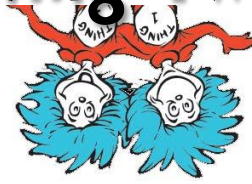


There's Fun to Be Done!

[Thing Two!]

Horton Saw a Who...



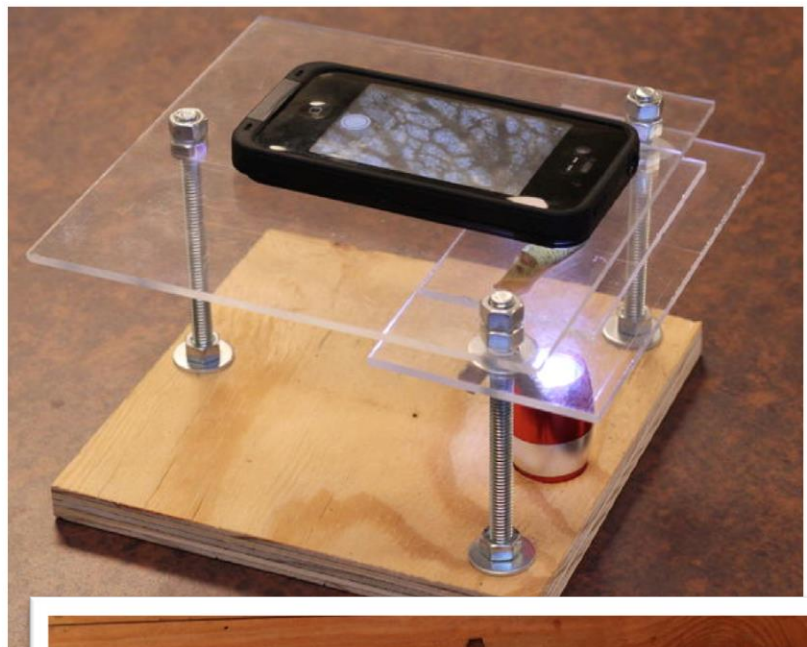
and So Can You!

Start this section by reading the story! (It can be compared and contrasted to the original 25 min long TV animated version of the story at <https://www.youtube.com/watch?v=K0xQslegNyQ>. Have students seen

the CGI version? What do they remember? What do they learn from each version? In what ways are they similar or different? Were the stories told all the same?)

Great discoveries don't always have to be big. In Dr. Seuss's book *Horton Hears a Who*, (read it with students) Horton the elephant struggles to protect a microscopic community from his neighbors who refuse to believe it exists. Horton hears a Who and believes the Whos exist without seeing them. What other teeny, tiny wonders exist that can't be seen with the naked eye?

The world is an interesting place, but it's fascinating up close. Through the lens of a microscope students can find details that they would otherwise never notice, becoming intrepid explorers of the until recently unseen. A microscope allows students to see things that exist beyond our human world. Peer through and discover something new ... What will you find?



The following instructions show how to build a stand for about \$10 that will transform any smartphone, tablet, or similar device into a fairly powerful digital microscope.

Suggestion: One way to do this project in a group setting would be to have all the hole drilling pre-done and give out sets or kits that the students in the class could assemble themselves.

Another way would be to use pegboard, if you don't have access to a drill or don't want to use it around students. Cardboard is another option-illustration on p. 36.

Step by step explanation and video instructions for the following are available at the following links:

<http://www.geekosystem.com/smartphone-microscope-diy/>

<http://www.instructables.com/id/10->

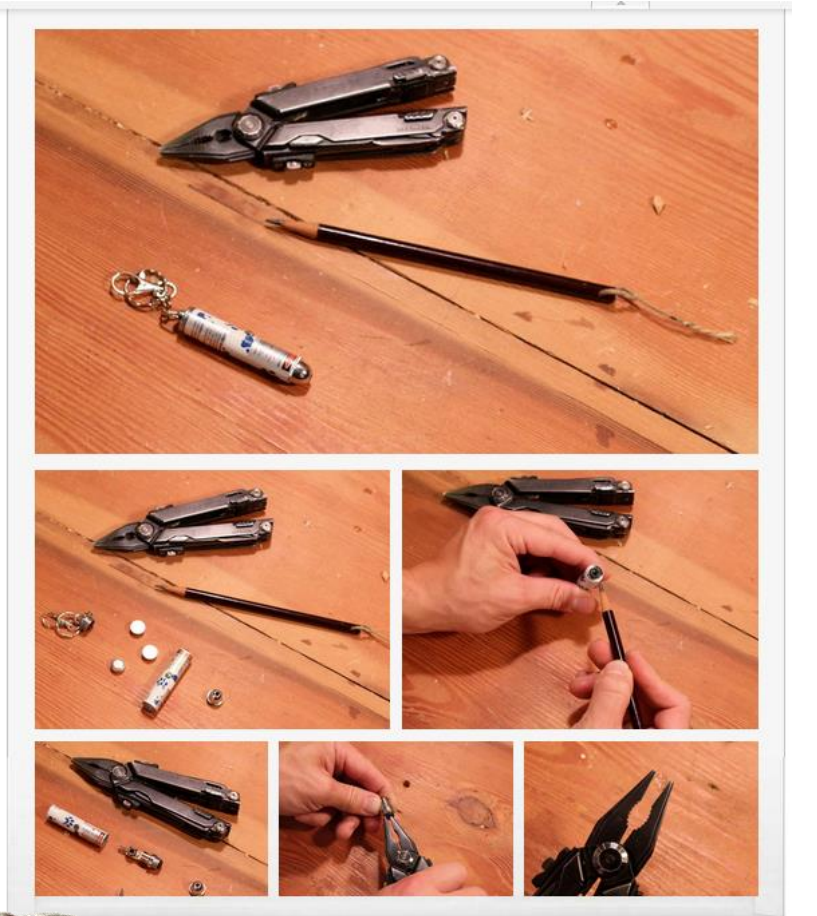
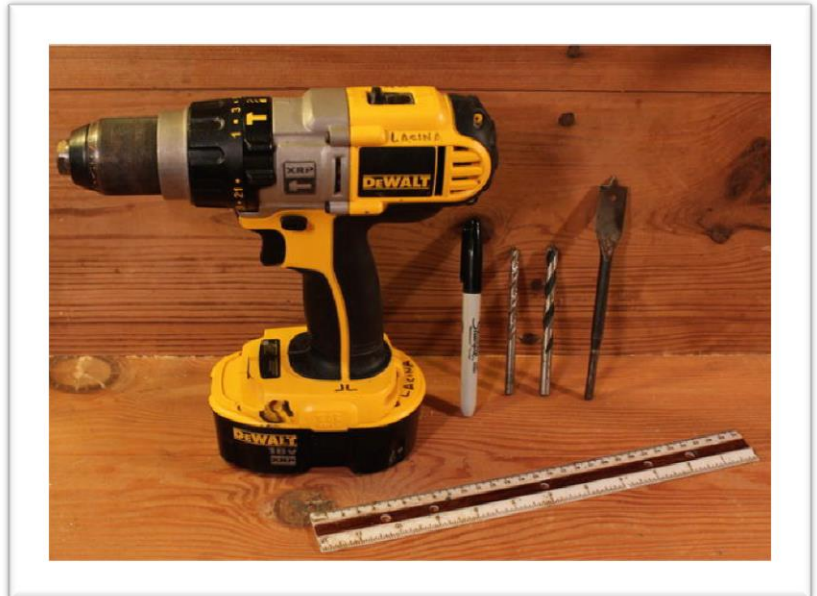
[Smartphone-to-digital-microscope-conversion/step8/Explore/](http://www.instructables.com/id/10-Smartphone-to-digital-microscope-conversion/step8/Explore/)

Materials and Tools

The cost of this project is around \$10 per stand (not counting the smartphone), and it only takes about 20 minutes to build (It takes longer to explain than to do). Students can be viewing whole communities of cells with a smartphone within the hour!

Materials required:

- 3x 4 1/2" x 5/16" carriage bolts
- 9x 5/16" nuts
- 3x 5/16" wing nuts
- 5x 5/16" washers
- 3/4" x 7" x 7" plywood -- for the base (or another piece of plexiglass that size)
- 1/8" x 7" x 7" plexiglass -- for the camera stage
- 1/8" x 3" x 7" plexiglass -- for the specimen stage
- Scrap plexi (~ 2"x 4")



for specimen slide (optional but useful)
cheap laser pointer (you'll need the focus lens (use two for increased magnification))
Mini LED click pocket or keychain sized flashlight (necessary only for viewing backlit specimens)

Tools:

Drill
Assorted bits
Ruler

Getting the lens from a laser pointer

The focus lens of just about any laser pointer will act as the macro lens on the microscope stand. Don't waste money on an expensive model; the lens from the \$2 laser is fine. **EDIT:** To achieve higher magnification (up to 375x), use a second lens!

To get the lens from the laser pointer start by unscrewing the front cone and the back cover of the tube. Remove the batteries. Using the eraser end of a pencil, push the innards out of the front of the tube. The front of this assembly (the side without the spring to contact the batteries) is where the focus lens sits. Unscrew the small black piece of plastic in front of the lens and the lens will come free.

The lens, when viewed from the side is not symmetrical. You'll see a thin translucent strip (~1mm) on one side of the lens. That side must not be adjacent to the camera. You can determine the correct orientation by sticking the lens between the prongs of a hairpin and taping the rig to the back of a smartphone. The



correct orientation will provide you with a larger field of view.

As it is, you can take reasonably good macro photos with this lens and smartphone. This simple rig is limited; not to mention, it's extremely hard to keep the phone steady when taking zoomed in photos. That's why we need to build a stand!

Drilling the bolt holes

Have students make a mark with a Sharpie on the front two corners of the plywood base $\frac{3}{4}$ " from both the sides and the front edges. (Note: a sheet of plexiglass the same size can also be used for a base).

Instructor will put a sacrificial piece of wood beneath the plywood base before drilling. You don't want to damage surface of the bench, table, or floor you are working on! Stack the plexiglass camera stage (7" x 7" piece) on top of the base. Then stack the specimen stage (3" x 7") on top of the camera stage with $\frac{3}{4}$ " of the stage extending off the front of the base.

Drill through the entire assembly. The bolts that stick up through the base must be countersunk in order for the stand to sit flat. Flip the base over and counter sink the holes with a spade bit.



EDIT: A few tips on NOT cracking the plexiglass when drilling...First, go slow. Let the drill do the work and DO NOT press down hard on the drill. Use a sharp bit and press gently on the drill. You can also put a piece of tape over the area that you wish to drill through. It will reduce the chance of cracking the plexi.

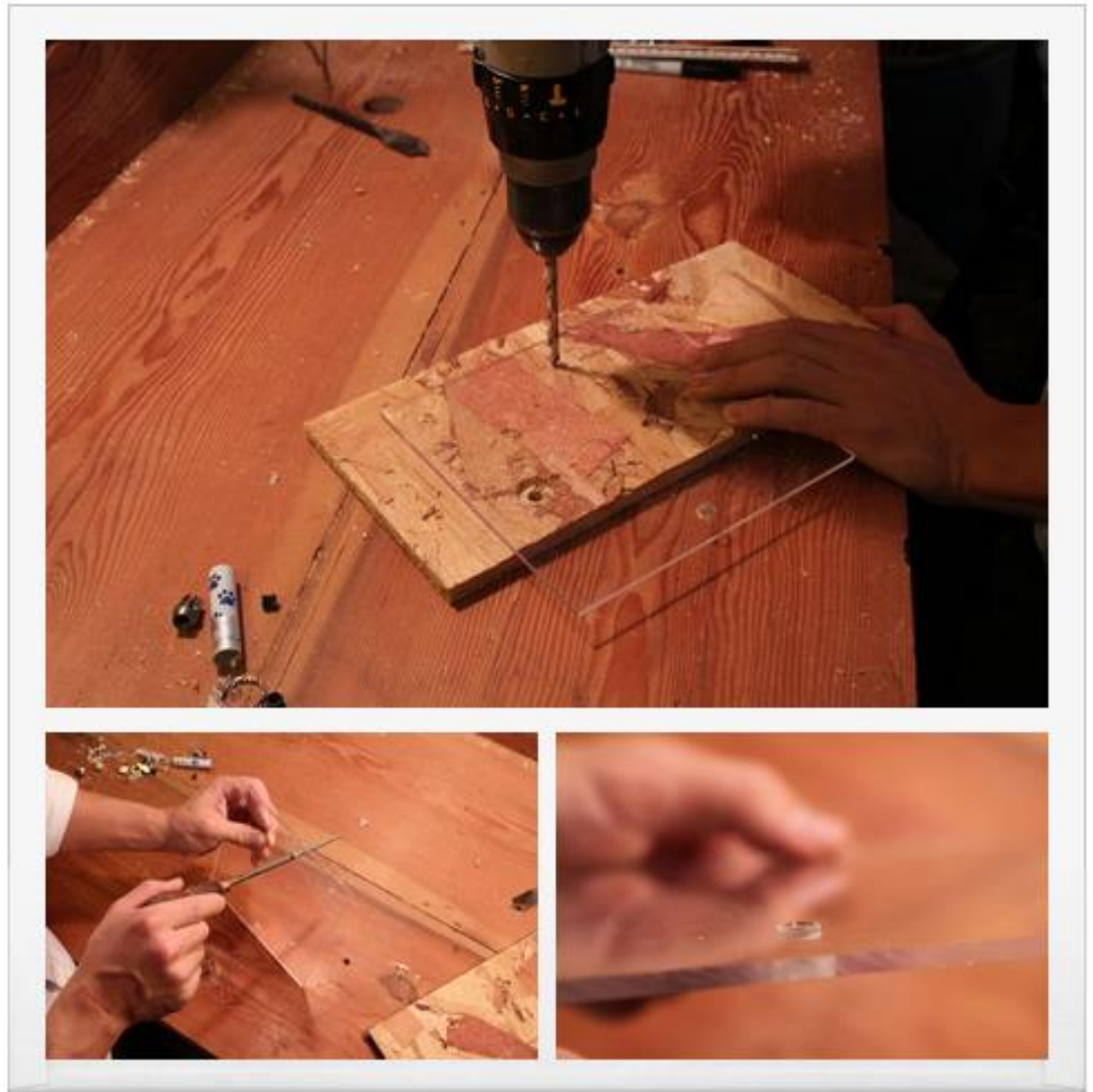
Embedding the lens

Find a drill bit that is the same size as or smaller than the diameter of the lens. Remember, you can always take more plexi away; adding extra plexiglass after drilling is not an option.

$\frac{3}{4}$ " from the front of the camera stage (in line with the bolt holes) drill a hole for the lens.

If the lens doesn't quite fit, file or use sandpaper to enlarge the hole. Be sure to do this slowly and test the fit often. It is easy to overshoot and make the hole too large!

When using the stand, it is important to have the lens as close as possible to the camera. If you don't plan on having your phone in a case when you use the stand, make the lens flush with the stage. Otherwise, leave the top of the lens slightly exposed (as is done in the image) so that the lens will rest closer to the camera.

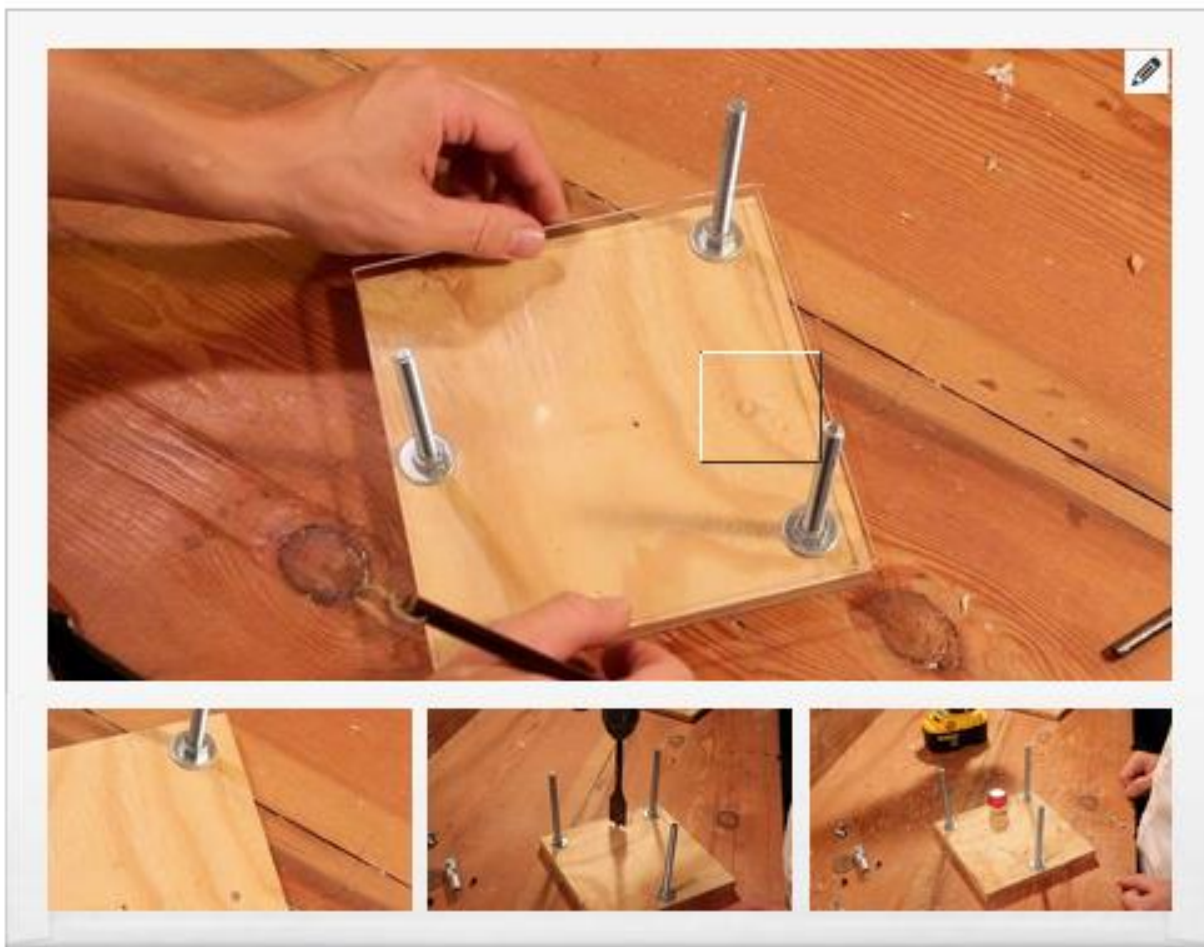


EDIT: If you are using TWO lenses, stack them on top of another. Insert one lens from below the plexiglass and the second from above. **Note: The lenses (standard acrylic lenses for 12x30mm modules) at the following link work well if you are not able to or interested in buying laser pointers. You don't have to take them out of the collar, just make a slightly larger hole. One will produce magnification above**
150x.http://www.aixiz.com/store/product_info.php/cPath/46/products_id/374

Lenses are also sometimes sold separately, ex.
<http://store.laserclassroom.com/laser-pointer-lens/>

Drilling the hole for the light source

It is important that a hole for your light source is directly below the focus lens. The best way to mark the placement of the light is to use the lens hole as a guide to mark the hole for the light



source. Slide the camera stage (without the lens) down to the base, mark with a pencil where the hole is to be drilled, and drill a shallow hole to rest the light in.

Assembly!

We are ready to assemble!

1. Have students start with washers and nuts to hold the bolts tight to the base.
2. Then they should add some upside down wing nuts and then washers to the two front bolts.
3. Now, have them place the specimen stage on top of the washers and add a nut to each bolt.
4. Lower them about 1/2" and rest the camera stage on top of these nuts. Tip: A level is handy here to make sure that the stage is actually flat. If you don't own a level there are plenty of free level apps for a phone! Or just use a small bottle with a bubble of air.
5. When the stage is level both front to back and left to right, have students tighten down the final nuts.





Explore! Go See What Can Be Seen!

Go take some pictures! Or video! With around \$10-\$15 worth of materials and a smartphone, your students just made a picture taking digital microscope! (Be sure to check out some plant and animal cells!-Slice of onion or leaf anyone? A hair?)

Troubleshooting!

As you have questions we'll try to address them in this section!

Lens won't focus!

This is most likely because the object is not close enough to the lens. If you still can't focus on the image and the nuts under the camera stage stop the specimen stage from being raised higher use a scrap piece of plexi as a slide. This will raise the object into focus.

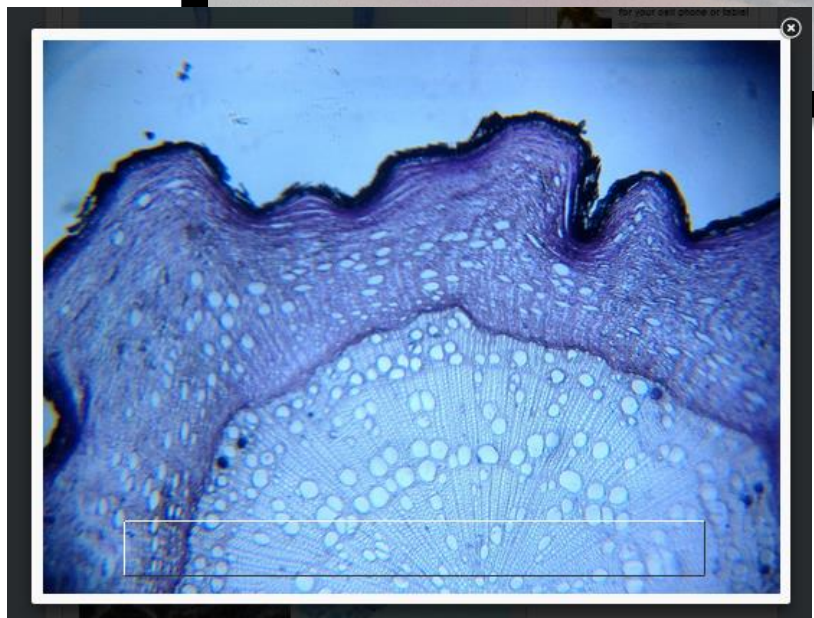
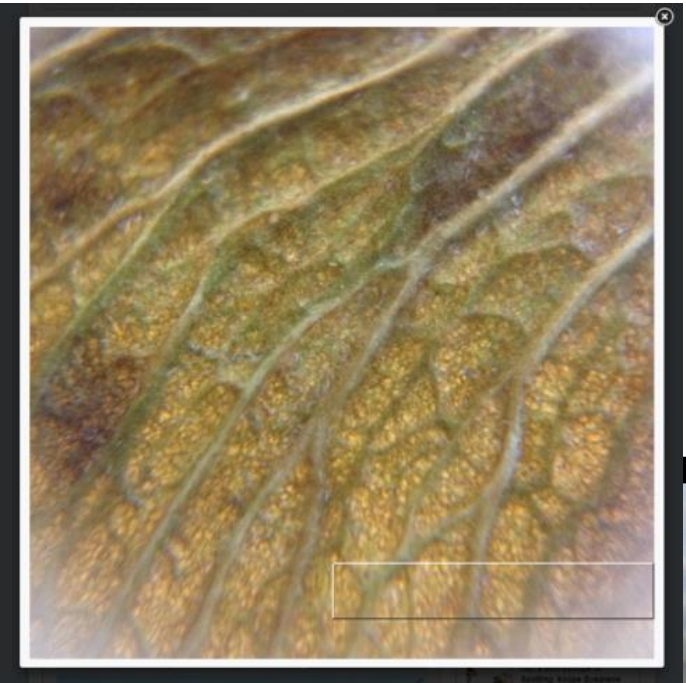
Cracked plexiglass!

This was touched on briefly earlier in the instructions. The big thing here is GO SLOW. Let the weight of the drill do the work and DON'T PRESS HARD. Use as sharp a bit as possible. Taping over the area you need to drill also reduces the chance of cracking.

I don't have the tools to make the cuts!

Not to worry! Most hardware stores have a shop and will charge a small fee for cutting the wood and the plexiglass down to size.

Help! I can only buy plexiglass in



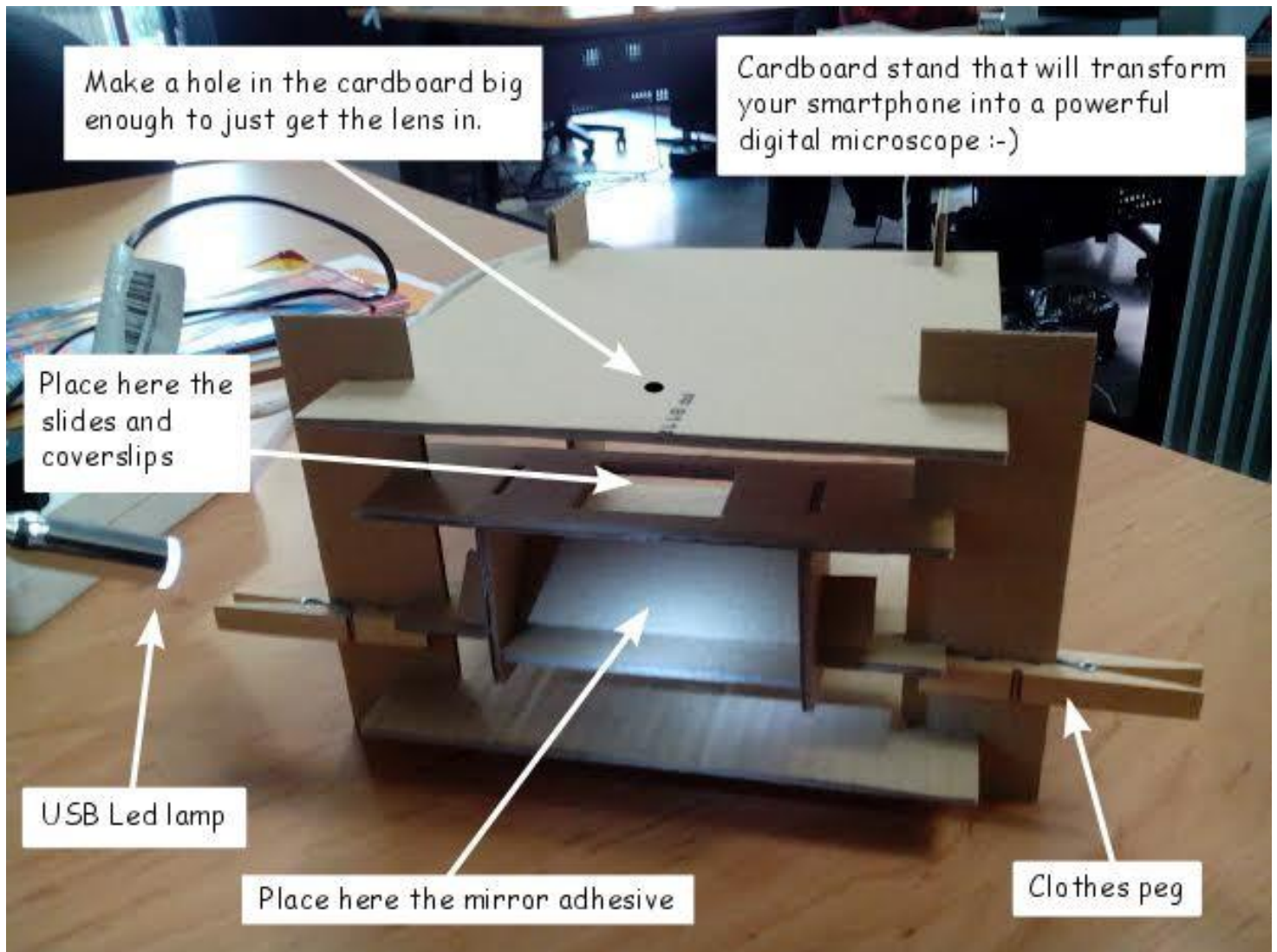
huge sheets!

Many hardware stores will have scraps. Ex. You may be able to purchase a large piece of scrap to make 8 microscopes for a fraction of the price of a full sheet.

Aaaaaah! I can't find the same LED light!

Pretty much any LED light will work. Ideally it can stand up straight with the light pointing vertically. If your light is tall, it might raise the minimum height that your specimen stage can be. This of course can easily be fixed by using longer bolts.

Variation: Ideas spread ideas. Someone tried it with cardboard, cutting with scissors/a craft knife, using mirror adhesive, and clothes pegs. What other ways can your students think to innovate and create something great? Have them apply engineering design steps and strategies as well as some creative thinking to solve this practical problem! (See other's ideas in the comments at: <http://www.instructables.com/id/10-Smartphone-to-digital-microscope-conversion/?ALLSTEPS>)



Variation: As

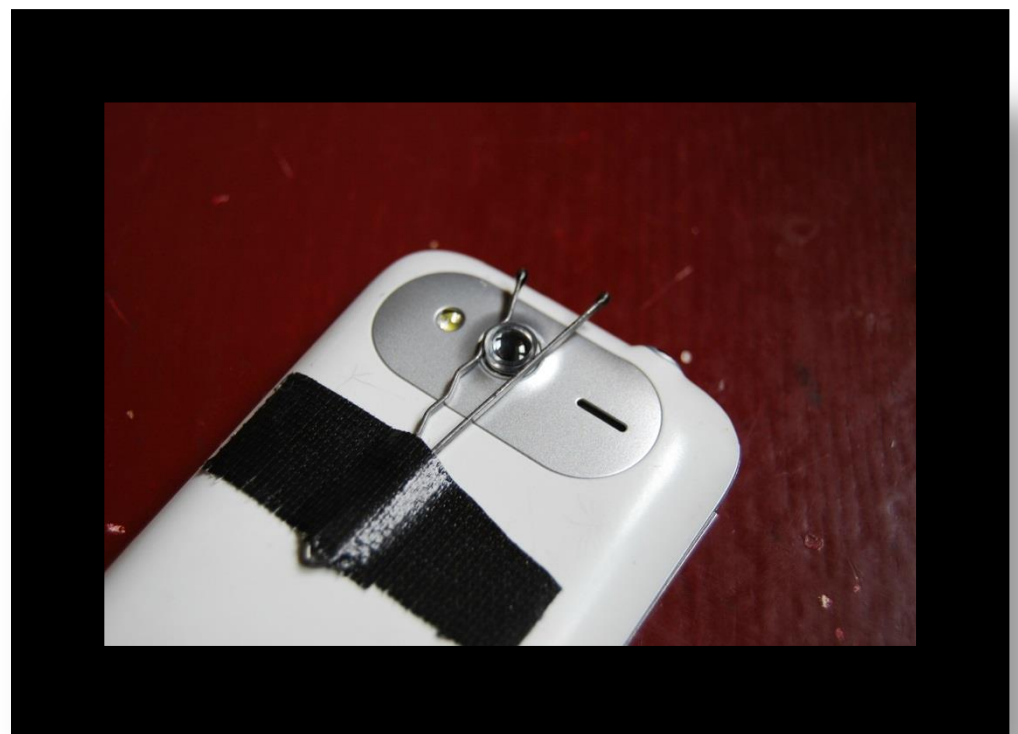
mentioned above, as it is, you can take reasonably good macro photos with just a bobby pin, tape, lens and smartphone. This simple rig is very limited; not to mention, it's extremely hard to keep the phone steady when taking zoomed in photos. So, this version isn't quite as powerful or as stable, but it can serve the purpose in a pinch.

Take apart your cheap laser pointer. You need to spin off the tip, screw off that grey plastic protection. It's usually pretty securely and tightly fit so you probably need to use clips. Then you will find the key part. Grab the lens from inside, and attach it to your tablet, phone, or device using something like a bobby pin as shown. With that setup, you can get awesome, super close-up views and images.

To prevent it from moving, put that macro lens between hair clamp (aka "bobby pin") and use tape to secure it from moving.

Notes: The lens **has** to be with convex side facing away from camera and flat surface has to face the camera.

The device's camera has to have at least 3MP. Also auto-focus improves quality.



Also, if you are trying to get picture and are having trouble focusing, then here are few tips for you. The camera has to be really close, closer than 1 cm (0.4 inch). It helps to move your camera very, (VERY!) slowly toward the object you are trying to take picture of.

Oobleck: Solid, Liquid, or...Colloid?

Activity inspired by materials from Marilyn L. Fowler, a science specialist with the AIM High Program in the Austin Independent School District, Austin, Texas.

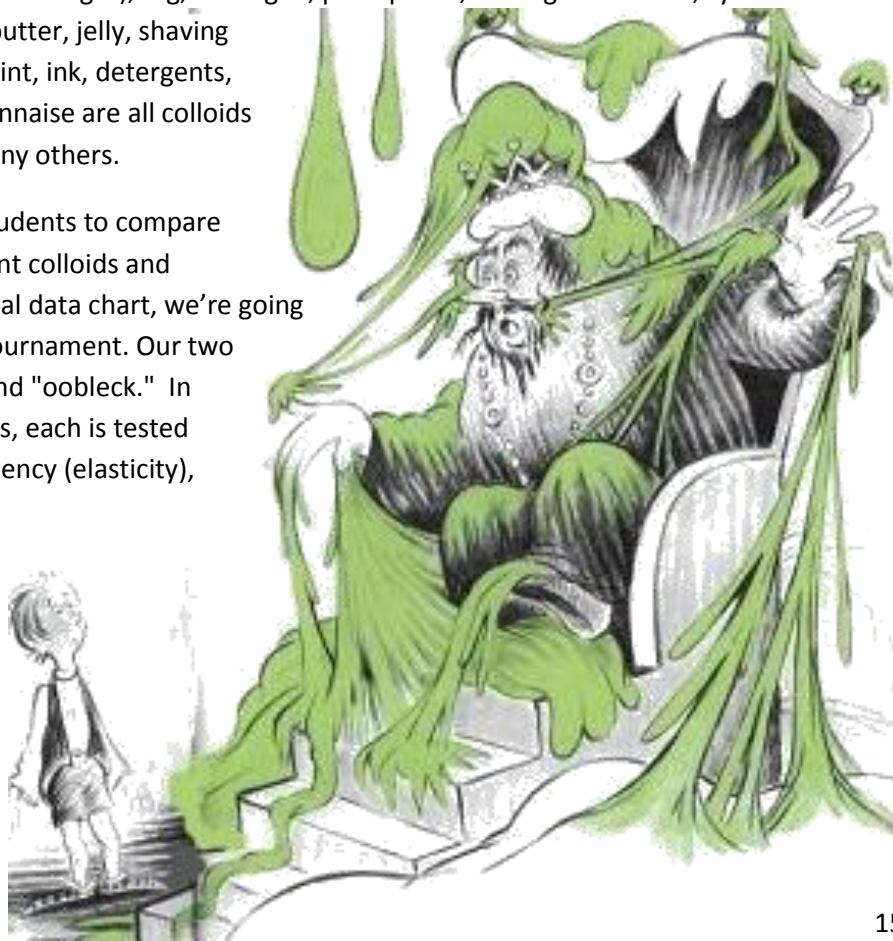
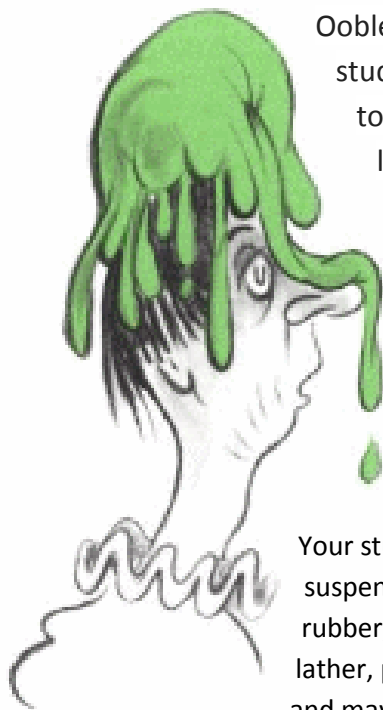
Is it solid or liquid? After reading the book by Dr. Seuss, "Bartholomew and the Oobleck," (note: it is a fairly long book be sure to allow enough time), the students discover a space anomaly, create their own oobleck, compare it to Glurch, and witness the amazingly weird oscillation between solid and liquid!

In most cases, students learn that matter exists in three states: solid, liquid, and gas. However, there are many materials that do not conform to these neat designations. For example, a colloid is a material that consists of one substance suspended evenly (usually at a microscopic level) within another. The suspended material is comprised of particles so small that they don't sink to the bottom of the second substance. Together, the two materials display properties unlike those of their separate components.

Your students are already familiar with a fair number of colloids--smoke (a solid suspended in a gas), fog, meringue, protoplasm, homogenized milk, synthetic rubber, butter, jelly, shaving lather, paint, ink, detergents, and mayonnaise are all colloids among many others.

The following activity asks students to compare the properties of two different colloids and instead of using the traditional data chart, we're going to present the activity as a tournament. Our two colloids are called "glurch" and "oobleck." In this tournament of properties, each is tested for viscosity (stickiness), resiliency (elasticity), and fluidity (ability to flow).

In most competitions, two competitors are pitted against each other with a clear victor emerging at the end of the contest. Defining the terms of victory is quite simple: The



winner is usually the individual or team that amasses the most points or performs the "best." But, when you ask students to compare the viscosity of two substances, how do they obtain quantitative (measurable) data? At this point, it is necessary to introduce the concept of operational definitions.

An operational definition describes exactly what the variables are and how they are measured within the context of your study. For example, if you were doing a study on the impact of sleep deprivation on driving performance, you would need to operationally define what you mean by sleep deprivation and driving performance.

In this example you might define sleep deprivation as getting less than seven hours of sleep at night and define driving performance as how well a participant does on a driving test.

What is the purpose of operationally defining variables? The main purpose is control. By understanding what you are measuring, you can control for it by holding the variable constant between all of the groups or manipulating it as an independent variable (one that doesn't depend on anything else).

Clash of the Colloids! Let's get ready to glop!

Option: You can begin by creating an imaginary situation. Tell the children that you have been able to obtain a sample from a friend of yours at NASA. A sample of a strange substance brought back from a previously unknown moon orbiting Mars.

The moon is covered with what appears to be a large green ocean. NASA sent a probe to this moon, but it was lost and what happened is unknown. The second probe is stuck on the surface. A third probe managed to collect a sample of the strange ocean material.

Then reveal a small batch of the substance that you have prepared in advance.

Explain that the material has been nicknamed Oobleck because it looks like the substance found in the book *Bartholomew and the Oobleck*, by Dr Seuss, and that preliminary studies have revealed that it is safe to handle. Tell them that your friend, a chemist is studying the exact composition of the substance to see if it is similar to another substance already discovered by NASA's probe to one the moons of Jupiter, Glurk, and to see if the strange new substance can be recreated using materials commonly found on Earth. Your chemist friend has given you the secret formulas he's discovered for both other-worldly substances and wants you to confirm his findings before he tells his results to NASA.

First, write each property (viscosity (stickiness), resiliency (elasticity), and fluidity (ability to flow)) on the chalkboard. Then ask the class, "How will you know if their property is present?" In the case of viscosity, students might answer that the property is displayed if the colloids stick two pieces of paper together like glue. Write this suggestion next to the name of the property

and ask the class if they think this should be one of the criteria of the contest. If they agree, this test becomes part of our definition of viscosity.

Similarly develop definitions for the properties of resiliency and fluidity. Inform the class that they have just performed an important science skill for experimenters--they have operationally defined the terms of the test.

Glurch:

Glurch is a colloid that has the consistency of putty. You can experiment with this recipe by adding more or less salt, but students should have success with the following procedure.



Materials

Each student or group of students will need the following:

- 45 mL liquid laundry starch
 - 25 mL white glue
 - Pinch of salt
1. Pour the starch into a cup. Add salt and stir until it is completely dissolved.
 2. Add the white glue and stir about 30 strokes.
 3. Squeeze out the excess starch until the substance becomes doughy.
 4. Remove from cup and knead. If the glurch is runny, add a few more grains of salt.

Oobleck:

The following recipe yields enough oobleck for each student or group of students.

Materials

- Approximately 50 mL cornstarch
 - Approximately 25 mL water
1. Pour the water into a cup. Add cornstarch a little bit at a time while stirring.
 2. When the mixture becomes too thick to stir, remove from the cup and knead.
 3. Add a few drops of water if the oobleck is too crumbly.

Note: If you're going to dye it green, like Dr. Seuss' Oobleck, adding the food coloring to the water rather than the cornstarch makes mixing easier and adding too much dye stains hands, surfaces, and clothing!

Let the games begin!

Give each student or group of students a copy of the tournament "map" (see sample copy). **Use the operational definitions on the sample copy as a guideline only--encourage your students to devise their own testing criteria.** A second sheet where they can fill in their own testing criteria is included.

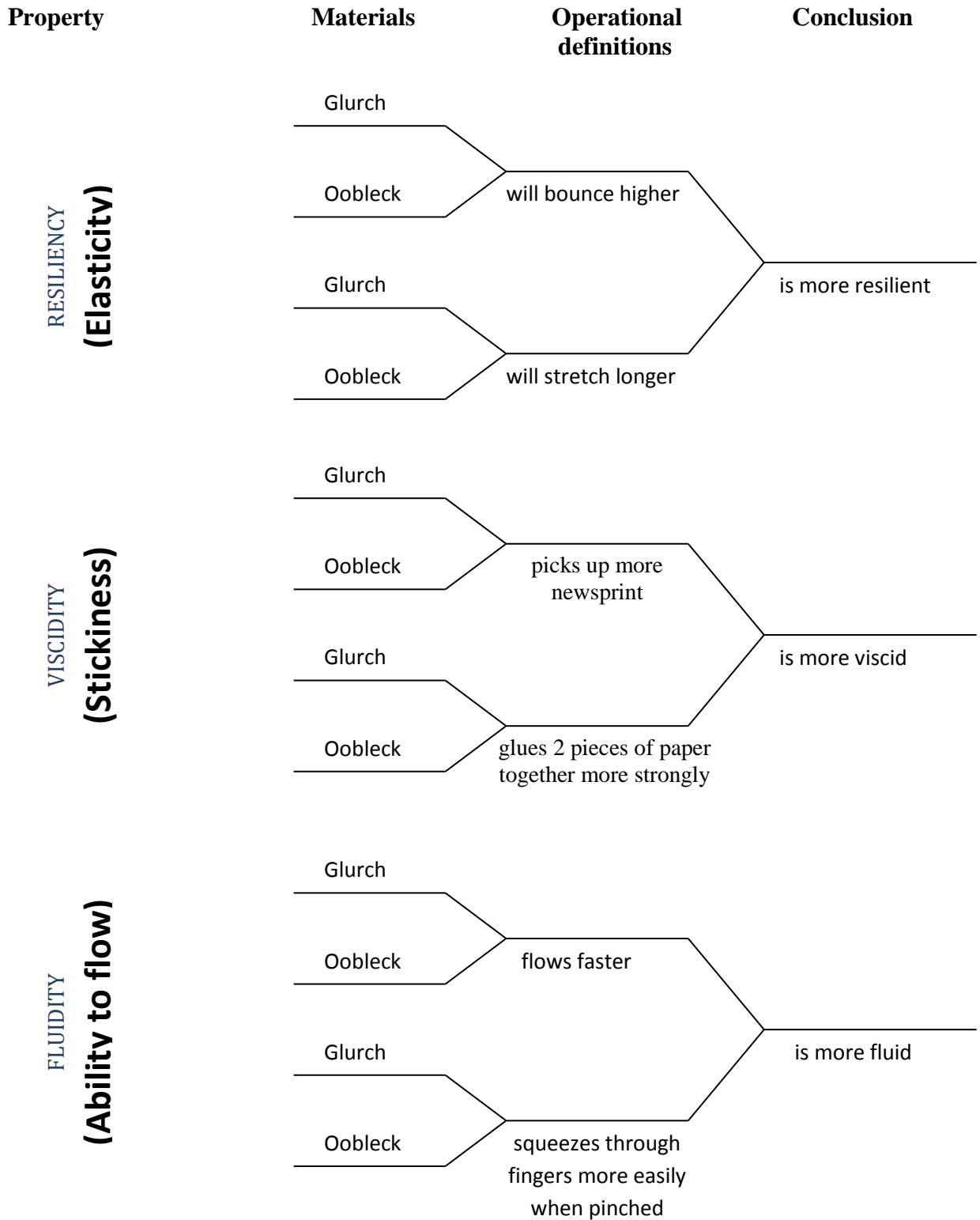
Ask students to use a small quantity of their colloids to test each of the definitions the class has agreed upon. Students or groups should record the "winner" of each test on the tournament map. Students should study the Oobleck and Glurch and list their properties using all of their senses EXCEPT TASTE!

After testing is completed, have students compare notes on the "victors." How well did the class's operational definitions work to distinguish the two colloids? What needs arose as tests were conducted? How could the test have been fairer? Analyze the experiments as you discuss these questions with students.

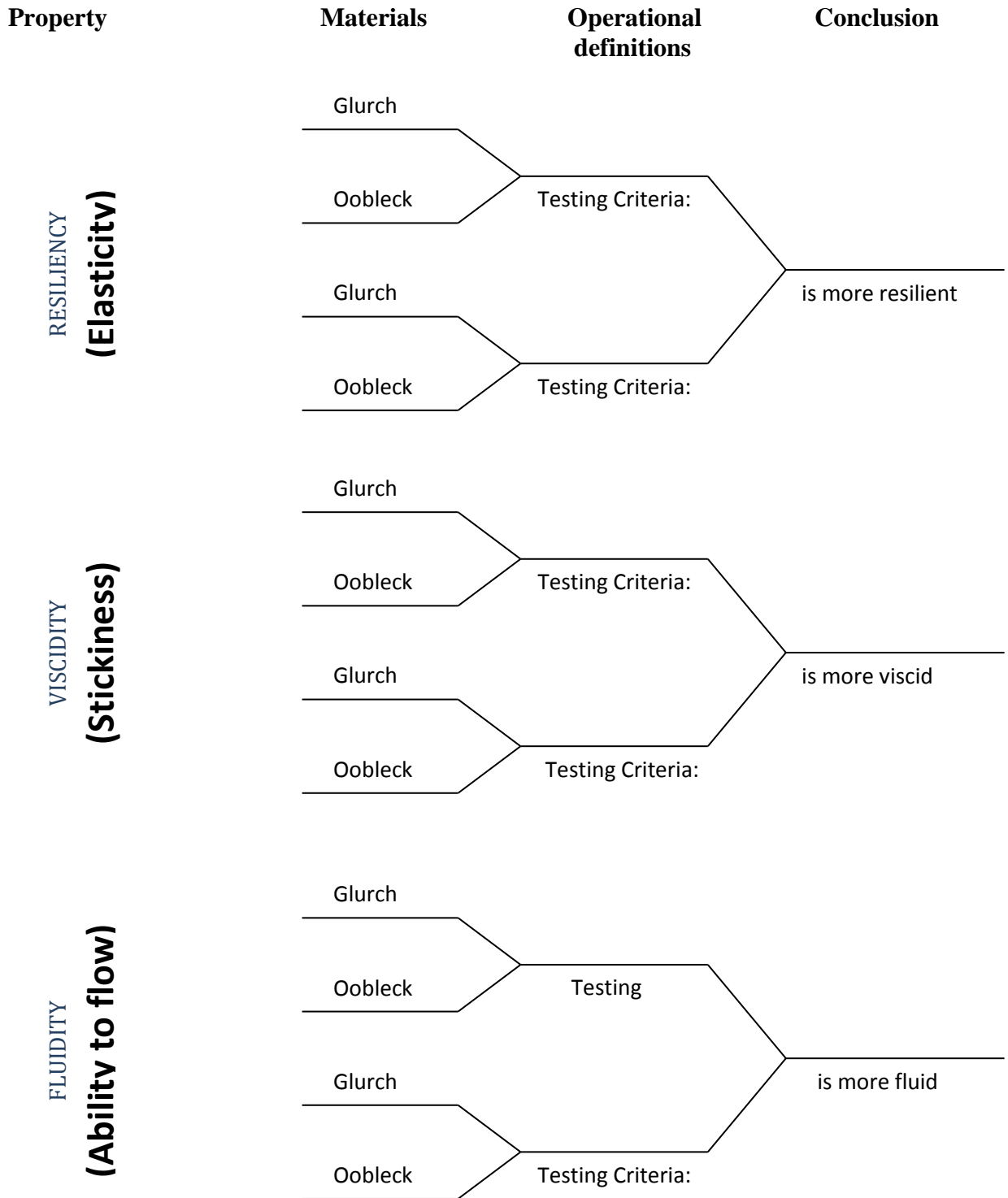
To follow up, ask students to use the tournament data to answer the following questions:

- If both colloids were poured, which would fill a container faster? (Oobleck--it is more fluid.)
- Which colloid would be better measured in mg than in mL? (Glurch--it is less fluid.)
- Which colloid would make a better substitute for thumbtacks? (Glurch--it is more viscid.)
- Which substance would make less noise when pulled up from a surface? (Oobleck--it is less viscid.)
- Which colloid would be more difficult to hide in your closed fist? (Oobleck--it is more fluid.)
- Which colloid would make a better emergency soccer ball? (Glurch--it is more resilient.)

A Tournament of Properties



A Tournament of Properties



Fun Science Facts!

A good way to introduce this discussion is with a video related to quicksand, such as:

- National Geographic's Weird Science: I Didn't Know That: Can You Survive Quicksand? (intense and informative!)
<http://video.nationalgeographic.com/video/science/weird-science-sci/idkt-surviving-quicksand/>
- Discovery Channel's Man vs. Wild Moab Desert Quicksand (he gets out a bit quicker)
<http://adventure.howstuffworks.com/28993-man-vs-wild-moab-desert-quicksand-video.htm>,
- or the more humorous quicksand clip from the classic film The Princess Bride (keep an eye out for the R.O.U.S.!) : <https://www.youtube.com/watch?v=d8Fsyld7YDo>



Oobleck is a “non-Newtonian” substance. It doesn't follow the rules – Sir Isaac Newton's rules of viscosity – that is! All fluids have a property known as viscosity. It is the measurable thickness or resistance to flow in a fluid. Newton stated that only altering the fluid's temperature could change the viscosity of a fluid. For example, motor oil or honey flows more easily when you warm it up and becomes very thick when it gets cold. So, a Non-Newtonian fluid has the same dependence on temperature, but applying pressure can also change its viscosity. Newtonian fluids such as water or vegetable oil are those whose viscosity does NOT change as a result of sheer force exerted upon it.

Oobleck sometimes acts like a solid and sometimes like a liquid depending on how it is treated. When it is under pressure, it behaves like a solid, but when not under pressure, it behaves as a liquid. Quicksand is another non-newtonian fluid which is why struggling hard to get out of quick sand makes it more difficult to move. When you squeeze a handful of Oobleck, its viscosity increases so it acts like a solid for a split second. When you release pressure or decrease the SHEER FORCE, it behaves just like a liquid.

Toothpaste and catsup are non-Newtonian, but they show LESS viscosity under pressure. When I think of viscosity, I always remember the television commercial of the child who is patiently waiting for the catsup to flow out of the bottle and onto the hamburger bun. Be thankful that the viscosity of catsup is greater than that of water the next time you are sitting across the table from somebody who is pounding on the bottom of the catsup bottle.

Coollest thing ever - scientists STILL cannot totally explain why Oobleck doesn't follow the rules. That's a great thing for budding scientists to hear!

Oobleck is a “suspension” not a “solution.” The starch does not dissolve in water, but is merely suspended in water. Scientists have 3 educated guesses or theories about Oobleck behavior.

The “sand in water” model argues that like sand in water, the “grains” of cornstarch are packed so closely together with little water between them so that when you squeeze gently the starch grains slide against each other and water lubricates this, but when you squeeze quickly there is not enough water in the spaces and friction causes the grains of sand to resist the flow.

The “long chain” model bases its explanation on the long chain shape of the starch molecule – they look like worms under a microscope. This model argues that when the mixture of starch and water is pushed hard the chains stretch in a direction that is at right angles with the push, so the long molecules get “tangled” and resist the push.

In the “electric charge” model the explanation is that the molecules of Oobleck acquire an electric charge as they are rubbed together, the faster the rub, the more electrical attraction is created which makes the Oobleck more viscous – the molecules hold together and resist the push.



Shuffle Duffle Muzzle Muff, It's Hard to Take Off from this Gloppy Stuff!

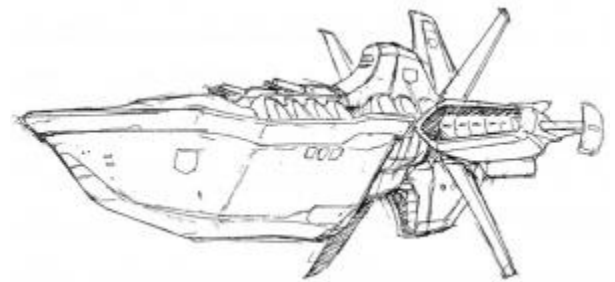
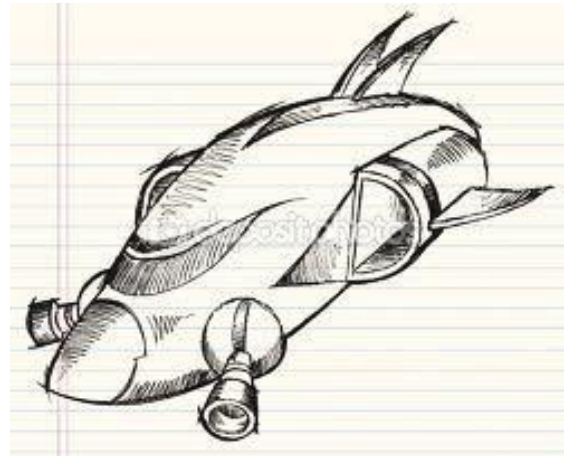
Now that they've been scientists it's time to be engineers!

NASA wants to get it right this time (they don't want to lose any more ships to the Green Slime of the Oobleck Ocean!) A lot of thought has to go into the design of a spacecraft (ex. real Mars landers) and due to budget cuts they don't have enough staff! The NASA scientists need our help!

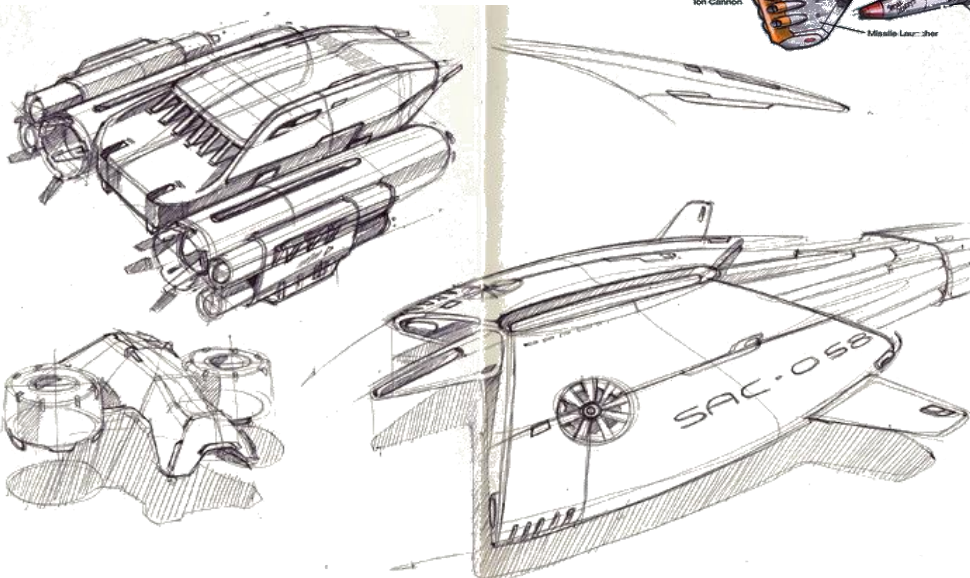
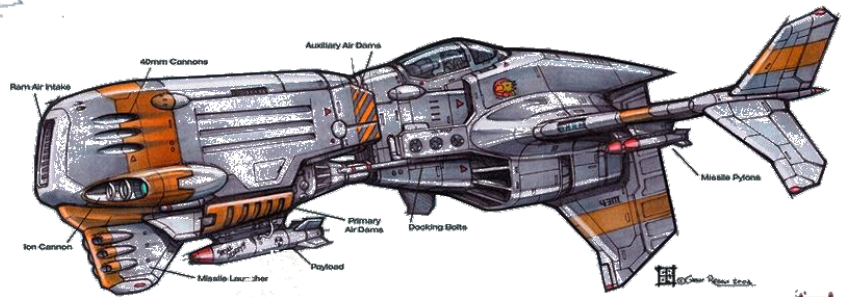
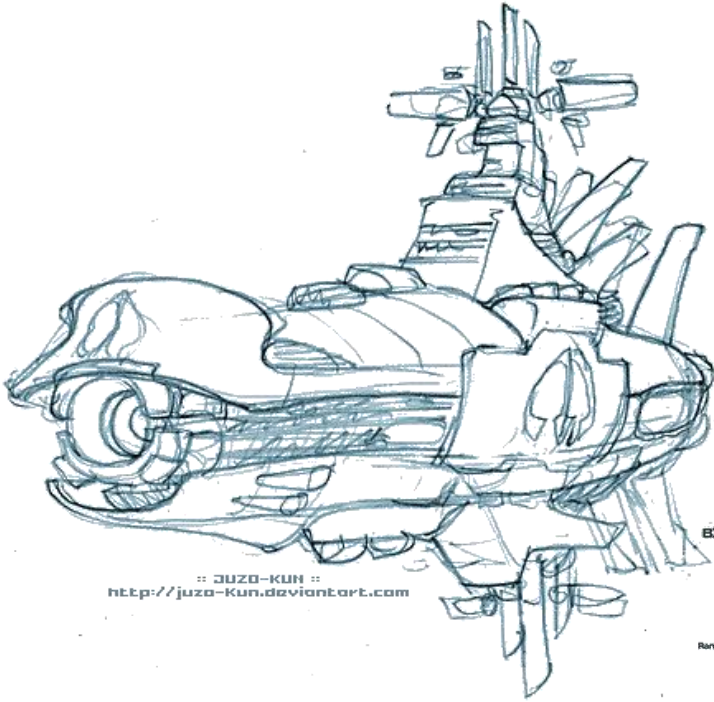
Their challenge for us is

to design a spacecraft that allows the Oobleck expert Bartholomew to able to land safely on the ocean of Oobleck without sinking and take off without getting stuck using only the materials provided. Have them draw their plans on paper using the collection of art materials you have provided and then give them time to build and test a "model" of their spacecraft using what they've learned from the videos and experiments.

Encourage them to have lots of fun with their sketches, adding extemperaneous parts like a scooper, observation deck, etc. Have students create a labeled drawing and cool poster of their design landing on the ocean of Oobleck before actually building and testing their designs on your Oobleck ocean.

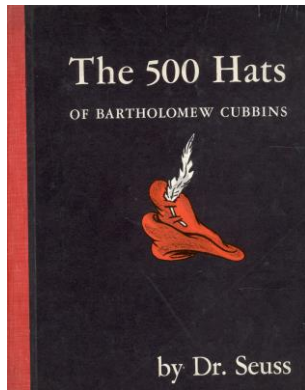


You'll need art supplies, lots of old newspapers, masking tape, green food coloring, cornstarch, measuring cup, mixing bowl, aluminum sheet pan (for your oobleck ocean) water, paper towels, and a collection of construction stuff (tooth picks, popsicle sticks, plastic utensils, cardboard, cardstock, paper clips, packing peanuts, straws, paper cups, etc.)



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Bartholomew's Hats



Of course, it's best to begin this section by reading the book! The original cover of the *500 Hats of Bartholomew Cubbins* (the second book Seuss wrote) does not look much like a typical children's book. The cover is black with the exception of a picture of a single red hat with a white feather sticking straight out of it. The back cover is almost identical to the front; the

only exception is that the title of the book and the author's name do not appear. As soon as the book is opened, one immediately sees what appears to be a never-ending trail of red hats with white feathers.

Despite the cover looking nothing like a children's book, this page makes it seem more kid-friendly. It is not until the reader gets to the dedication page that things begin to really seem strange. The book is dedicated to "Chrysanthemum-Pearl (aged 89 months, going on 90)." Now, if the name was not odd enough, the age surely must make the reader a little curious. However, today one might not find the dedication page so strange considering the author, unless of course the reader was unfamiliar with Dr. Seuss.



Chrysanthemum-Pearl? A Real Girl?

Helen and Ted toasted the success of the second Dr. Seuss book over dinner on November 29th, 1938, their eleventh wedding anniversary. Ted was 34 and Helen 40. The dedication of the *500 Hats* was the symbol of a turning point in their lives, meant to put at peace a private anguish. The words seemed mirthful, but they were bittersweet: "To Chrysanthemum-Pearl, age 89 months, going on 90."

Seuss always said about children, "You have 'em, I'll entertain 'em." Chrysanthemum-Pearl was the imaginary child that Ted had invented and discussed at every opportunity. When friends bragged about their children, Ted drew himself up and related with sober pride the most recent Olympian feat by Chrysanthemum-Pearl, ever clever and precocious. One evening with friends around their dinner table, he announced that she could "whip up the most delicious oyster stew with chocolate frosting and flaming Roman candles." She could "carry one thousand stitches on one needle while making long red underdrawers for her Uncle Terwilliger." For many years the name of Chrysanthemum-Pearl had appeared on Geisel Christmas cards, but then so had Norval, Wally, Wickersham, Thnud, and a dozen other fictional "kiddies." The truth wasn't so funny. Seuss and his first wife did want to have children of their own - they just couldn't. Early in their marriage, probably by the fourth year, Helen was hospitalized with abdominal pain and had to have a surgery that made it so that she couldn't have children (her ovaries were removed) and the family was pledged to secrecy. Promising each other privacy on the matter, they developed the charade of precious Chrysanthemum-Pearl.

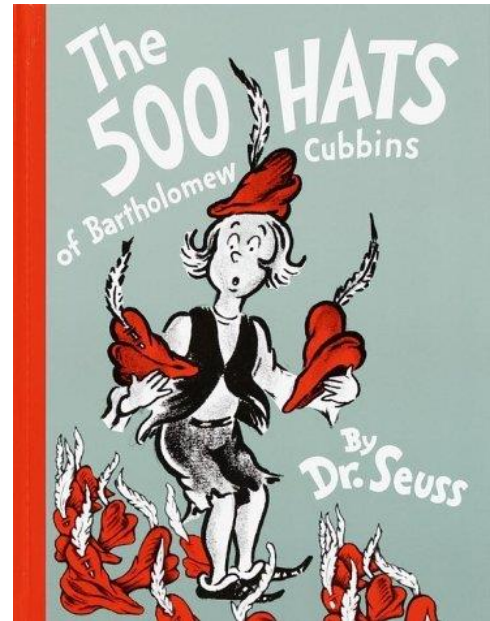
Topping it Off!

Unlike the majority of Geisel's books, *The 500 Hats of Bartholomew Cubbins* (the characters of Bartholomew and King Derwin returned a decade later in *Bartholomew and the Oobleck*) is written in prose rather than rhyming and metered verse, the cover of the book is black and both the title and Dr. Seuss' name are written in an ordinary font, not the zany font that has become associated with all things Seuss. The reason for these distinct differences is the fact that when the book was first printed in 1938, Seuss was working as an author for Vanguard Press. Vanguard decided to print the book with such a bleak cover because they considered it a "mystery book" and thought the black was fitting.

After *500 Hats* was released, Dr. Seuss left Vanguard for Random House and stayed with them for the remainder of his career. In 1988, Random House bought Vanguard, uniting the entire Seuss collection. It is believed that part of the reason Random House bought out Vanguard was because they wanted to own the right to the first two Dr. Seuss books, despite the fact that in 1988 the books were over 50 years old. The books were so successful that they were still making money for Dr. Seuss and Vanguard as backlist books. Seuss was finally given access to

his first two books *And To Think That I Saw It On Mulberry Street!* and *500 Hats* and was able to change the covers. Today's cover of *500 Hats* is more colorful, brighter and the title and Seuss' name are both written in the classic Seuss font.

Another major difference between *500 Hats* and some other Dr. Seuss classics is that this book is written in prose. Since it was still early in his career, Dr. Seuss had not quite found his hook yet. He said of writing *500 Hats*, "I knew nothing about children's books...traditional fairy tales were still in order. I thought perhaps that was the thing to do." Also, unlike most Seuss books, the main character in *500 Hats* is a person. Bartholomew is said to be a "rare human hero in the world of Seuss."



Typically, Dr. Seuss did not discuss where he got his ideas from, but he did eventually share his inspirations for *500 Hats*. Geisel, who collected hats, got the idea for the story on a commuter train from New York to New England while he was sitting behind a businessman wearing a hat; the passenger was so stiff and formal that Geisel idly wondered what would happen if Geisel took his hat and threw it out the window. Geisel concluded that the man was so "stuffy" he would just grow a new one.

Seuss drew inspiration from other things while writing *500 Hats*, such as his own collection of hundreds of hats. Seuss kept a closet full of hats in order to entertain his guests. Two hats that stood out amongst the others were a "particularly ornate fireman's hat from Ecuador" and a "baroque helmet worn by some Czech functionary." He used some of the hats as models for his book.

500 Hats went through many changes before Dr. Seuss finally put his pencil down. The book is said to be the "most worked" draft of all Seuss books. He worked up to the very last minute making changes on the book, even calling Vanguard and making corrections over of the phone. The draft contains notes from his wife Helen; Evelyn Shrifte, an editor at Vanguard; and of course Dr. Seuss, himself. One of the most notable changes was the number of hats used. The number of hats was originally set at 48, then later changed to 135 and was finally set at 500. Dr. Seuss never gave a reason for the changes, in fact he rarely offered explanations for his ideas. "Friends and journalists learned that it was folly to ask Ted where he got his ideas; his answers were charming but elusive, since he really didn't know."

The plot is simplicity itself: Set in feudal times, there's a king who lives in a castle above a town, and every male in town must doff his hat for the king, but Bartholomew can't take off his hat. When King Derwin is riding through a street past Bartholomew Cubbins, a poor boy in the market. Bartholomew removes his hat, according to the laws, but another hat mysteriously appears; when he attempts to remove this one too, another one appears again, and this continues. The king places the boy under arrest, and the remainder of the story tells of the king's efforts to deal with this infraction of the Law Above All Laws.

After reading the story what messages do students see in it? For example: They might believe that the necessity for ironclad royal authority, and citizens' deference to that authority, drives the whole plot—even though the king himself seems to have second thoughts about it, the law that hats must be removed is never refuted, and the king actually attempts to put a young boy to death rather than have the hat-doffing law broken. (The attempt doesn't work, because it conflicts with yet another divine law: that individuals cannot be executed while wearing hats.)

Adaptations:

Not long after publication, the story was adapted for an album issued by RCA Victor (Y-339). Narrated by Paul Wing, the audio adaptation had a running time of 13 minutes and 37 seconds. The dramatization featured music and sound effects on two 10" 78rpm records in a bi-fold sleeve. This recording was played in elementary school classrooms during the early 1940s.

Geisel wrote the script for the 1943 short of the same name for Paramount Pictures.

Minnesota's Children's Theatre Company, the only youth theatre company to ever win the coveted regional Tony Award, is the only theater company in the world with the rights to perform *The 500 Hats of Bartholomew Cubbins* on stage. The company has produced it nearly a dozen times since Theodor Geisel and his estate provided Children's Theatre with the rights. The company has toured the play across the United States, in China, Russia and Japan. The last time the company produced the play was to sold-out houses in 2010 at their Minneapolis home.

Note: In addition to your reading aloud of the story, there are other versions available, ex. a straight audio version at <https://www.youtube.com/watch?v=rBtvq9t8Czg> (the narration is a bit intense and it's 44 minutes long), a 25 minute version with the book, though it's a little far from the camera, is available at https://www.youtube.com/watch?v=IBk_fzYvcNk.

moses: The Mad Hatter



©Moses/Photograph by Eugene Ishihara

The Hawaiian artist moses (no captalization and no last name) is one person who can suggest you put a bag over your head without your being insulted. Nothing is more ordinary than a paper bag, which is why these hats are so extraordinary. He crafted more than 250 of them in a remarkable creative outburst that lasted almost ten years.

Moses says he "feels like the luckiest guy in the world" because he was given "The Paper Bag Hat Assignment." He can't explain why, but throughout the 1980s he was obsessed with paper bag hats. He saw designs in trees and in mountains. Some are quite simple — just a bag cleverly folded and shaped into a head covering.

Others, like his Anthurium and Gothic Knight, rely on the bag's crisp texture to hold intricate pleats.

Quite a few, such as Two/Flat Knight, are held together with vast quantities of white glue. Waiting for the glue to dry was the most tedious part of the construction process.

To achieve the soft texture of some hats (ex. his Beethoven and Dahling), bags were twisted and crumpled repeatedly until the fibers just gave up and the paper became as soft and flexible as flannel. At the time, Moses lived in a Chevy van and used the project room of the local library as his studio.



©Moses

Local merchants gladly donated bags, and Moses used thousands. The rays of Sun Rook were made from at least 100 paper bags, which were twisted tightly, bent in half and glued onto a form, so that more than 200



points bristle from its crown. Periodically, he'd fill his van with the current crop of hats, drive down to Hapuna Beach with a borrowed camera and ask passersby if they'd like to be photographed wearing one of his creations. People's reactions were always positive. Perhaps they caught a dose of Moses' infectious enthusiasm.

Moses eventually gave up making hats; he had developed severe tendonitis or carpal tunnel. Living in a Chevy van along the shores of Ohau prompted him to donate the bulk of his *Crowning Glory* collection to the

Mingei International Museum in San Diego, California where they remain as a part of the museum's permanent collection. These exquisite paper sculptures were featured in the July, 2000, issue of the *Smithsonian Magazine*.

Martha Longenecker, the Mingei museum's founder and director, marvels at these "imaginative, amusing, whimsical and timeless sculptural forms."



Have students view a gallery of his incredible art at an online gallery put together by his

daughter of the photos he took of his creations:

<http://www.kiraod.com/moses/mydadshats.html>



*"Aloha. The powers that be gave me the 'paper-bag hat assignment.' This photo essay, "**CROWNING GLORY**," a collection of 255 paper-bag hats, is for your viewing pleasure."*

-- moses

All hats and hat photos ©1999 moses, All Rights Reserved

Crowning Glories: Millinery Mindsets & Seussian Sculpture!

Now, it's time for students to put on their thinking caps and design a new hat inspired by Bartholomew's adventures, Dr. Seuss's world, and the art of Moses in a project that is easy, challenging, fun, and full of imagination! The wackier their ideas the better, the only thing limiting them is their imagination! Working with paper is remarkably similar to working with fabric, which is what real-life milliners and artists do.

Students will work individually or in a collaborative group to create a paper hat sculpture which mimics the world of Seuss and the art of the sculptor Moses, which they will later model!



Important art terms:

Utilitarian art: art which is functional –can be used. Ex. costume, pottery, silverware

- Sculpture: three-dimensional artwork.
- Adhesive: substance used to bond items together or adhere i.e. tape, glue, paste
- Craftsmanship: quality of work-showing skill and control of materials while creating.
- Additive method: Adding material together to create a form.
- Monochromatic: Tints, shades and tones of one color
- Texture: the way a surface feels to the touch. i.e. rough, bumpy, smooth, fuzzy, etc.

Materials

- Magazines, pictures, books, etc for inspiration
- Plastic grocery bags
- Scissors
- Round objects to use as a head form (ex. a ball, another student, or a cabbage)
- Masking tape
- Double-sided tape (very helpful)
- Measuring Tape
- Paper/construction materials for example:
 - Newspaper
 - Paper Bags
 - Colored paper
 - White printer paper

- Thick white paper
- ribbon, fabrics, unusual papers. You are only limited by imagination!
- Decorating materials
- Glue
- Double-sided tape

Low brims and high brows!

'Think left and think right and think low and think high. Oh, the thinks you can think up if only you try!'-Dr. Seuss

Have students search high and low for inspirations for their hats. A plant, a person, a color, a watch, a sport, an animal, a car, or even a fabric swatch!

What with Pinterest and other digital inspiration board tools, students might think that there's no need for a real-life version. But there's nothing quite as satisfying as clipping photos out of magazines or collecting colorful napkins and creating an action board: a collage of images, pictures, and text to show and collect ideas to help students organize and more clearly delineate their thoughts and help students create a vision. They need to have some specifics in mind when creating their board (do they want something colorful, or just one color, something inspired by nature, etc.), so they have a clear idea of what to look for and what they want to create.

Once they have their action board, have them look for something that seems to be in common across the page, their theme, ex. a color, an animal, shape, etc. Once they have a cohesive idea, then have students sketch out the basics of a design. Then they need to articulate the vision, envision how they will realistically do it or get it, and relentlessly drive it to completion as they transform their ideas into reality.

Time to Transform: Create a hat!

1. Have students measure and record the circumference of their heads. They will need to be able to put their hats on their heads.
2. Have students cut down a plastic grocery bag to create a single sheet of plastic. Place plastic sheet over cabbage or ball.
3. Apply strips of masking tape to plastic, overlapping each slightly, until they have formed the shape of a skull cap (making sure to adjust it



to be able to fit the size of their own heads). Add two to three more layers of masking tape to create a firm wig/hat base.

4. Remove cap from cabbage, and trim excess plastic around cap. To add extra support, place a few strips of masking tape around the edge and inside the skull cap.
5. Place cap back on the cabbage and begin styling the hat.
6. **If creating hair:** Cut colored paper or newspaper to 1/2-inch strips, or cut lengths of curling ribbon to create hair. Curl "hair" by carefully dragging across the closed blade of a pair of scissors.
7. Add 4- to 6-inch strips of double-sided tape to the bottom rim of the cap, and begin adding details, ex. hair. Continue adding more tape and "hair" strips until you reach the crown of the cap and the wig is full.
8. Cut strips of paper in a wave pattern but you can do just about anything you'd like with your paper. Cut it straight and curl it like ribbon, cut it short and spikey, make it long and flowing etc. After this step you can start gluing your paper on (both multi-purpose craft glue or white glue, ex. Elmer's, would work). Decide where you wanted the part to be and then glue the paper on in lines moving from the front of the head towards the back. When one line is done, start another line right next to it. When the ear area is reached they may wish to begin to weave the strips into each other to create the volume. Option: Add some hair, ex. ringlets, around the ears to hide the cap and create a more realistic feel for the wig. Then repeat that process on the right side and finally, the back of the wig.

Note: A sample video of this process is available at: <http://goodwillrocktherunway.org/my-wig-tutorial/> and a sample of Martha Stewart's version: <http://www.marthastewart.com/249923/paper-wigs>

9. Continue to add hat elements until the design is complete.

10. Have students assemble an inspiration (mood) board telling the story behind and inspiration for their hat!
11. Give students 10 minutes to add any last minute touch-ups. During that time, they can practice their presentation.
12. Students vote for their favorite hat based on the following categories:
 1. Largest or tallest
 2. Most detailed
 3. Best presentation
 4. Best overall hat: craftsmanship, presentation, theme, creativity

Some tips for creating a hat out of paper:

- Paper is very forgiving so don't worry if it's looking a little like a jumbled mess at first.
- Use color! Colored paper makes fabulous hats

- Accessorize! Origami makes perfect hair/hat accessories.
- Be creative! No two hats will be (or should be) the same so don't put pressure on yourself to replicate things. Be yourself and express yourself through the wig.

Additional Paper Hat Inspiration







<http://zu4ki.livejournal.com/33755.html>

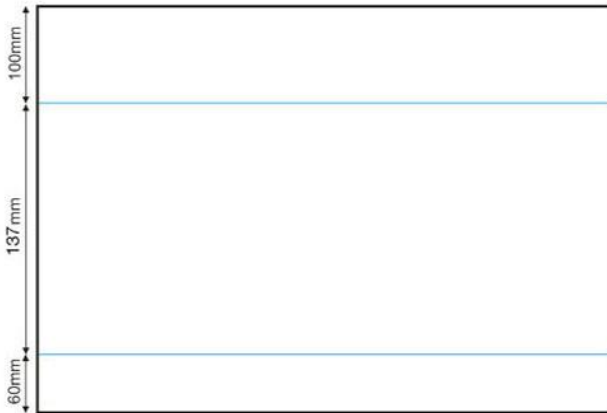


Top Form!

Have students practice by cobbling together a jaunty top hat from waste office paper (design created by the staff of architectural firm ClarkeHopkinsClarke.) The origami technique uses up every last scrap, and the pleated construction expands and contracts to fit any size head.

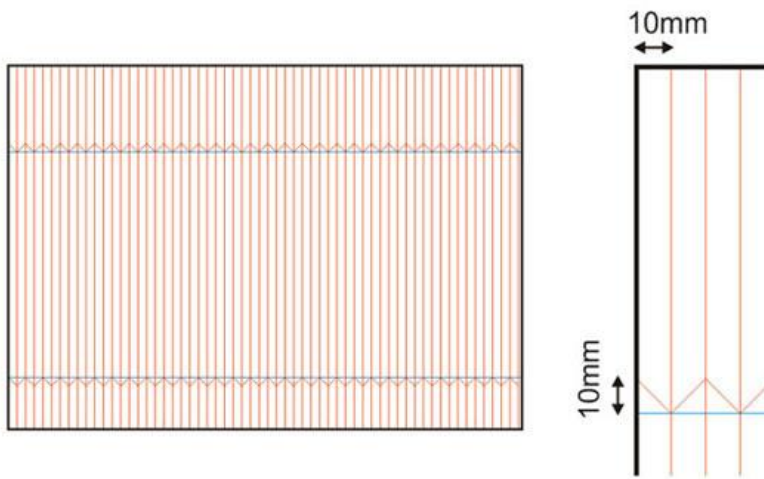
STEP ONE

Each hat requires two pieces of paper 11" x 17" (business paper/wide format/tabloid/ledger paper/A3). The hats are one-size-fits-all, but if a student requires an extra-large hat, an additional half a sheet of 8.5x11 paper is needed. Tools required are: knife for scoring, rulers, double-sided sticky tape, thick sticky tape (ex. masking tape), and glue.



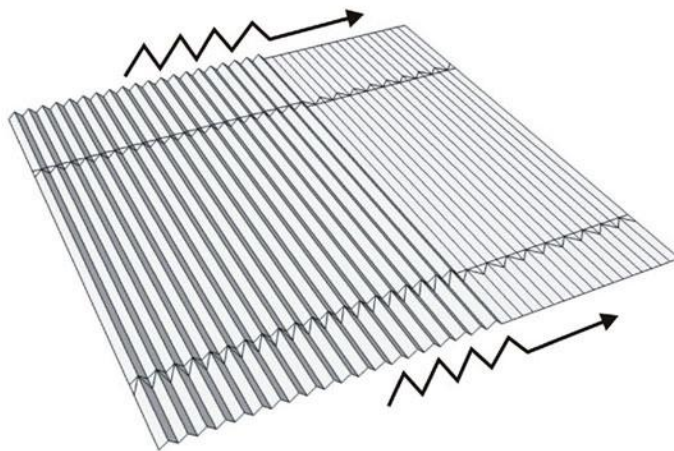
STEP TWO

On one sheet, score the blue lines as shown. The 60mm wedge will be the brim of the hat, while the 100mm wedge will be the crown.



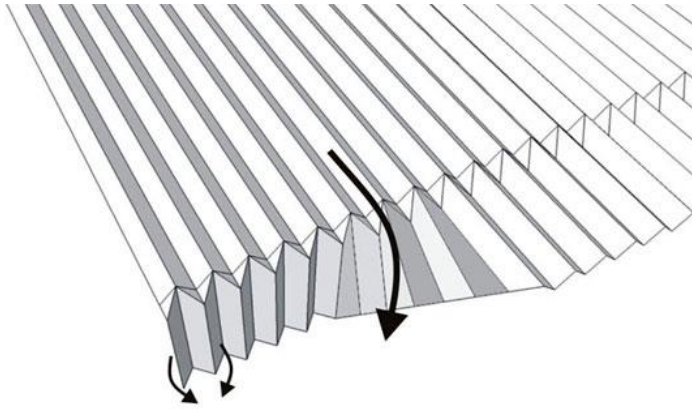
STEP THREE

Score the red lines as shown. These will form the guidelines for pleating.



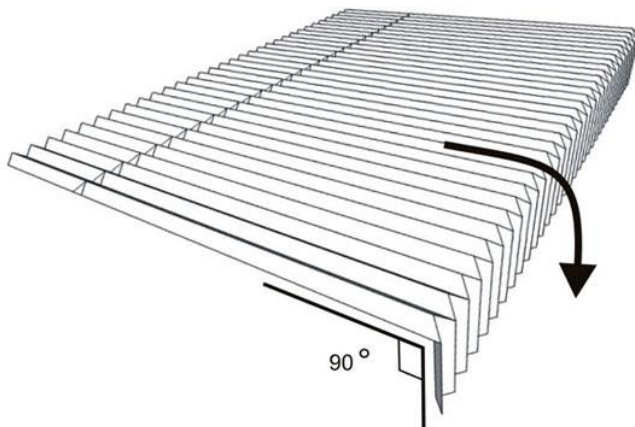
STEP FOUR

Pleat along the score lines.



STEP FIVE

This is the most difficult step. Carefully fold down the 60mm wedge, and in the process, pleat the score lines in that wedge in an opposite direction to how you pleated them in step 4.



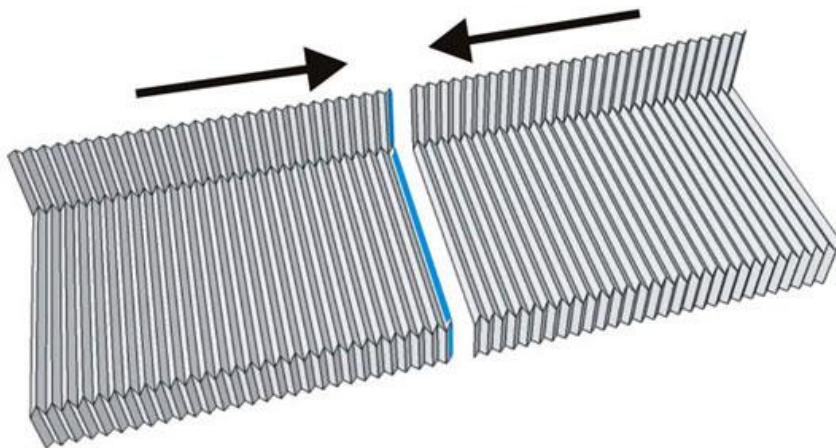
STEP SIX

Make sure step 5 was performed so that the brim (the 60mm wedge) was fold down 90 degrees to the side band (the 137mm center wedge).



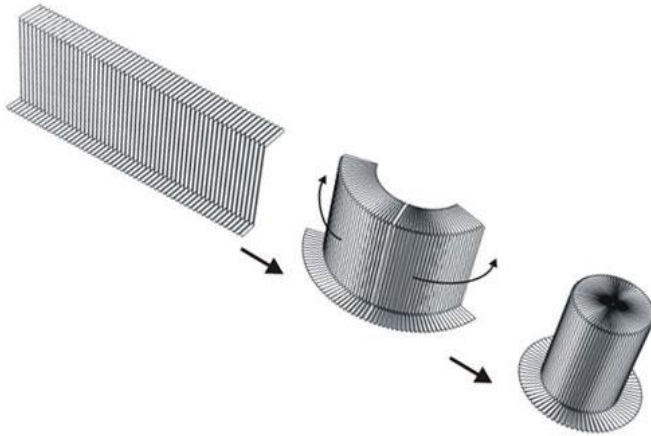
STEP SEVEN

Similar to steps 5 and 6, fold the crown (the 100mm wedge) upwards 90 degrees to the side band.



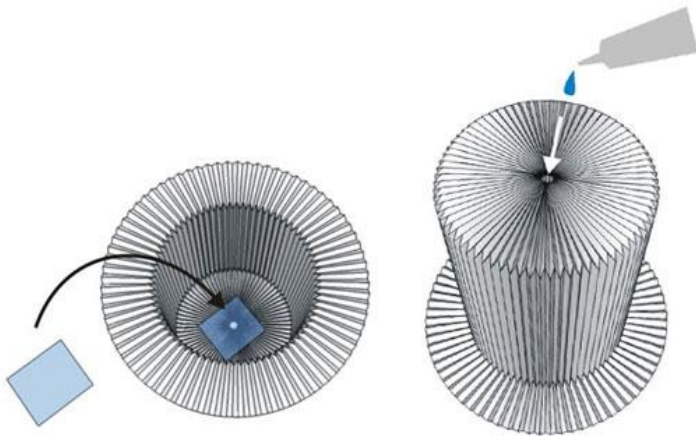
STEP EIGHT

Repeat steps 2 to 7 on another 11x17 sheet, then join these two sheets together using double-sided sticky tape.



STEP NINE

Curl the entire piece into the shape of a hat. Connect the ends with double-sided sticky tape.



STEP TEN

Stabilize the inside of the crown with a piece of thick sticky tape, then reinforce the outside with a bit of glue in the center hole. Now, make each hat unique!

Looking for a Deeper Meaning

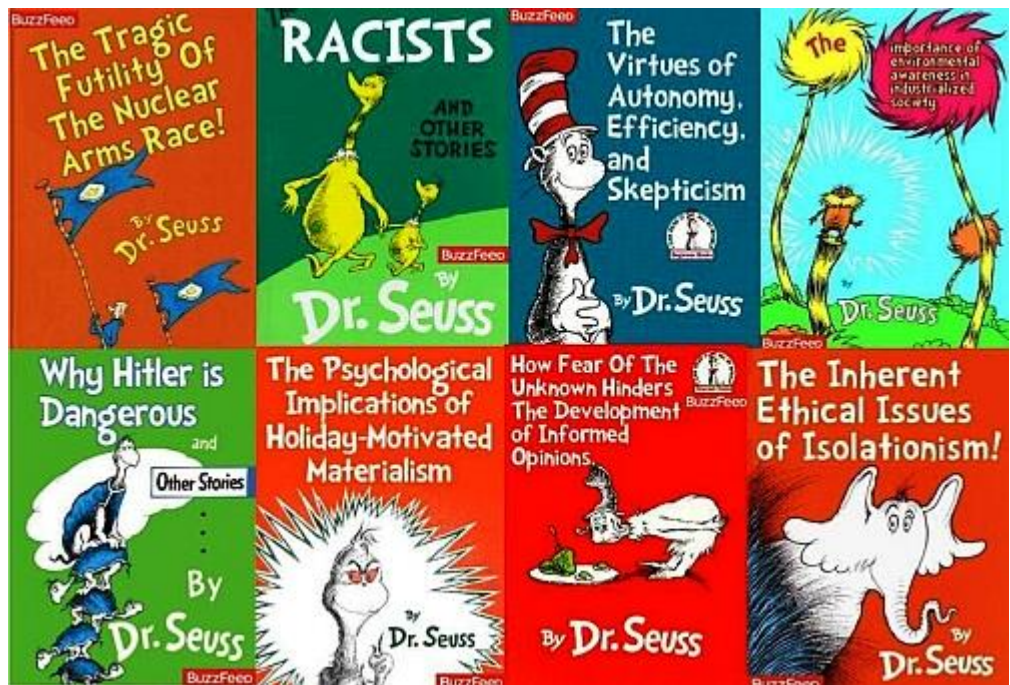
We often just read books and never think about how or why they were written, especially children's books. Sometimes, the reason is obvious (a book about children with diabetes, for example), but most of the time, we just think that authors are very creative and come up with a book out of thin air. If you've ever written anything creative, you'll know this isn't true at all. Many times, authors have been influenced by a story in the news, a world problem or just a simple picture and an idea is born out of that. What about one of the most creative children's authors of our time, Dr. Seuss? It turns out that there are some interesting facts behind his books.

Theodor Seuss Geisel wasn't actually a doctor (at least not until his alma mater, Dartmouth, gave him an honorary PhD), but his unique poetic meter and leap-off-the-page illustrations made him one of the most successful

children's writers in history. In total he published 46 children's books

In 2010, Life Books named Dr. Seuss one of the 100 People Who Changed the World.

Many times we get caught up in the charming illustrations and lost in his



whimsical worlds of nonsense. It might never occur to a casual reader that Dr. Seuss actually wasn't talking nonsense. Although Seuss claimed he "didn't know" where his ideas came from, it has not stopped others from analyzing his work. Here's a little background on some of his greatest hits.

1. **The Lorax** is widely recognized as Dr. Seuss' take on environmentalism and how humans are destroying nature. Groups within the logging industry weren't very happy about it and later sponsored *The Truax*, a similar book—but from the logging point of view. Another interesting fact: the book used to contain the line, "I hear things are just as bad up in Lake Erie," but 14 years after the book was published, the Ohio Sea Grant Program wrote to Seuss and told him how much the conditions had improved and implored him to take the line out. Dr. Seuss agreed and said that it wouldn't be in future editions.

The Lorax was in fact called propaganda by Dr. Seuss himself. The book is set up in a way that resembles the after effects of an enviro-pocalyptic way of life.

“Teaching kids how to think” as he wanted to do, got Geisel in trouble more than once. For instance his book, “The Lorax“, has been banned in some schools, particularly in logging communities. (the book theme being about not exploiting nature, particularly not being favorable to greedy big businesses that do so without taking into account the environmental impact of their actions). Geisel’s response to the uproar over “the Lorax” was: “The Lorax doesn’t say lumbering is immoral. I live in a house made of wood and write books printed on paper. It’s a book about going easy on what we’ve got. It’s anti-pollution and anti-greed.”

Dr. Seuss shows what the recklessness of human consumption and the culture of industry that we have created will and can do to the fragility of nature. The nostalgic aspect to the story gives the reader a chance to feel compassion towards the fleeting existence of nature. Another parallel that the book draws could be the comparison of faceless big corporations and the Once-ler whose face the book never shows. The book’s essential message seems to be that we are given one planet yet we continue to sacrifice it to live a frivolous and materialistic lifestyle. It only takes one person to stand up for what is right, and that person is you. When you are entrusted with something, don’t squander it; take care of it, and speak up for what’s right even if you get shouted down. *The 1972 short (25 minute) animated version is available at <https://www.youtube.com/watch?v=FSSrYnc1yQs>*

2. ***The Sneetches (1961) – World War II & Racial Equality (with some Anti-Capitalism)*** If you recall the plotline of The Sneetches, we are introduced to two separate groups of Sneetches who are in essence exactly the same with the exception of a star printed on one group’s bellies. The star resembles how arbitrary race is to a person’s being, by showing the Sneetches removing and reprinting the stars multiple times in order to attempt to keep their differences. As many people know the Nazi’s required Jews to wear yellow star patches so they could be easily identified as the lesser. There is also a bit of Anti-Capitalistic flavor in the book in regards to the salesman who gains profit off of a harmful and discriminating business. *The short animated version (25 minutes) is available at https://www.youtube.com/watch?v=qPhOZzsi_6Q*
3. ***Yertle the Turtle*** = Hitler? Yep. If you haven’t read the story, here’s a little overview: Yertle is the king of the pond, but he wants more. He demands that other turtles stack themselves up so he can sit on top of them to survey the land. Yertle shouts orders to the others and climbs himself literally on the backs of the others so he can find his way to the top. Mack, the turtle at the bottom, is exhausted. He asks Yertle for a rest; Yertle ignores him and demands more turtles for a better view. Eventually, Yertle notices the moon and is furious that anything *dare* be higher than himself, and is about ready to call for more turtles when Mack burps. This sudden movement topples the whole stack, sends Yertle flying into the mud, and frees the rest of the turtles from their stacking duty. Dr. Seuss actually said Yertle was a representation of Hitler. Despite the political nature of the book, none of that was disputed at Random House—what was disputed was Mack’s burp. No one had ever let a burp loose in a children’s book before, so it was a little dicey. In the end, obviously, Mack burped. *A read aloud version (with the book pages) is available at <http://www.youtube.com/watch?v=CheU6UvSes4>*
4. ***The Butter Battle Book*** was pulled from the shelves of libraries for a while because of the reference to the Cold War and the arms race.

The Butter Battle Book, perhaps the most controversial of all his books, was written in response to the arms buildup and nuclear war threat during the Reagan administration. Published in 1984, *Butter Battle* sheds light on the growing threat of war between the Yooks and the Zooks. Yooks and Zooks are societies who do everything differently. The Yooks eat their bread butter-side up and the Zooks eat their bread butter-side down. Obviously, one of them must be wrong, so they start building weapons to outdo each other: the "Tough-Tufted Prickly Snick-Berry Switch,"• the "Triple-Sling Jigger,"• the "Jigger-Rock Snatchem,"• the "Kick-A-Poo Kid"•, the "Eight-Nozzled Elephant-Toted Boom Blitz,"• the "Utterly Sputter"• and the "Bitsy Big-Boy Boomeroo." The book concludes with each side ready to drop their ultimate bombs on each other, but the reader doesn't know how it actually turns out because the story ends with a blank page, leaving a cliffhanger ending that is open to interpretation. When Ted presented this particular project, Random House saw red flags!

For the first time in decades, editors and art directors questioned Dr. Seuss—the cover, the ending, the verb tenses, even the title itself went through several changes. Never one to initiate confrontation, Ted suddenly found himself defending every element in question. Ted remained as true to the original as possible because the book itself represented the truth about the arms buildup. Ultimately, few changes were made.

For six months, *Butter Battle* remained on *The New York Times'* Bestseller List . . . for **adults**. In 1990, when the televised version of *The Butter Battle Book* was shown in the U.S.S.R., Ted bragged that the country began "falling apart." Indeed, the Soviet Union was crumbling at that time, but Ted's message reached a much broader spectrum—and challenged readers to answer the question, how does it all end?

See a one minute "live-action preview" for the book here:

<https://www.youtube.com/watch?v=jQWtZdEC5g>

The full movie is available at YouTube https://www.youtube.com/watch?v=C5FR_cuQsrc,

SchoolTube <http://www.schooltube.com/video/bf8b526c80c54176bc32/> or search for it online.

Have students compare and contrast while exploring matching texts—stories and the movies adapted from them—to develop their analytical strategies. Have them draw comparisons between the two texts and hypothesize about the effect of adaptation. They analyze the differences between the two versions by citing specific adaptations in the film version, indicating the effect of each adaptation on the story, and deciding if they felt the change had a positive effect on the overall story.

6. Dr. Seuss' first children's book, ***And to Think That I Saw It on Mulberry Street***, was rejected 27 times according to Guy McLain of the Springfield Museum in Geisel's hometown. Only after Geisel bumped into a friend who'd just been hired by a publishing house did the book get the green light. "He said if he had been walking down the other side of the street," McLain told NPR, "he probably would never have become a children's author."
7. ***Oh The Places You'll Go*** is Dr. Seuss' final book, published in 1990. It sells about 300,000 copies every year because so many people give it to college and high school grads.
8. No discussion of Dr. Seuss would be complete without a mention of ***How the Grinch Stole Christmas!*** In the Dr. Seuss-sanctioned cartoon, Frankenstein's Monster himself, Boris Karloff,

provided the voice of the Grinch and the narration. Seuss was a little wary of casting him because he thought his voice would be too scary for kids.

Tony the Tiger, AKA Thurl Ravenscroft, is the voice behind "You're a Mean One, Mr. Grinch."• He received no credit on screen, so Dr. Seuss wrote to newspaper columnists to tell them exactly who had sung the song.

Regardless of the reasons why he wrote them, Dr. Seuss created fun, colorful and whimsical stories that make children feel free even when the events and philosophies that were being touched on are real life concepts, ex. not knocking something until you try it, materialism has no true purpose, never give up, be an individual, try and try until you succeed, stick up for what you believe in, etc. Everything that he put into his books was everything that he believed truly mattered in his life and his readers lives.

What do students think? Are these types of deeper meanings and cultural commentary appropriate in Children's Literature? Are they unavoidable?

Authors such as Seuss write in a specific place at a specific point in time and what is happening around them has an effect on their writings. It's only natural. When trying to develop his material and transform his content from mere thoughts into an actual book, Seuss could only draw on what he knew, and what he knew was his time and his context.

Some argue that the hidden messages actually help the child reader to learn large moral lessons that the human race learned from these events without making them too obvious. While they are entertaining for children because of the rhymes and illustrations, they are entertaining for adults because of these hidden meanings and teach important lessons to children and adults alike.

His stories are filled with made up words and lands, and young children would never be able to make the connection between what they are reading and the large political issues they are referring to. Instead of relating these stories to large events throughout history, children take out morals such as "being mean to people will not make you powerful" and "everyone is important, no matter how small".

Whether or not you see layered meaning in the fanciful work of Theodore "Dr.Seuss" Geisel, his singular style of rhyme-centric storytelling and fantastical drawing has stood the test of over a half century. And while his readers might grow up, few can forget the first books that helped them fall in love with books.

At the time of Dr. Seuss's death, some 200 million copies of his books, translated into 15 different languages, had found their way into homes and hearts around the world. It's now estimated that more than 500 million copies of his books have been sold.

Book and Movie Comparison/Contrast Guide

Setting: Ways that the book and movie are the same include...	Setting: Ways that the book and movie are different include...
Characters: Ways that the book and movie are the same include...	Characters: Ways that the book and movie are different include...
Plot Events: Ways that the book and movie are the same include...	Plot Events: Ways that the book and movie are different include...
Resolution: Ways that the book and movie are the same include...	Resolution: Ways that the book and movie are different include...

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Resolution: Ways that the book and movie are the same include...	Resolution: Ways that the book and movie are different include...

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