

Superheroes on Trial

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INTRODUCTION

It is said that truth is stranger than fiction. To a pre-adolescent, I'm afraid, the lines are blurred. My students are frequently asking me if something is true. Not the topics of realistic fiction, but the far-out and the fantastic. Do dragons really breathe fire? Can you go to Mars in a day? How does Spiderman make his web? How does Superman fly? I sometimes hear other adults refer to today's children as "street wise."

This so-called wisdom lies dormant in front of a TV or a book. Children aren't the only ones guilty of believing everything that they see on TV or in the movies. Many grown-ups accept as fact the very "science" that is presented in *Star Trek* and *Star Wars* and other science fiction movies and books. Shows that present themselves as factual are an even bigger problem. Who are they going to believe, the teacher or the media? Both might be right or wrong at different times. Students need to be able to analyze the product and use as many resources as they can to draw a reasonable conclusion. If they can't, they should be able to admit that they don't know all the answers and are still looking. Adults, and especially teachers, should do the same.

A situation arose last year that was very typical of this dilemma. One of my students stated that dogs can see ghosts. My first inclination was to laugh, but I kept my composure. I asked her how she knew this, and she said that she saw it on TV. Several students agreed with her. I guess they were watching the same show. When I asked the class how many of them have seen a ghost, no one raised their hand. I attempted to explain that if humans can't see ghosts, which I am skeptical of, then it is implausible that dogs can. Moreover, dogs can't speak, so how do we know what they see anyway? My attempts fell on deaf ears. I told the class that when they could prove it, I would believe. No one has proven it thus far.

How can we get our students to think critically and scientifically about the information that is presented to them in the media and through literature? That is the question that I hope to address in this unit. *The American Heritage Dictionary* defines the word *analyze* as, "To separate into parts or basic principals so as to determine the nature of the whole; examine methodically." That will be the end result of this unit. The students will be able to pull apart the truth from fiction based on scientific principles.

Science is often presented in a theoretical manner to young people. They may be able to memorize formulas and explain certain things, but they often can't explain how that impacts them or apply that information in another setting. Science is life. Physics is life.

It can't be separated or compartmentalized. Every step they take and every breath they breathe is affected by the physics around them. Shouldn't they know how it all works?

My students are fourth graders and primarily gifted and talented. Although the regular modes of learning are acceptable, they need to be challenged more. They are very active and need to move around the room and share their ideas with their classmates. This may be true for any child in 4th grade, but when some of the students are at a 9th grade level, 4th grade material will not challenge them. The difference between my highest students and the rest of the class is that the highest ones have an unusually high level of curiosity about the world. This is also confirmed by their adult-like understanding of these things.

My hope was to develop a unit that would meet the needs and interests of all the children in my class. This unit will be appropriate for students from a high fourth grade class through eighth grade and possibly into high school. I chose to do the movies *Superman* and *Spiderman*, but if I taught a higher grade level, I may have chosen to do *Star Trek* and *Star Wars*, so I am including some good books about them in the bibliography. It all depends on the intellectual ability and the interests of the students. It can be adapted to be more difficult depending on the teacher. He or she should keep in mind the TEKS at their grade level and may want to align their activities so that it is appropriate for the age of the students and their comprehension.

My students are like most children their age in their enjoyment of television and movies. When my grandparents were children, there were no radios or televisions. One member of a family usually played an instrument and the rest of the family would sing. My dad talks about the time when he was young and the family would sit around and listen to the radio. He said that everyone had a picture in their mind of the characters and the setting. The action would come alive in their minds. Ah, the good old days.

When I look at my father's old textbooks, I am surprised by their lack of pictures. My students complain if a book doesn't have pictures. Today's children's books and all textbooks are much more visually appealing and that is good, but I wonder whether our children have become so spoiled by the sound and visual effects in contemporary media that they are losing their ability to imagine things. I try to discourage my students from watching too much TV and encourage them to read every night. Despite the fact that I don't like my students being such media junkies, I am not going to fight it this time, but go along with it. The adage "If you can't beat 'em, join 'em" will be my motto.

We will be watching two movies—one current and one over twenty years old. A movie can evoke many senses and if we can incorporate their brains in the process, that's even better. Moreover, the fact that the students will have to analyze these science fiction movies for truths and errors will set them on a lifelong course of analyzing media instead of blindly watching it.

THE PLAN

The students will be looking at clips from two science fiction movies—*Superman* and *Spiderman*—to find the parts that are not likely to happen in real life and test them in the classroom. My hope was to show the entire *Superman* movie and only clips from *Spiderman* since most of them have already seen it. The students would then write down everything they thought was unusual whether it could or couldn't happen in real life. We would then spend some time discussing the possibility of whether these things could happen in real life. We would make a class list and narrow it down to about five things for each movie that we wanted to experiment or research. Of course, there would be experiments that I would already have in mind and try to steer them in that direction. A good strategy is to remain open-minded enough to try the students' ideas whether they were on the agenda or not. Teachers can learn a lot from their students with this kind of an attitude.

The class will follow the scientific method in determining if the idea is plausible, at least for most of the experiments. The class will develop a hypothesis. The teacher will then prepare experiments that could prove or disprove the hypothesis. For example, could Superman really fly? A basic understanding of gravity says that what goes up, must come down, unless another law of physics takes over. The students will then learn about what keeps the tons of metal in an airplane afloat. In comes Bernoulli's law. It may not be necessary to teach the term to younger children, but the concept, yes. The faster the flow of air, the less pressure there is. Hands-on activities will make this come alive.

My hope is to tie in the curriculum from other areas. Since social studies is often overlooked, I wanted to teach them about the function of the court system which is applicable to what children are supposed to learn in fourth grade and up. We will conduct a "trial" to prove or disprove if the science in the movies could or couldn't happen.

The students will be broken into two groups. Each group will represent one movie. I will let them pick, unless they all want to do the same movie. Since I have twenty students in my class, there will be about ten children representing each movie. Using the information and the experiments that they have done in class, they will then prosecute or defend their movie in a classroom jury. The prosecuting team will use experiments to prove that the movie or book is a fraud. The defense can do the same or appeal on a more personal level. Therefore, there will be about five students on the defense and five prosecuting. Some of the students will be lawyers, some will be witnesses, and others could be scientists acting as expert witnesses. On the defense, they might have the movie producers and the attorneys that represent them. Either way, they will have to prove through science that they are telling the truth. The rest of the class will be the jury when one group is presenting their trial. I will be the judge. A final verdict will determine which team made the best presentation.

I used to be in a speech club. The speeches I gave often required intense research and by the time I was ready to give my speech, I felt like I had really mastered my subject. That is what the students will accomplish in this unit. They will start out as listeners, and progress to become active inquirers, researchers, scientists, and then presenters. By the time they are ready to present what they have learned to the class, through their part in the trial, they will be experts in their field. My hope is that the students have so much fun that they forget that they are learning. Who says that's not allowed?

BACKGROUND

Superman

Superman was a popular movie over twenty years ago. A powerful yet humble hero never goes out of style and still appeals to children today. Superman possesses many qualities of a superhero and there are at least five that can be scrutinized scientifically. They are as follows:

- His ability to fly
- His ability to withstand great stress i.e., getting hit with great force
- His great strength
- His X-ray vision
- The ability to reverse time by reversing the rotation of the earth

I will take each point and talk about it in more detail.

Flight

Since flying is one of Superman's greatest feats, it is worthy of considerable discussion. We are all subject to the law of gravity as Newton found out by a stray apple, yet massive objects like airplanes fly through the air. That's because there is a force that is keeping them up. The force is actually a push that is working in the opposite direction of gravity. This is called Bernoulli's effect. *The American Heritage Dictionary* defines it as "The phenomenon of internal pressure reduction with increased stream velocity in a fluid." This is just a fancy way of saying that the faster a fluid, like air or water, passes over something, the lower the pressure.

An airplane wing is curved on the top and flat on the bottom. The curved top has a bigger surface area and so the air will move more quickly than under the wing. The faster air makes lower pressure and therefore, the airplane is lifted off the ground. An airplane would have four forces working on it. Gravity would push it down. Lift would pull it up. The engine would push it forward, thus providing thrust, and the atmosphere would push it backwards. That is called drag. By controlling the wings and the acceleration of the engine, they can control which force will be greater.

As a child, I used to stick my arm out of the car window. When I tilted my arm, it would rise. By both tilting and leveling my arm, I could get a nice wave motion going. Superman has arms, but he puts them out in front of him so getting lift would be very hard. Anyway, our arms aren't big enough to provide enough lift. Consider a bird. Their wings are very large compared to the rest of their bodies. The ratio of wing to body is large. Also, bird wings are arched on the top like airplane wings. This is why birds can fly and humans, even "super-humans," can't.

Damage/Pain Resistance

Superman must be made of flesh and blood to survive on this planet, so it is unlikely that his body could survive a bullet wound. But, how about his suit? The material that is currently used to make bulletproof vests is five times stronger than steel. So could it be possible that the flimsy suit that he is wearing is bulletproof? Bulletproof material is not that thin. Not only does it have to be strong enough to deflect a bullet, it must be dense enough to prevent trauma by the impact.

Superman's suit appears thin. You can see his bulging muscles and that would not be likely with bulletproof material that is used today. Scientists and engineers are always striving to make things better, so the future holds many possibilities. There are elements of science fiction that are very likely to happen in the future and in many cases have occurred. In the old Star Trek series, people used communication devices that look very much like cell phones that we use today. Who would have thought that? Sometimes the lines between science and fiction are very blurred.

Super Strength

Most astronauts have to exercise for two hours every day when they are in space. This is because the lack of gravity causes them to lose muscle and bone mass. When humans go to the moon, there is a lower gravity there than on earth. It is about one sixth that of earth. A human would weigh less on the moon and would seem to be stronger because everything would weigh one-sixth its actual weight on earth. Therefore, they should be able to pick up things that would be too heavy for them on earth.

One could argue that Superman is from another planet, Krypton. If Krypton has a greater gravitational force than earth, Superman should be much stronger when he comes to earth—but not for long. The problem is that Superman came to earth as a baby and his body would quickly adjust to the changes here the same way that the astronauts' bodies quickly change when they are in outer space.

X-ray Vision

Superman has X-ray vision. Normal vision occurs by light entering our eyes. X-rays emit light and therefore Superman would have to have a source of the X-rays emitted from

his eyes. Since X-rays are a source of radiation, it would kill him over time. Also, X-rays need a metal plate to receive them. Unless the people he were X-raying were behind a metal plate, then he would not be able to see through them. This is explained in more detail in Lesson 1.

Time Reversal

Time reversal is impossible. In the movie, Superman spins around the earth a few times. This supposedly makes time reverse so that he can bring Lois Lane back to life. Reversing the rotation of the earth will not reverse time. If the earth stopped, time wouldn't stop. Likewise, reversing the rotation of the earth will not reverse time. If a plane flies east or west over the face of the earth, time still proceeds forward. If the earth were to rotate twice as fast, there would be twice as many days in a year, but a year would still be a year, and we wouldn't age more rapidly.

Einstein's special theory of relativity deals with the warping of time. As a mass approaches the speed of light, time appears to slow down. It never stops or reverses. As much as I'd like time to reverse and be 29 again, it is not going to happen.

Spiderman

This unit was halfway completed when I started doing it with my students. We did not watch the movie with the class, but since almost every student had seen the movie, it was a non-issue. They had to list all of the characteristics that Spiderman possessed as a superhero. They came up with more ideas than I did and were very eager to share this with the class. Some of the things that they came up with were the following:

- The ability to stick to or climb walls
- His spider sense—ESP
- His ability to make spider webs
- Seeing things in slow motion
- Super strength
- Receiving the power from a spider
- Fast reflexes
- Being able to jump with super long strides
- Developing a new type of spider with new DNA
- Improved vision

These are the things that relate to Spiderman. They had more ideas that related to the Green Goblin, but we are not going to focus on him. We spent a couple of days discussing the possibility of these things happening and read books on spiders. The students had to do further research on spiders and anything that could relate to Spiderman by going to the library and searching the Internet. The movie has many fictional qualities

that are a result of the characteristics that Spiderman possesses after having been bitten by the spider. Could these happen in real life?

We took each characteristic of Spiderman and discussed each one. The students had to defend their answer with facts rather than feeling. Let's review a few of these points. I will take some of these and discuss them in greater detail.

Climbing Walls

Spiderman could climb walls and so can a spider. The movie shows our superhero with hairs that come out of his fingers when he is about to climb a wall and his hands were sticky on at least one other occasion. While it is true that spiders climb walls, their hairs don't retract and protrude at will the way they do in the movie. A spider also has eight legs that help it to climb and they are quite diminutive compared to a human. Force equals mass times acceleration. Gravity is a force and is working against whatever is clinging to a wall. A spider has a much smaller mass than a person and therefore is less likely to slip off the wall.

Spider Sense

It's amazing how animals have the ability to sense things that we humans can't. Animals have very strange reactions before earthquakes. Some species of snakes come out of their shelters; dogs bark; sheep flee. Do they have ESP? No, but many have senses that are much more acute than ours, or have senses that we lack. Scientists are continuing to find out things about animals. They now know that sharks have an ability to detect the electrical impulses in other animals. Dogs have excellent hearing, bats use echolocation, and many animals can detect tiny waves of motion in the earth. Ants can see polarized light. Butterflies have chemoreceptors on their feet. Birds of prey can see small rodents from two miles away. No wonder they can sense an earthquake before we can.

Spiderman seemed to know what was going to happen before it happened. Maybe he assessed the situation using all of his senses. I have a friend who has hearing beyond the range of normal for both high and low pitches. She could obviously hear things that most of us couldn't. She might be able to predict who was coming into the room by hearing the footsteps from far away. This does not mean that she knows the future. She only is using the senses she has to make a prediction. Animals do the same thing.

Spinning Webs

Spiders produce webs from structures called spinnerets. They are located on the posterior abdomen (rear-end) and are used to extrude spider web silk. Spider silk is a fibrous protein and ounce for ounce is much stronger than steel. No wonder Spiderman can support himself by holding onto the web. There are some problems, though. Spiderman shoots out the web. Spiders don't do this. They just extrude it. Of course, the spinnerets

are located on the abdomen in spiders, but Spiderman has them on his wrists. Two main reasons that spiders create webs are to catch their prey and make an egg sac. Spiderman doesn't eat anything that he catches in his web.

Slow Motion Vision/Fast Reflexes

One of the best parts about watching professional football is seeing the replays, especially when they are in slow motion. You can see in clarity the exact position where the foot lands or where a player takes a hit. The slow motion effect is caused by slowing down the footage that was already shot.

At one point during the movie, Spiderman appears to see something in slow motion while it is actually happening. This would be impossible since every action in the world would have to slow down at the same time. The laws of physics don't allow it.

Spiderman may only appear to things that look like they are in slow motion, but he is actually only seeing things with quick reflexes. Since he is supposedly part human, this is allowed. Spiders have many eyes and like most animals do have quick reflexes. It is very hard to swat a fly. They move before they get caught. Birds seldom get hit by cars, even ones that challenge the speed limit. So it is fair to believe that Spiderman can perform these feats if he is part spider. That brings us to the next subject.

Receiving Animal Traits

We have all heard about people be bitten by snakes, mad dogs, sharks, and, of course, spiders. If the victim is lucky, there is little damage done. Sometimes death occurs. I have never heard of a person acquiring the traits of the animal. For example, shark attack victims don't become fast swimmers and dog bite victims don't acquire keen hearing.

My students would say that a spider has venom and it is the venom that helped Spiderman, not the bite itself. I would retort that since none of us know someone that has gotten spider or snake traits after being bitten by the respective animal, then why does it make so much sense in a movie? It may seem obvious to an adult, but children tend to believe things they see or hear.

This scares me because children are going to be exposed to many things in their life and many will not be good or true. When my students get to a point where they are convinced about what they see or believe on TV when there is no real proof, I play a trick on them. I ask another student to do the trick with me and we appear to read each other's minds. It never fails to fool all of them. I tell them that it is a trick and they are surprised that I tricked them. I encourage them to not take my word for everything, but to check everything out for themselves, because they will have many teachers and professors who will have different beliefs. Just because they see things on TV or other forms of media doesn't make it a fact.

Mutant Spiders

Scientists try to make new breeds of plants that grow larger, produce better fruit, resist fungus, or produce small, edible seeds. This is known as biological engineering. Parts of plants are spliced together to produce a new plant. Usually the new plant is an improved version of the old plant. There is ongoing research into human and plant engineering and some of it is controversial and even questionable. Mutations do occur naturally in humans and animals. Most mutations are harmful and some can lead to death. When scientists try to change the laws of nature, it becomes tricky. They have already cloned some animal species. Cloning an animal involves copying its DNA. Changing the DNA of a species is entirely different. It is a change versus a copy.

I sometimes wonder why Spiderman only got the good qualities of a spider. He can see better. He can make webs. He can climb walls. He is strong. Why isn't Spiderman hairy? Since he can see better, why doesn't he have eight beady black eyes like most spiders? Where is all the hair? Why does the webbing come out of the wrists instead of...well, the back side?

There is something that needs to be emphasized about this unit. I am not saying that all science fiction is bogus or can never occur. Science fiction writers used to write about going to the moon or outer space. These things have already happened. Science fiction writers are dreamers, but so are inventors. Inventors want to create something that doesn't currently exist. Science fiction writers may hope that what they write about will one day occur. Our dreams won't come true if we don't have them. My concern is that some people may believe that what they see or read will occur if given enough time. In logic, one must reason from the known to the unknown.

It may be a lot more appealing to reason from the unknown to the known. This is dangerous. It leads to speculations in science about everything from UFOs to quantum mechanics. The laws of physics will not change and some things that happen in science fiction books or movies will never happen in this universe. I hope that I have made clear what will never happen and what could happen. I want to leave the door open, however, because I'm a dreamer too.

Trial

This is my favorite part of the unit. To prepare my students for the trials they will perform, we did a trial based on something easier for them to comprehend. I read the book, *The True Story of the Three Little Pigs*, by John Scieszka. This book tells the story from the wolf's point of view about how he was the one victimized, wrongly accused, and suffered unjust treatment all because he needed to borrow a cup of sugar from his neighbors, the three pigs.

Since the students need to know what the judicial system is and how it works, having a mock trial is a fun way to teach them. Since I have twenty students, we had two trials. Ten students held one trial while the others served as the jury except one student who was the bailiff. We had to review all of the vocabulary that one needs to know to run a trial, as well as the purposes of the lawyers and the pieces of evidence.

The students did much better than I could have imagined. There were five people that represented each side. For example, one group that served as the defense had a defense lawyer, an assistant DA, the wolf, and two witnesses. One of the witnesses was an expert witness who was a medical doctor who claimed that the wolf was too young to be able to attack the pigs. The other witness was a neighbor of the pigs who claimed that the pigs actually attacked the wolf. Evidence from both sides included many pretend pieces of evidence, such as, paw prints, bloody bones, pig tails, a detailed map with the wolf's plan to kill the pig, etc. One student even cut her hair and claimed it was the hair from the pig's "chiny chin chin."

We later had another trial that the kids asked to do. One student was accused of hitting another student. This trial lasted about a half an hour. Four honest students were asked to make the decision on innocence or guilt and the punishment. There was a surprise decision and everyone was happy in the end.

With those two events behind them, they were ready for Superman vs. the State of Texas and Spiderman vs. the State of Texas. Since these trials will rely on their scientific knowledge and experience as well as their creativity, they will not have to be too concerned over trial terminology and understanding. The superheroes are on trial for being phony and fooling the public into thinking that they are real.

The students will have to come up with their own positions for the trial. The prosecuting team for Superman vs. the State of Texas might have two attorneys, two expert witnesses acting as the scientists, and maybe an eyewitness. The students who are not part of this trial will be the jury. There should be nine of them. They will get specific instructions on how to choose whether the superhero is innocent or guilty of crimes of deception.

LESSON PLANS

Lesson 1

The students will prove whether Superman's X-ray vision is possible. In the movie, Superman can supposedly see through things and even the color of Lois Lane's underwear. Could this be possible?

Materials

X-rays from a doctor's office

Photographs

The book *Discover How Things Work*

Procedure

The book gives a brief description of how many different things work, including how photographs and X-rays work. The students will tell what it was like when they had X-rays. The students will then look at photos and X-rays and compare them. They should note that the X-rays seem to look through the person and that it is the inside of the body that they see and not the inner layers of clothing. The photos, on the other hand, capture the surface image. They may also note that the X-rays are only black and white.

Students who have had X-rays may note that they had a metal plate behind them. The teacher will read the book describing the two contrasting images. The students should be able to state how X-rays work and write a summary of it. They should also note that this would not have been a possibility for Superman. This and other summaries and data will be in their science journal used specifically for this unit only.

Lesson 2

Can Superman fly? All airborne things require some sort of lift due to the gravity on our planet. What goes up must come down, including an adult male. But what keeps an airplane afloat? Lift. Bernoulli's principle states that things with a lower pressure will be pushed up.

Materials

Paper

Large fan

Several yardsticks

Aluminum foil

Books on airplanes

Lightweight stick, possibly plywood

Cloth

Procedure

First, the students will take a piece of paper and blow on them from the top. They will notice that the paper actually rises because the pressure is lower and the paper is blown up not down. The wings of an airplane are curved and this causes the air to move faster and be lifted.

This experiment will require some creativity on the part of the teacher and the students. The students will build a wing and see it rise by the air pressure from a fan. The students can build the wing using aluminum foil or paper or any other material that is lightweight and moldable. The shape should resemble the shape of an airplane wing and be about a foot in size. The wing should be attached to a lightweight stick. There should

be two yardsticks about an inch apart on both sides of the fan about six inches in front of the fan. The yardsticks should be propped up above the floor about foot so that the center is near the center of the fan. The stick with the wing should be set between the yardsticks so that they can move up and down freely. Then turn on the fan. The stick wing should be raised due to the wing shape and the lift provided by it.

What lift does Superman have? None. That cape has no support and could not keep him afloat. To prove this, the students will remove their wing from the stick and add some cloth like a bandana. The cloth will certainly flap, but it will not raise the stick. Now they have homemade proof that Superman is not able to fly on his own.

There are two things that I like about this experiment. One is that the students had to create the wings themselves, instead of having the teacher give it to them. The students can work in small groups and compare wings. They can see which ones rose the highest and fastest, and that could lead into some great discussions. The other thing that I like is that this is the closest thing that I can think of that mimics an airplane flying. Making paper airplanes is fun and one can learn from that, but it does not mimic the way that an airplane flies.

Lesson 3

Let's look at some materials to see how well Superman's suit could hold up.

Materials

Weights of various masses
Tissue Paper
Paper Towels
News Paper
Plastic Bags
Cloth

Procedure

The students will put increasing weights on the materials to see at what point the material breaks. The students should record in their journals everything that they see. The groups will report to the class what they found and compare results. If the results are quite different between the groups, the teacher should stress the importance that scientists should do repeated experiments so that variables don't affect the results.

Lesson 4

How could Spiderman shoot out his webs? The students will do research instead of an experiment to see if a spider could shoot a web.

Materials

Books on spiders
Research from the Internet

Procedure

The students are on their own here. They need to find out and describe and illustrate the way a spider makes a web. They should notice that a spider makes a web more by oozing than by shooting. The students will present their research to the class. This will be kept in their journal. Note: this activity could be done with a partner.

Lesson 5

At one point during the movie, Spiderman is suspended by his spider web with one hand, and holding a cable car full of people in the other. Could a human (even one with special powers) perform this feat?

Materials

Weights
Toy monkey or doll
Small pail

Procedure

What we want to do here is add increasing weights to a toy that has arms. When I was a child, there were these hanging monkeys and if those could be found, those would be perfect for this experiment because they have scooped hands that would hold a small bucket. If those could not be found, a used doll like a Barbie would work well. The doll should be used because it might get ruined.

The students need to rig up the doll so that it can hold up a bucket. A student may have to hold up the doll or monkey by the other arm. The bucket will be filled with increasing weight until the arm is pulled out. If the arm doesn't get pulled out, that is fine too, because that could prove that what they see in the movie is possible. Basically, the shoulder joint isn't that strong and a very heavy weight pulled on it will probably pull the joint out of the socket. I don't think that spiders have very strong joints, so getting the powers of a spider would not really help Spiderman in this way.

Lesson 6

The students should know the following vocabulary words: defense, prosecution, attorney, lawyer, bailiff, evidence, exhibit, jury, court, trial, counsel, testimony, eyewitness, and expert witness. The students can work in pairs and together find the meaning of two of the vocabulary words. They can use a dictionary or the Internet to find the meaning and ask the teacher. They will present their definition and how it is used to the class.

Since the trial was explained in some detail in the background section of this unit, I want to focus on some logistics for this lesson. The trial should be as close to a real trial as possible. The teacher should be dressed in a black robe and have a gavel. The classroom should be set up like a courtroom and the students should be allowed to dress according to character.

Originally, I did not want to have a practice trial. I thought that it would give the students too much of a chance to change their ideas and give themselves an edge. But this is not a real court and the students are not real lawyers, so an edge is helpful for them. Anyway, in real court cases, the attorneys have to present evidence to the other side before the trial. The practice trial should be done the day before the real trial so that the students have enough time to adjust their plan and make improvements, but not too much time to dillydally.

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For those who don't like to spend a lot of money on experiments, this is a good book, especially for young children.
- Kraus, Lawrence M. *The Physics of Star Trek*. New York: HarperCollins Publishers, 1996.
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- Markle, Sandra. *Science in a Bottle*. New York: Scholastic, 1995.
There are lots of fun hands-on activities for young children. All of them require a plastic soda bottle and a few other items.
- Rogers, Kathy. *Stars & Planets*. San Antonio: ECS Learning Systems, Inc., 1993.
This activity guide has a few astronomy activities for children in the lower grades.
- Science Fiction & Fantasy For Children*. June 2003. <<http://www.libntt.lib.uoguelph.ca/SFBib/index.htm>>.
Search through this site for a multitude of sci-fi and fantasy books.
- Schnieper, Claudia. *Amazing Spiders*. Minneapolis: Carolrhoda Books, Inc., 1989.
This children's book goes into details about spider characteristics and has beautiful photographs.

Star Trek—The Official Site. 2003. Paramount Pictures. June 2003. <<http://www.startrek.com>>.

Here is everything you always wanted to know about Star Trek. It includes character profiles, surveys, quizzes, and articles.

Star Wars Saga. 2003. Lucasfilm. June 2003. <<http://www.starwars.com>>.

Young people and teens would like this website, which includes all of the movies in the series.

The Ultimate Science Fiction Web Guide. June 2003. <<http://www.dragonmagic.com/UltimateSF>>.

This site gives over five thousand links to web science fiction writers.

World Almanac for Kids—Space. 2001-2003. World Almanac Education Group Inc. June 2003. <<http://www.worldalmanacforkids.com/explore/space>>.

This is an easy to understand web site for children on all aspects of astronomy including radio astronomy.

Wolverton, Mark. *The Science of Superman*. New York: I books, 2002.

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Zitzewitz, Paul W. *Physics, Principles and Problems*. Columbus: Glencoe, 2002.

This high school physics book can guide a teacher into a full understanding of physics.

Films

Superman. Directed by Richard Donner. Warner Home Video, 1980. (127 minutes)

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