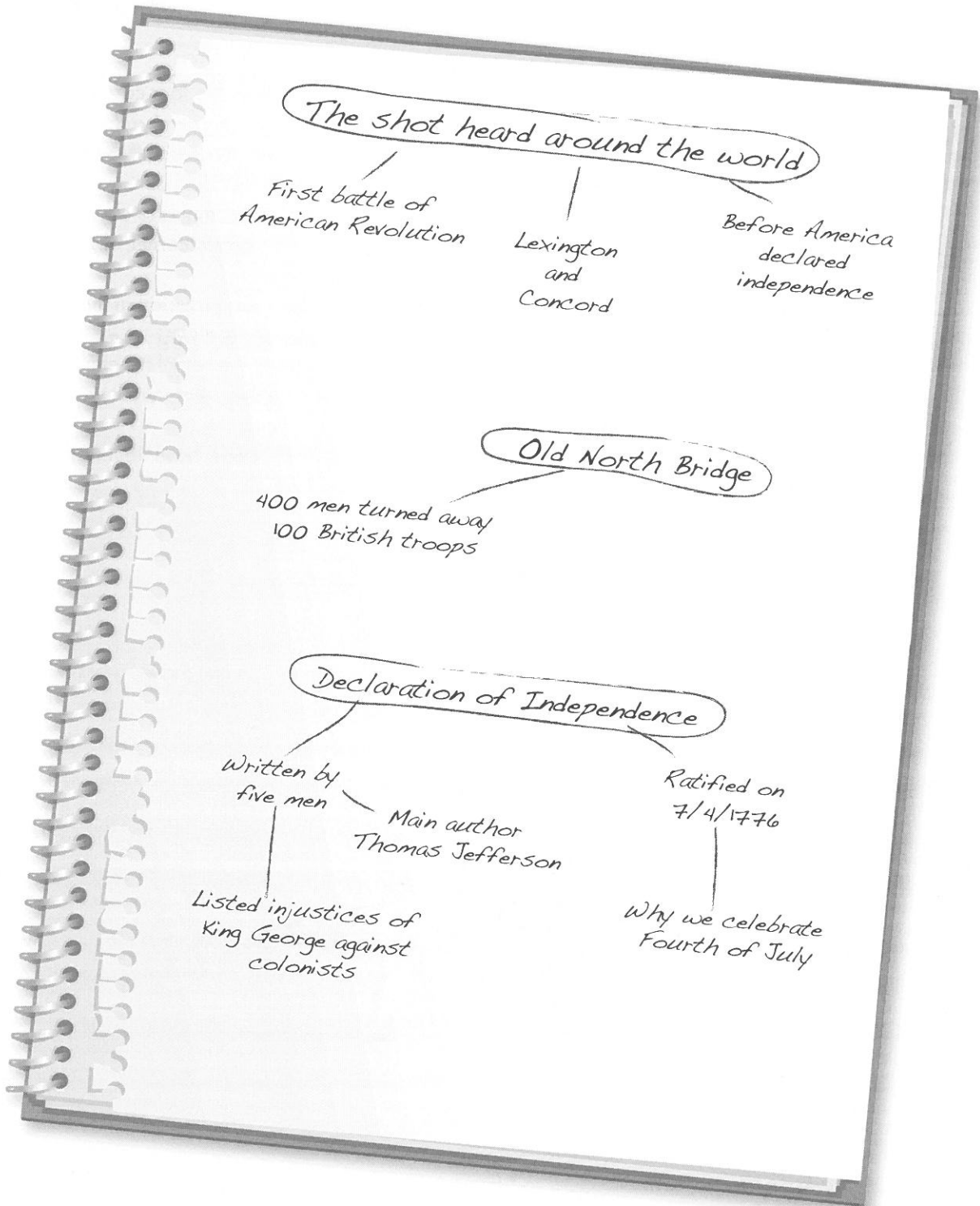
- Old North Bridge
 - Stopped British at Old North Bridge
 - 400 men turned away nearly 100 British troops

- Declaration of Independence
 - Committee of five men wrote it
 - Lists the injustices of King George against colonists
 - Thomas Jefferson credited as main author
 - Ratified July 4, 1776
 - Reason we celebrate Fourth of July

EXAMPLE OF THE CORNELL METHOD OF NOTE TAKING

Shot heard around the world	The first battle of the American Revolution was when English troops advanced on Lexington and Concord in order to seize weapons in the armory there. The American Minutemen, so named because they could be ready at a moment's notice, armed themselves and fired upon the British troops. This took place before America had even declared independence.
Old North Bridge	The Minutemen stopped the British at the Old North Bridge, with about 400 men turning away nearly 100 British troops.
Declaration of Independence	A committee of five men wrote the Declaration of Independence in order to list the injustices that King George had committed against the Colonists. Thomas Jefferson is often credited as the main author of the Declaration. It was ratified on July 4, 1776, which is why we celebrate the Fourth of July.

EXAMPLE OF THE MAPPING METHOD OF NOTE TAKING

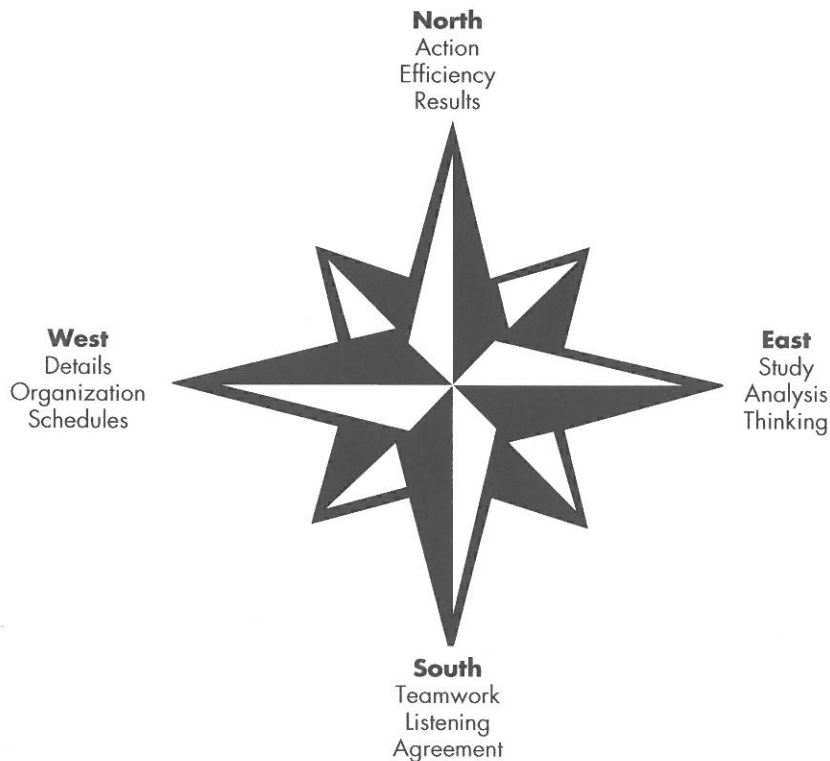


ACTIVITY: COMPASS POINTS

This activity, which takes about an hour, can be used with almost any age level, although you may have to clarify the directions a bit more with younger students. It is an excellent way to foster classroom discussion and help students understand the benefits and challenges of group work.

1. Inform students that they will need to identify themselves as one of the four cardinal directions (points). They may find themselves identifying with a couple of different directions, but they will have to find the single direction that they most identify with, and they cannot select an intermediate direction (e.g., northeast).
2. Read out loud the description of each of the directions. Provide examples to clarify.
3. Once students have identified themselves, assign a direction to each corner of the room and have groups go to their corresponding corners.
4. Have students take 5 minutes to answer the questions on the sheet provided in their groups. Have someone in each group write that group's responses down.
5. Have someone from each group report that group's responses to the rest of the class.
6. Debrief about the activity. What did students learn about how they might work with people from other groups?
7. Discuss the benefits of diversity in groups (e.g., different groups have different strengths, too many of one type of people can cause conflict).

COMPASS POINTS



WHAT'S YOUR (COMPASS) POINT?

Group Direction: _____

Group Members: _____

1. Use adjectives to describe some potential **strengths** of your compass point.

2. Use adjectives to describe some potential **weaknesses** of your compass point.

3. Which compass point group do you think your group would work best with? Which compass point group do you think would be most challenging for your group to work with?

4. If a group did not include people of your compass point, how do you think it would function?

ACTIVITY: PROFILE OF A STUDENT

This activity, which takes about an hour, is more appropriate for older students, although it could be adapted for younger students as well. This activity has been adapted with permission from G. Thompson-Grove (n. d.) with the National School Reform Faculty.

1. Distribute the provided activity sheet to students.
2. Tell students that they must read the descriptions and select the ones that best describe them. Each student will likely identify with numerous descriptions, but each student should pick just one. You can read the descriptions aloud, if you wish.
3. Have students get into groups. You can do this by assigning various numbers to various areas of the room, or you can allow students to discuss their results with classmates—without using numbers—until they believe they are in like-numbered groups. This works better in some cases, because there are so many numbers that some students probably will not have exact matches. If students discuss their results in order to form groups, there is an increased sense of teamwork and personal sharing. In either case, you may have to intervene to help form the groups.
4. Have each group appoint a scribe to record what its members say.
5. Instruct group members to discuss their school experiences.
6. If you wish, instruct groups to allow each group member to speak uninterrupted for 1 or 2 minutes.
7. Instruct students to discuss in their groups what people should know about the group's characteristics if they want to accomplish high-level group work. What should people know about their group? What strategies work best?
8. Have each group report to the rest of the class.
9. Debrief as a class after all of the groups are done reporting. Ask students: What strikes you as you listen to other groups? What does this tell you about how different groups might work together?

WHICH STUDENT ARE YOU?

Student 1. You are life smart, but not school smart. You would do almost anything to avoid looking stupid in school. You are the class clown, or the loud political protester, or the persistent talker—on the verge of being a “behavior problem.” You don’t mind being sent to the office instead of having to give an oral presentation—and you know just how to get sent there. Everyone at the office knows you well and greets you with affection—they know you as “really, a nice kid.” The things you are really good at seem to have little place in school.

Student 2. You are a good student, but you fly under the radar. You have figured out what each of your teachers wants, and you do exactly that—on time, and completely. You are a committed student, but you take few risks, and so you seldom challenge yourself to higher levels of learning. You are the quiet kid whose work always falls within the average range. Because you complete your work, get A’s and B’s, and are never any trouble, you are often overlooked.

Student 3. You love learning. You can’t get enough of it. You actually look up those books that your teachers mention in passing and independently figure out alternative math theorems—just for fun. Your only problem with school is the busy work you have to do and those classes you have to take with kids who just don’t seem to care about learning.

Student 4. Who are you, anyway? It often takes teachers a full semester to remember your name, and you often feel invisible. This is either because you like it that way—sitting in the back and hiding behind textbooks, doing decent but unremarkable work to keep a low profile—or because you feel disenfranchised and disempowered. You are sometimes envious of other students, although at other times, you feel above them. You know more about certain subjects than they do, but most teachers don’t know that.

Student 5. In your mind, there is no way you can succeed in school. You have been a “remedial” student from before you can remember. You read slowly and seldom get a passing grade on an in-class essay. You do have strengths, but no one seems to notice or value those. You wonder if life in the real world will be like school.

Student 6. You are a finely tuned teacher-pleasing machine. You know exactly what you need to do to maximize your grade, and you do it (no matter what) and then some. You are organized, disciplined, and focused—on your homework, on getting good grades, and on your extracurricular activities, which will look good on your transcript when you apply to college. Your teachers know you will volunteer for anything they ask—and they often do ask.

Student 7. You are as efficient as possible in order to leave time for other things in your life—your mantra is, “The lowest passing grade for the least amount of work.” Why pass a class with a 78% when you can pass with a 69.2% and a good sob story? You know all the tricks: make-up tests, rewrites, do-overs, extra credit points, parental pressure, coach pressure, and group work (with the right partners). You put more effort into playing the game than learning.

Student 8. You have a creative mind, you love the arts (drawing, music, drama), and you believe that most of the significant ideas in life can't be expressed by talking or writing, which is all anyone seems to want to do in school. You have a hard time staying focused in most of your required classes. You are happy with yourself, but you often feel like you are marching to the beat of a different drummer.

Student 9. Who says that academics, classes, and grades are the most important things about school? As far as you are concerned, your classes are where you get to see your friends. Frankly, sometimes your work seems to interrupt what's really important—like talking to your friends, going to games, and participating in what they call “extracurricular” activities. These activities don't seem “extra” to you at all—to you, they are central to what school is really about.

BUBBLEGUM PROJECT

I used this project with elementary students, but it could also be adapted to work for middle school. I gave my students 2–3 days to complete this project, which served as an introduction to PBL. The project embraces all of the four core curriculum areas:

- Math
 - Probability
 - Percentages
 - Unit Conversions
- Social Studies
 - History of gum
 - Public policy
 - Public service announcement
- Science
 - Scientific method
 - Experiments
 - Making gum
- English
 - Analyzing poetry
 - Writing poetry using the five senses
 - Creating an ad campaign for gum

MATH

1. Have students estimate the number of gumballs in a full gumball machine.
2. Have students estimate the quantity of each color.
3. According to students' estimations, what percentage of the total number of gumballs does each color represent? The sum of these percentages should equal 100%.
4. Have students count the gumballs to discover the actual overall and per-color quantities. (You could also just tell them!)
5. Students should record the results on a bar graph to represent the data.
6. Have students create two pie charts, one representing the percentages of their estimates, and one representing the actual percentages.
 - For instance, if the red gumball count is 13%, then the red pie sector should represent 13% of the 360 degrees of a circle (≈ 47 degrees).
 - $\text{Percentage} = (\text{number in category} \div \text{the total}) \times 100$; and $360 \times \text{this percentage} = \text{degrees of the circle}$.
7. Have students determine how many gumballs fit . . .
 - in a foot? (12 inches = 1 foot)
 - in a mile? (5,280 feet = 1 mile)

SOCIAL STUDIES

1. Students will conduct Internet research on the history of chewing gum and give mini-presentations on what they learned.
 - o What are the origins of chewing gum?
 - o How has chewing gum evolved?
 - o How is chewing gum used today?
2. Next, students will research the gum policy for the school and conduct a debate about whether this policy is fair or unfair.
 - o Is gum allowed, or not?
 - o How long has this been the case?
3. After conducting Internet research about gum pollution, students will create public service campaigns to get students to keep the school from having gum all over it.
4. Students will look at different public service announcements and their uses of slogans and images.
5. For homework, students should create posters for their public service campaign.

SCIENCE

1. Tell students they are going to conduct an experiment using the scientific method to determine how long the respective flavors of four types of gum last.* They will be working as a class. A form is provided for them to use to track how long each gum's flavor lasts.
2. Which gum out of the ones students are testing do they think lasts the longest?
3. Students should formulate a hypothesis based on their opinion.
4. Have students make a list of the materials necessary to carry out the experiment. As they are doing this, they should be chewing the first type of gum, noting how long its flavor lasts. (The purpose of this activity is chiefly to reinforce the scientific method, so try to reassure students who are concerned that the validity of the experiment is compromised by them being distracted.)
5. Have students determine what the steps of the procedure should be. List them in chronological order.
6. Have students indicate the experiment's variables, both independent and dependent. (You may have to discuss dependent and independent variables.) At this point, students should move on to the second type of gum. Students could discuss the following questions and how they relate to independent and dependent variables:
 - o Who is chewing the gum?
 - o Is the flavor of a previous gum still lingering in the mouth of a participant?
 - o How much gum has a participant already chewed?
 - o In what order are the types of gum chewed?
 - o When do participants record their observations?
 - o Is 10 minutes enough time to chew each type of gum?

* This is dependent on your school's policy.

- o Do participants use the same criteria to make observations?
 - o Could the participant mix up gum flavors?
7. Have students indicate what will serve as the control part of the experiment. At this point, students should move on to the third type of gum.
 8. Students should create charts and graphs to record their observed results. At this point, they should move to the final type of gum.
 9. Have students come to a conclusion.
 10. Students can run follow-up experiments in which they see which kinds of gum allow them to blow the largest bubbles.
 - o Each student will determine how the experiment is set up.
 - o Students should report their findings to the class.
 11. As an additional follow-up activity, students can create their own chewing gum, experimenting with different flavors, amounts of ingredients, and intensity of taste.

REVIEW: THE SCIENTIFIC METHOD

1. State the problem in the form of a question.
2. State your hypothesis.
3. Make a list of the materials necessary to carry out the experiment.
4. Write down the procedures in detail, listing them in chronological order.
5. Indicate the variables, both independent and dependent.
6. Indicate what will serve as the control part of the experiment.
7. Create charts and graphs to record your observed results.
8. State your conclusion.

HOW LONG DOES THE FLAVOR LAST?

Brand: _____

Flavor: _____

	Very strong	Somewhat strong	Taste still present	Weak	No flavor at all
After 2 minutes					
After 4 minutes					
After 6 minutes					
After 8 minutes					
After 10 minutes					

ENGLISH

1. Students will read the poem “Troublesome Bubble.”
 - o Students will discuss the poem.
 - How does the poem make them feel?
 - What is the tone of the poem?
 - How does the poem use rhyme?
 - What is the poem’s rhyme scheme?
 - o Students should discuss the differences between prose and poetry.
 - How could music be considered modern poetry?
 - Is some writing a mixture of poetry and prose?
 - o Have the students write poetry or prose about how it feels to chew gum.
 - Use the five senses: touch, sound, sight, taste, and smell.
 - Incorporate details into the written pieces.

2. Students should research and consider the slogans for various brands of gum.
 - o Juicy Fruit: _____
 - o Doublemint: _____
 - o Extra: _____
 - o Winterfresh: _____
 - o Big Red: _____
 - o Orbit: _____
 - o Freedent: _____
 - o Big League Chew: _____
 - o Bubble Tape: _____

3. Discuss with students how the slogans make them feel, and which audiences specific gums seem to be targeting.
4. Discuss the marketing strategies of familiar products with students.
5. Discuss various methods that marketers use to sell gum and how these methods depend on their audiences (e.g., Bazooka Gum became popular after including cartoons in its packaging).
6. Students should create a hypothetical gum and figure out how to market it, using strategies such as:
 - o fancy packaging,
 - o unique flavors,
 - o product tie-ins, and
 - o creative improvements such as flavor boosters.

7. Students should identify the audience for their product and figure out how they will effectively sell their product to that audience.
8. Have students create an advertising campaign including a slogan, a package design, and a commercial to sell the gum.

Troublesome Bubble

By Todd Stanley

I was sitting in math class one cold rainy day,
Dreaming my terrible boredom away,
When I reached in my pocket and then—ah!—I found
A tiny round object, wrapped up and bound.

I took this thing out and I saw in plain view
Here was a morsel I simply must chew!
A nice piece of gum I'd forgotten about—
I unwrapped it slowly and kept a lookout.

I had to be careful; I couldn't be seen—
Frankly, I really was not very keen
To be caught by our teacher, who'd made it quite clear
Being caught chewing gum should fill students with fear!

One boy was caught with some gum just last week,
And now he is gone—not one word, not one peep!
We don't know where to, we do not have a hunch—
But one rumor says he's been turned into lunch!

Chewing this trifle, I risked life and limb,
But life without gum would be ever so dim!
The gorgeous aroma was too much to take,
Like sweet-smelling cookies your mother might make.

I slipped the gum quietly right past my lip
Like a cool drink of water—I took a small sip,
And then I bit down on that sugary pill—
Chewing, I tried very hard to keep still.

But it tasted so good I got carried away
And started to chomp like a cow eating hay!
I knew I'd be caught; I was ready to sing—
But Teacher was too busy with teacher things.

And then all too fast, my gum ran out of taste!
All my fine chewing had been a big waste.
There was one thing to do with my chewed-up confection
(If Teach would just look in the other direction).

With my tongue to my teeth, then, I started to push
On the soft wad of blubber I'd chewed to a mush.
It grew bigger and bigger—before I could stop,
It got out of control and gave quite a loud pop!

Teach halted the lesson and walked to my side—
I had to be wise, now, I couldn't be snide—
But when Teacher asked what all the noise was about,
I turned to respond and I left not a doubt.

Across my whole nose there was rubbery slop—
To clean it, I'd probably need a strong mop!
I'd fallen for gum; I had taken the bait—
That troublesome bubble had just sealed my fate.

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TODD STANLEY