



Using Scrapbooks in Science



by
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National Science Standards

Standard		How Addressed
A	Unifying Concepts and Processes	May be addressed as the assigned focus of the scrapbook or as an added expectation – having each entry specifically identify which of the unifying concepts of science it would most directly pertain to, etc.
B	Science as Inquiry	May be used as part of the inquiry process.
C	Physical Science	Scrapbooks may be targeted toward any single or combination of disciplines in science. Technology may be specifically incorporated, either through the topics, or through their application, by requiring computer creation and/or submission of the scrapbook, video or audio scrapbooks, etc. Engineering design technology can also be incorporated through descriptions of technology they see in their lives, i.e. simple machines, thermostats, etc.
D	Life Science	
E	Earth and Space Science	
F	Science and Technology	
G	Science in Personal and Social Perspectives	The main purpose of the scrapbook is to allow students to see science as an integral part of their personal experiences and interests
H	History and Nature of Science	May be addressed as an assigned focus of the scrapbook.

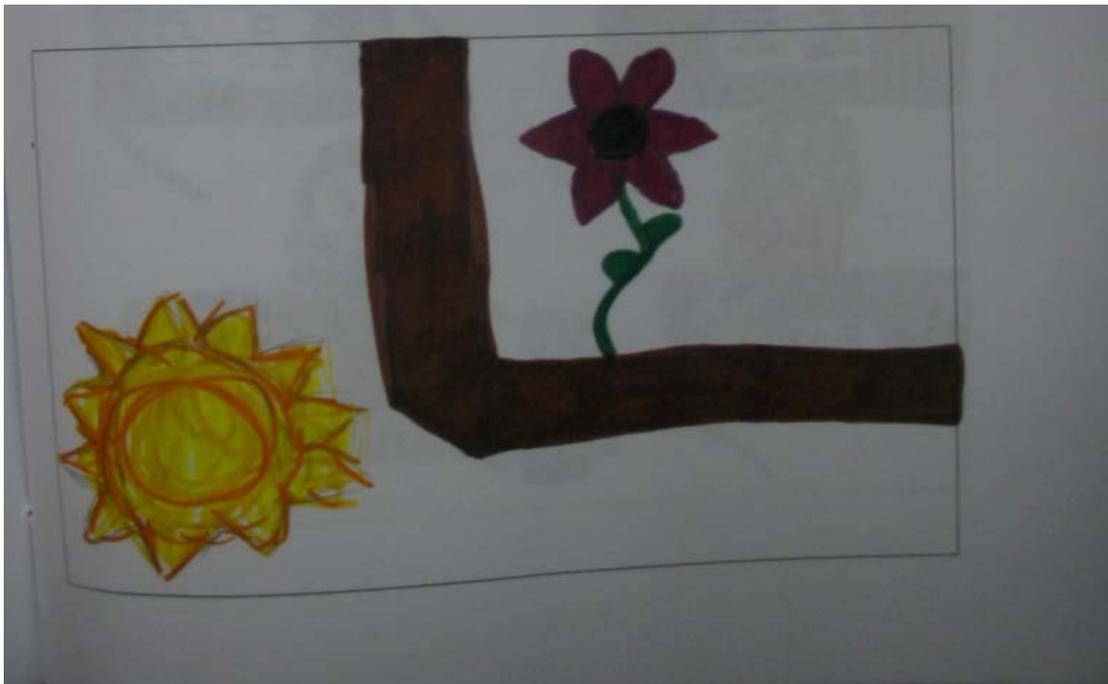
Note 1: Also incorporates English and Art, and may be used to incorporate additional History and/or Geography and Math

Note 2: May be used to specifically target ESL, GT, Special Education and other special needs populations.

Why Use Science Scrapbooks?

Scrapbooks encourage students to see the science all around them and realize that it is truly relevant in their lives outside of school. Scrapbooks will increase student understanding of the scientific concepts by relating them to their own interests and experiences, resulting in a greater desire and excitement to learn.

“O sun O sun
Where out thou CO₂?
Deny our power and give it to humans.
What light yonder breaks to the surface?
I am the plant and you are the sun,
For we are the makers of breath,
So thrive my leaves, till we break down,
A thousand times good day.”



Why Use Science Scrapbooks?

Students learn more effectively through their own powers of observation, rather than from the instruction of scientists, teachers or textbooks.

THE EPIDERMIS

It protects our body,

It can get burnt in the sun,

It scratches off and

Creates dust,

It gets dried out and

Needs lotion.

It gets replaced with

New cells every second,

HAVE YOU GUESSED IT?

That's right, it's the epidermis,

Our skin,

And it is one of our most

IMPORTANT PARTS –

Without it we would be lost!

Why Use Science Scrapbooks?

Scrapbooks are a great opportunity for students to apply their own interests and abilities to their learning processes.

A biological interaction I have witnessed is the population control of the dogs and cats at the local dog pound on Fort Sill and Lawton.



I learned that in the United States, 50,000 puppies and kittens are born every day. It is important to have your pet spayed or neutered so that they don't make more puppies or kittens that have to be put to sleep when they get sent to the dog pound. I don't like it when pets are put to sleep, but there has to be population control or they would be all over the place.

Why Use Science Scrapbooks?

Scrapbooks enhance what you are already doing in the classroom. They allow you to see if your students are truly grasping the concepts you are trying to teach, and provide opportunities for you as a teacher, to discover and correct misconceptions.

“Biological Impossibilities in the Movie Star Wars”



In the movie Star Wars, there are many biological impossibilities. These  include humans breathing in outer space without masks and spaceships blowing up in outer space. Humans must have oxygen to survive, and there are not any gases in outer space since  space is a vacuum. Oxygen is used in the human body to oxidize glucose and to make ATP, which is energy. Also,  fire is the result of a chemical reaction between fuel and oxygen. Since there is no oxygen in outer space, there cannot be  fire.”

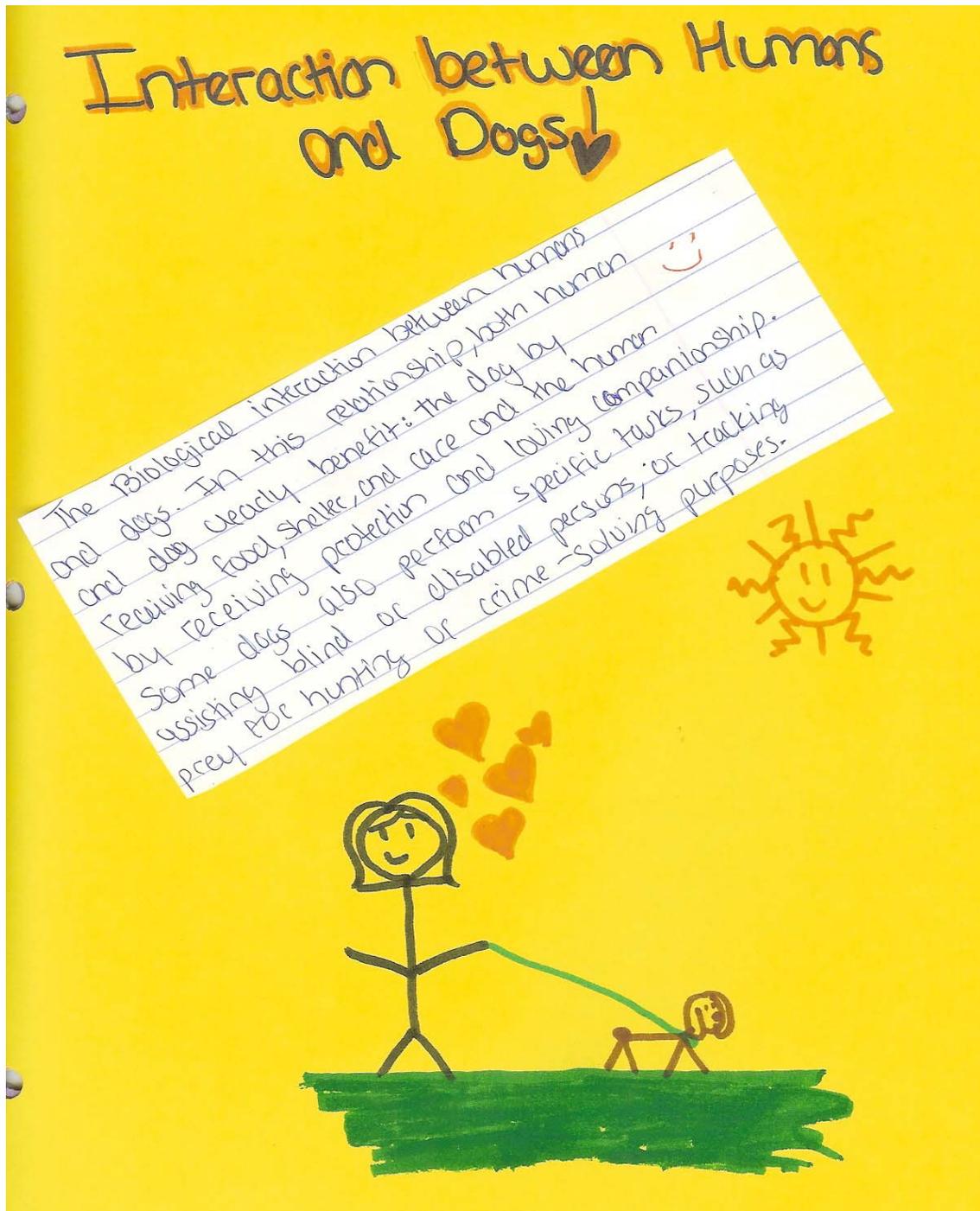
Why Use Science Scrapbooks?

Scrapbooks encourage thinking at the higher levels of Bloom's Taxonomy, specifically application, and evaluation. Scrapbook assignments can easily be targeted toward analysis and synthesis with some rewording of the entry criteria, or with specific probing questions for some of the criteria.

“If you think about it, Wal-Mart is kind of like a bunch of cells. It has become this huge franchise because of one store that split off into two stores. And each of those stores gave birth to other stores, so on and so forth. When the stores split you have to make sure there is someone to run the store and that you have enough people to keep it going. And you can't have too many Wal-Mart's too close together because that's bad for business. All of the basic rules of the cell cycle apply to Wal-Mart.”

Why Use Science Scrapbooks?

Scrapbooks allow a great deal of flexibility in dealing with special populations, such as Gifted and Talented, Special Education, ESL, etc. More on this topic later...



Sample Scrapbook Assignments

Simple Machines Scrapbook (Elementary Science)

Date due: _____

For this assignment you will make a scrapbook about simple machines you have seen at school, at home, or in pictures. You will need two sheets of notebook paper. Fold these in half to form an 8.5 x 5.5-inch booklet. Staple at the fold (the top) and number the pages on the bottom. Write your name at the top of Page 1.

Choose three items from the list below. Each choice should go on its own page. Use a picture choice for Page 1. See the directions at the bottom for Page 4.

1. Find a picture or take a picture of a simple machine being used to make a job easier.
2. Find a picture or take a picture of two or more simple machines working together.
3. Find a cartoon picture or draw your own cartoon picture showing a simple machine being used.
4. Make a drawing of your own invention that uses simple machines to make a job easier.
5. Make a drawing of a simple machine and put labels on it.
6. Ask an adult at home to tell you about a simple machine they use around the house, garage, or yard. Write four or more sentences about the simple machine and what it does.
7. Write a poem about a simple machine.
8. Make a list of five simple machines we have at home or school.

Page 4: Title this page “My Simple Machines Reflection.” Write four or more sentences about new things you learned about simple machines doing this assignment. Write two or more sentences about how simple machines help people do their jobs.

Newton's Laws Scrapbook

(Middle School)

For this project, you will apply Newton's three Laws of Motion to events in your life and activities that you are interested in.

Your scrapbook must include at least 10 separate entries, but may not include more than three each from categories 1-5, and one each from any categories 6-8. ***Category no. 9 may be used only once and is REQUIRED as the final entry in your scrapbook each 9 weeks.***

1. Illustrations (photographs or pictures) of one of Newton's Laws in action, with which law identified.
2. A description of an experiment you have done to investigate Newton's Laws. You must include your hypothesis, a brief description of the experimental setup and any conclusions you were able to draw.
3. A brief description of something you have experienced or observed involving one of Newton's Laws.
4. A brief description of a violation of one of Newton's Laws that you have observed in advertisements, cartoons, movies, etc. Sources must be identified, as well as which of the three laws is being violated.
5. Articles or clippings from newspapers or articles. You must include the article in its entirety, a summary of the article which shows which of Newton's Laws applies. You must include the name of the source and date of publication.
6. Cartoons relating to Newton's Laws – your own creation, from newspapers, magazines, etc.
7. A poem that you have composed relating to Newton's Laws.
8. Artwork you have created related to Newton's Laws.
9. Reflections on the progress you feel you have made (or the lack thereof) in better understanding the way the world works or the methods scientists use in seeking the "secrets of nature". **REQUIRED**

All items in your scrapbook should be presented on standard 8.5" x 11" sheets of paper and stapled together. Do not put them in folders or binders!

Scrapbook
Newton's Laws of Motion and Gravity in Space
(Middle School)

For this project, you will apply Newton's Laws of Motion and Gravity to space-related activities and objects.

Your scrapbook must include at least 10 separate entries, but may not include more than three each from categories 1-5, and one each from any categories 6-8. ***Category no. 9 may be used only once and is REQUIRED as the final entry in your scrapbook each 9 weeks.***

1. Illustrations (photographs or pictures) of an object or activity in space, with an explanation of which one of **Newton's three Laws of Motion** is being demonstrated.
2. You have been given the opportunity to design an experiment to fly on the next space shuttle mission. Describe your experiment and explain how the differences in gravity in space might affect what happens.
3. A brief description of something you have experienced or observed involving one of Newton's Laws or resulting from the gravitational pull of a planetary body.
4. A brief description of a violation of one of Newton's Laws of Motion or Gravity that you have observed in advertisements, cartoons, movies, etc. Sources must be identified, as well as which of the laws is being violated.
5. Articles or clippings from newspapers or articles. You must include the article in its entirety, a summary of the article and which of the laws applies. You must include the name of the source and date of publication.
6. Cartoons relating to Newton's Laws of Motion or Gravity – your own creation, or from newspapers, magazines, etc.
7. A poem that you have composed relating to Newton's Laws of Motion or Gravity.
8. Artwork you have created related to Newton's Laws of Motion or Gravity.
9. Reflections on the progress you feel you have made (or the lack thereof) in better understanding the way the world works or the methods scientists use in seeking the "secrets of nature". **REQUIRED**

All items in your scrapbook should be presented on standard 8.5" x 11" sheets of paper and stapled together. Do not put them in folders or binders!

Space Scrapbook - Biology

Due Date:

You will create a scrapbook of items relating biology and space. All items need to relate to topics in biology, but must have a focus on space travel, exploration, the planets and or space-related objects themselves.

Your scrapbook must include at least 10 separate entries, but may not include more than two each from categories 1-5, and one each from categories 6-8. ***Category no. 9 may be used only once and is REQUIRED as the final entry!***

1. Illustrations (photographs or pictures) along with your explanation of the biological idea shown. If the photo is from a website or book, you must document its source!
2. You have been given the opportunity to design an experiment and send it on the next shuttle mission to be conducted. Describe the experimental hypothesis and procedure.
3. A brief description of a biological interaction of behavior you have witnessed or experienced as a direct result of other planetary bodies.
4. A brief description of a physiological challenge to interplanetary travel. You must site your sources!
5. A brief description of a biological impossibility that you have observed in advertisements, cartoons, movies, etc. Sources must be identified, as well as the principle(s) being violated.
6. Evaluation of clippings from newspapers or articles. The article must be included in its entirety, along with the name of the source and date of publication. Your evaluation of the article's validity may include your agreement or disagreement of conclusions or choices and your reasons, your opinion on the importance of the information being presented, what you would have done differently under those circumstances, etc.
7. A poem that you have composed integrating space and biology.
8. Artwork you have created integrating space and biology.
9. Reflections on the progress you feel you have made (or the lack thereof) in better understanding the way the world works or the methods scientists use in seeking the "secrets of nature". **REQUIRED**

All items in your scrapbook should be presented on standard 8.5" x 11" sheets of paper and stapled together. Do not put them in folders or binders!

By whatever means you choose to do so, the purpose of this scrapbook is to help you notice ways in which biology and space are connected to your life and your experiences.

Physics Scrapbook

Each 9 weeks you will be required to create and maintain a scrapbook for the purpose of recognizing the universality of the laws of physics. Scrapbooks will be presented each 9 week grading period. Scrapbook due dates are listed at the bottom of the page. Your scrapbook will account for two *Project* grades each 9 weeks.

Your scrapbook must include at least 10 separate entries, but may not include more than one each from categories 6-8 and no more than 3 each from any other category. *Category no. 9 may be used only once and is REQUIRED as the final entry in each of your scrapbooks.*

1. Illustrations (photographs or pictures) along with your explanation of the law of physics concept shown.
2. A description of an experiment (formal or informal) that you have done to determine the physical principles involved in a phenomenon (a trick in gymnastics, affect of humidity on heat, etc), or in which you have used a principle of physics to obtain information about some phenomenon.
3. A brief description of an event you have witnessed or experienced, which illustrates a principle of physics (centripetal force, milk souring, etc.).
4. A brief description of a violation in the principles of physics that you have observed in advertisements, cartoons, movies, etc. Sources must be identified, as well as the principle(s) being violated.
5. Evaluations of clippings from newspapers or articles related to physics. The name of the source and date of publication for periodicals must be identified on the paper. Your evaluation of the article may include your opinions on the importance of the information/research, if you agree or disagree with the conclusions or choices and why, what you might have done differently, etc.
6. Cartoons related to physics – your creation or from newspapers, magazines, etc.
7. Poems that you have composed based on ideas from this class.
8. Artwork you have created related to ideas or events in this class.
9. Reflections on the progress you feel you have made (or the lack thereof) in better understanding the way the world works or the methods scientists use in seeking the “secrets of nature”. **REQUIRED**

All items in your scrapbook should be presented on standard 8.5” x 11” sheets of paper.

By whatever means you choose to do so, the purpose of this scrapbook is to help you find ways that physics are connected to your life and your experiences.

Dates Due: **Sept 25** **Dec 4** **Feb 19** **Apr 30**

Examples of Scrapbook Entries



Examples of Scrapbook Entries

Reflection.....

This time of year is my mom's favorite time of year. She likes to look at the trees and the changing colors of the leaves. We'll be driving along the road and she'll tell me to look at the pretty trees. I have learned why the trees change color during this time of year. This time of year, there is less sunlight reflected and the chlorophyll which makes them look green to us when there is lots of sunlight, now isn't as visible as the other pigments that make them look red, yellow and even brown. I like to see the different colors too and I remember that they will very soon be green again.



Examples of Scrapbook Entries

Leaf Experiment

These are leaves from the same tree. During the fall, the lack of sunshine helps chlorophyll leave the leaves and it turns them a different color. Some will be brown, some yellow, and some even red. These leaves from the exact same tree show how the chlorophyll will leave different branches and leaves on the tree at different speeds. This makes leaves have different colors.



Instructional Strategies / Tips

- I hand out the scrapbook assignment at the beginning of the semester and discuss my expectations and the due dates at that time. I have one scrapbook due for every grading period (6 weeks or 9 weeks) and make the assignment specific to the topics covered during that grading period. Of course, reminders are necessary as due dates approach!
- I have given additional, topic-specific scrapbook assignments in lieu of tests, and as grade recovery assignments, to be used in place of a previous low major grade.
- As you are teaching a concept, be sure to give some examples of things that could start a student thinking about personal experiences that could be used as scrapbook entries.
 - Ex: When studying Newton's 1st Law of Motion, talk about being thrown forward when someone slams on the car brakes.
- Remind students that scrapbook entries need to be things that occur outside of the classroom, not activities done during class, with the possible exception of the entries on experiments they have conducted. Students should not just repeat examples you gave or ideas that were discussed during class – the scrapbooks need to be more personal.
- Encourage students to apply the topics discussed in class to their own interests. Even if they tell you there is no relation, with a little prompting and thought, they will begin to see ways to apply science to any interest and activity. I have assigned scrapbooks that require the student to relate all entries to a specific activity that he/she chooses.
- Returning the scrapbooks to the students can be a topic of concern. Just as with any other project, they often turn up a few years (or weeks!) later, with a different name. Students can be brilliant where this kind of cunning is concerned, and there will always be someone who finds a way around any steps you can think of to prevent it. Some suggestions I've received and/or used to minimize incidents are:
 - keeping the Scrapbooks once the students have reviewed their grade,
 - including your initials and/or comments on each page,
 - making each scrapbook assignment specific to a topic or to a specific time period, i.e. only over what you've discussed during that particular 6-week period.

- For younger students, or with more difficult concepts, you may want to assign a scrapbook over a specific topic, i.e., one assignment over Newton's Laws of Motion, or Solution Chemistry.
- Older or more advanced students may enjoy scrapbooks as a review of a larger body of material.

Grading Strategies

- If you assign 10 entries, then they are each worth 10 points.
- How you grade the entries is up to you.
 - For lower grade levels and introductory science classes:
 - I generally see this as more of an effort assignment – I do not take off for attractiveness, nor do I give excessive extra points to the students who really go all out in decoration and layout. The purpose of the assignment is to apply content, so that is what I grade.
 - I tend to give credit, even if the application of the concept is incorrect, as long as the student explains so that I can see why they made the error. This allows me to correct misconceptions and keeps students from shying away from more difficult concepts for fear of losing points.
 - For advanced, honors and AP courses, I require that the information be accurate, and I expect a higher level of application. You might want to grade more strictly if the scrapbook is topic-specific.

Parent Involvement

Getting parents involved is ALWAYS a good idea! There are different ways to do this, and it is easier at some grade levels than others. Some suggestions I've used or known others to use:

- Send a letter to the parents explaining what the scrapbooks are and when they are due, and asking them to review the assignments with their children before they are turned in.
- Include a Parent comment section in the scrapbooks where parents should provide their feedback on the entries, assignments, efforts of their children, etc.
- Email parents reminders when the scrapbooks are coming due, and remind them of what is expected so that they can work on them with students.
- Have a Scrapbook due prior to a Parent/Teacher Conference or Open House, so that you can have examples on display for parents to see.

- Encourage students to use pictures of their own – photos of family, vacations, etc. – in their scrapbooks. Going through the photos with their family may result in some great conversations – some science-related and some not!

Special Applications

I have found scrapbooks to be especially helpful in dealing with special populations. Some examples may include:

- Students who have difficulty writing in class can complete weekly or subject scrapbooks, with more entries and more detail. These can be used in lieu of classroom grades, and allows special needs students to work outside of class and/or use a computer or other assistance that might not be readily available in a classroom setting.
- Students who struggle with English can show their understanding of concepts in a more creative, visual way.
- Scrapbooks give Gifted and Talented students an opportunity to really think outside the box and apply different methods of analyzing and presenting information.

Benefits to the Teacher

- Scrapbooks are a great evaluation tool – they allow you to check for understanding and application in a way that is much more fun and interesting to students than more conventional pencil-and-paper tests.
- Scrapbooks allow you to identify and correct misconceptions before moving to a new subject. We all know how misconceptions show up and surprise us on standardized tests. Scrapbooks give teachers an opportunity to catch some of the misconceptions early and correct them, either through individual notes and discussions with the student, or by re-teaching the concept if it is clear that many in a class show the same confusion.
- Perhaps the greatest benefit to me as a teacher, is the final entry – ‘Reflections on Progress’.
 - I encourage students to provide feedback on my teaching styles and on assignments. This allows me to learn about things that I may be doing that detract from my students’ understanding and—just as importantly—I get suggestions on things I could do to improve my instruction.

- I find out about projects or assignments that really worked, or perhaps that didn't. I have often received feedback on an assignment that I thought was a bust, and found that the students as a whole thought it was great and learned a lot from it.
- Of course, a requirement for 'complaints' is that the student give suggestions to address the problem!

Some Student Reflections

- "I have made a lot of progress in learning how the world works. Before I didn't know and didn't care, but now I won't be able to look at things the same way and it's actually cool, knowing how things happen and why."
- "I learned a lot in your class and I think Scrapbooks are good because they make you reflect on what you have learned and how they affect your life and the world you live in."
- "I learned a lot from this chapter and I told my mom what I learned and she didn't even know it. I taught her something new!"
- "For this scrapbook, my topic was muscles and the body. Something that really stood out to me was how the long distance runner breathes and uses his or her energy. It just amazes me that our body takes so much work for us just to breathe and run."
- "I feel like I have a better understanding of how our amazing body works. I can't believe that we make as many cells as we do in so short of time."
- "Everything I do now I think about it scientifically."
- "When I see a rainbow, I think of how it looks, other than just how pretty it is....How was this rainbow made? Even when I watch the sunset, it means more to me than just the colors now."
- "I have learned a lot this 9 weeks – mitosis, leaf pigments and cell energy. I also hope to learn more so I can be smarter than my parents!"
- "The picture of the ankle sprain shows how the ligaments attach to the bones in our feet. When the ligaments tear, they scar over and re-heal themselves. I think this is interesting because this is the kind of topic we discuss in our house all the time because my Dad is an athletic Trainer – he works with injuries of muscle and tissue every day and how to make them heal faster so that athletes can get on the field quicker."
- "My favorite part of this unit was studying the biomes.....I really liked doing my rainforest biome because I learned a lot about the rainforest.....It made me

think of the time we went to Moody Gardens in Galveston. I would like to go back there again and see it now that I have all of this information.”

- “I learned about solutions and saturation this 9 weeks. We were at dinner and my mom was putting sugar in her tea and after a few minutes, it started just piling up at the bottom and I actually knew why and was able to tell her! Let me tell you, that has never happened before!”
- “I think that doing the scrapbooks makes you think about what you are learning in a lot of different ways.”

Final Thoughts

- I have not found many opportunities other than scrapbooking that seriously address the real-life application of topics in a way that is not effort-intensive for the student, or grading-intensive for the instructor. The entries are generally short and quickly show if the student ‘gets it’ or not.
- I have used scrapbooks very effectively for the past seven years in Physical Science, Biology, Chemistry, Physics, AP Physics, AP Biology, Environmental Systems and Anatomy and Physiology, and truly believe that Scrapbooks can be adapted to any subject and any grade level.
- I learned about scrapbooks at a workshop several years ago. I am grateful to that teacher for sharing her ideas and would welcome any comments or thoughts. Please send any correspondence to me at texzann@yahoo.com.

