Supercharged Science

Week of Science

Workbook for Students

by Aurora Lipper

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Welcome to our Week of Science Together!

I am so excited you're joining us this week! In this workbook, you'll find everything you need to do hands-on real science together.

What age is this Science Week for? All ages. If you've got a kid interested in science, you're in the right place. My classes are based on interest and ability more than grade level. I suggest trying it out, and if your child is enjoying learning with my classes, then keep it up!

How long are the classes? Each day, I am doing a live science class for 20-30 minutes with time for Q&A at the end. Students will then do their experiments after our live session is over for as long as they need to, typically another 30 minutes or longer. Links to connect to class are sent in a separate email. (If you don't have it, please check your junk/spam folders.)

What will my child learn? By the end of the week, your kids will be happily engaged and excited, build and inventing every day, long after class is over. The topics we will cover are Physics, Chemistry, Biology, Earth Science, and Engineering. Your child will have an impressive stash of scientific concepts under their belt by the end of the week, as we will have covered more science than most kids do in a month.

What do I need to participate? You'll need the information in this workbook and a small box of easy-to-get materials (the list is included in this workbook). You'll also need to participate each day to be able to do the day's learning activities and projects with us. These sessions are only available live (unless you've opted to access them afterwards).

How is this different from other programs? In a typical science classroom, there's a lot of lecturing, note-taking, and solving homework problems. While this certainly has its place in learning science, it's not the first step. Learning science isn't just a matter of memorizing facts and theories. You can't learn science by playing "educational" video games with watered-down factoids students are supposed to answer.

Science is about developing a deep curiosity about the world around us, AND having a set of tools that let kids explore that curiosity to answer their questions. Science is all about formulating questions, and creating experiments to answer those questions. It's a way of thinking, a process of learning that has a definite method. You can't learn that from just reading a textbook, filling out endless rounds of drill worksheets, or watching silly cartoon animations.

Science education is a three-step process (and I mean teaching science in a way that your kids will really understand and remember). Here are the steps:

1. Get kids genuinely interested and excited about a topic.
2. Give them hands-on activities and experiments to make the topic meaningful.
3. Teach the supporting academics and theory.

Most science books and curriculum just focus on the third step and may throw in some experiments as an afterthought. This just isn't how kids learn.

There is a better way. When you provide your kids with these three keys (in order), you can give your kids the kind of science education that not only excites them, but that they remember for many years to come. That's what we're going to do with our time together this week.

Are you READY?? Then turn the page and let's get started!

Introductory Week Special Schedule

I am teaching live classes EVERY DAY for FIVE DAYS for students of all ages! Each day builds on the next, so it's important to participate in all five days. Here's the schedule:

- Day 1 Physics: Forces, Mechanics and Building Structures
- Day 2 Biology/Life Science: Molecules, Microorganisms and Photosynthesis
- Day 3 Chemistry: Acids/Bases, Chemical Reactions, Phase Shifts and Energy
- Day 4 Earth Science: Rocks, Minerals, Crystals and Meteorites
- Day 5 Engineering: Flying Machines, Rockets, Propulsion and Flight

To connect to class each day, please check your welcome email for all the details. Classes are EVERYDAY ALL WEEK LONG. All classes include time for Q&A after.

Materials List:

Day 1: Physics

- Popsicle sticks (one box)
- String or rope (6 feet)
- Bucket (1 - 5 gallon)
- Hot glue gun (low temperature)

Day 2: Biology/Life Science

- Dish soap (1 tsp)
- Salt (1 tsp)
- Fruit that is easily squished
- Plastic bag that can seal closed
- Rubbing alcohol (keep it COLD)
- Handheld magnifying lenses (1 or 2)

Day 3: Chemistry

- Red Cabbage (contains anthocyanin)
- Distilled vinegar (acetic acid)
- Baking soda (sodium bicarbonate)
- Epsom salts (and access to the oven)
- Cups to mix up experiments in
- Popsicle sticks for stirring/mixing
- Teaspoons or disposable pipettes or straws

Day 4: Earth Science

- Magnet
- Paper and pencil
- Nail (the kind made of steel)
- Rocks (6-10 different ones 1-3" long)
- Distilled vinegar
- Clean, empty glass jar
- Coffee mug (NOT your favorite one)

Day 5: Engineering

- Masking tape
- Straws (paper or plastic)
- Bouncy ball
- Skewer or stick

OPTIONAL:

- Paperclips (large, 1)
- Rubber bands (2)
- Pliers (for bending the paperclip, needle-nosed works best)
- Red laser pointer (cheap keychain lasers work great)

Day 1 Physics: Forces, Mechanics and Building Structures

1. Tension is when things _____.

2. _____is when things get _____ together.

Design Challenge #1:

Trial #	Load (kg? lb?)	Design (Sketch or Describe)
1		
2		
3		
4		

What did you find?_____

Day 2 Biology/Life Science: Microorganisms & DNA

1. Science is all about asking _____ and designing

   _____ to figure out the answers.

2. A _____ is the smallest unit of life that can replicate independently.

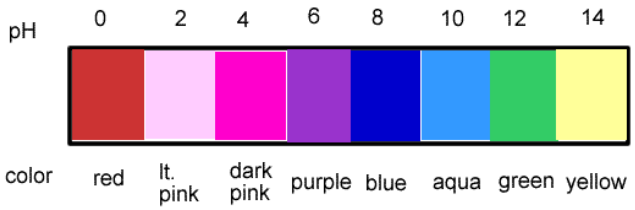
Use a microscope or magnifying lenses and find 4-6 specimens. Draw and label each image below (make sure your drawing has all four parts: boundary, what it is, magnification, and sketch). Refer to example (*image right*).

Day 3 Chemistry: Acids/Bases, Reactions, Phase Shifts & Energy

1. Chemistry is the study of how matter _____.

2. pH (power of Hydrogen) is a measure of how _____ a substance is.

Red Cabbage Color changes with pH



Experiment:

1. Solution #1 pH_____

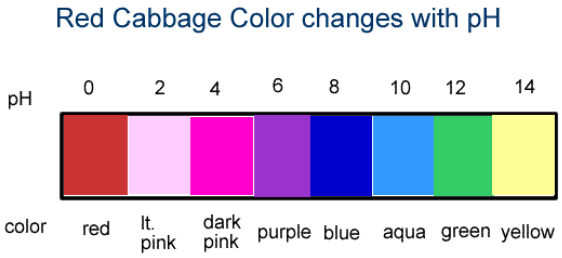
2. Solution #2 pH_____

Trial #	Solution 1 # tsp/drops	Solution 2 # tsp/drops	Endothermic or Exothermic? (Cool or Warm?)	Temperature Shift (Cold/Room/Hot)	pH shift (old pH → new pH)
1					
2					
3					
4					

How does temperature affect acidity levels?

Day 3 Chemistry: Acids/Bases, Reactions, Phase Shifts & Energy

Experiment:



Trial #	**Description** (What did you test? Lemon juice, soda…?)	**pH** (What color is it?)	**Temperature Shift** (Did you make it Cold/Room/Hot?)	**pH shift** (old pH → new pH)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Day 4 Earth Science: Rocks, Minerals, Crystals and Meteorites

1. Minerals are _____ chemical substances.
2. Rocks are made of two or more _____ .
3. A _____ is a mineral that looks how the _____ are arranged inside.

Density is a measure of how heavy something is for its size. You can find the density of a rock by weighing it on a scale (in grams), and then dividing by its volume.

Density is mass divided by volume.

$$Density = \frac{mass}{volume}$$

Volume is how much 3D space it takes up.

But how do you find volume? Well, if you took geometry class, you might know the math equations for perfect shapes, like a sphere, a cube, a cone or a cylinder. But this rock doesn't look like any of those! What do you do with something that is this shape? It's such an odd shape AND it's full of holes!

Here's how you do it…

- So you first place enough water in a cup that has marks on it for measuring.
- Make sure you have enough water to cover the entire rock when you stick it in!
- Note how high the water level is now.
- Place the rock in the measuring cup and read the new level of the water.
- Subtract the higher number from the lower number, and you have the volume of the rock! Easy!

Water has a density of 1, so anything less than 1 will float. Anything more than 1 sinks!

2-2.5	Fingernail
3	Copper Penny
4	Steel Nail
5.5	Glass
5-6.5	Knife Blade
6.5-7	Streak Plate
7	Quartz

Rock Workshop Data Table

Name_____

Sample	Color	Streak Color	Hardness *Can you scratch your sample with:*				Tribolum-inescent?	React with acid?	Magnetic?	Float in water?
Tape sample below:	What color is the surface?	What color is on the streak plate?	Fingernail? Hardness: 2	Coin? Hardness: 3	Nail? Hardness: 5	Scratch glass? Hardness: 7	Flash by friction?	Chemical/Clastic	Yes/No	Yes/No

After completing the table above, put a star (*) next to the rocks you think are minerals!

Day 5 Engineering: Flying Machines, Rockets, Propulsion and Flight

1. Rocket engines are _____engines.

2. For every action, there is an equal and opposite _____,

   or forces come in _____.

Trial #	**Bouncy Ball** (type & size)	**Drop Height** (feet? meters?)	**Time Aloft** (seconds)
1			
2			
3			
4			
5			
6			

What did you find?_____

Answers

Day 1:

1. Tension is when things get pulled apart.
2. Compression is when things get squashed together.

Day 2:

1. Science is all about asking questions and designing experiments to figure out the answers.
2. A cell is the smallest unit of life that can replicate independently.

Day 3:

1. Chemistry is the study of how matter interacts.
2. pH (power of Hydrogen) is a measure of how acidic a substance is.

Day 4:

1. Minerals are pure chemical substances. Rocks are made of two or more minerals.
2. A crystal is a mineral that looks how the atoms are arranged inside.

Day 5:

1. Rocket engines are reaction engines.
2. For every action, there is an equal and opposite reaction, or forces come in pairs.

HINT: Did you notice on Day 5 how difficult it might be to figure out which bouncy ball and drop height was the best? That's because the data table for the experiment was testing *more* than one variable at a time!

In science experiments, it's important to only change ONE THING when running your tests. The secret to making Day 5's data table work is to only change one of them – either the "Bouncy Ball Type" or the "Drop Height" on one table, not both.

If I were doing this myself, I would run my first set of trials for different bouncy balls all dropped from the same height. Then I would figure out which went the highest, and take that ball and now drop it from different heights to find the perfect drop height.

Teaching Science Right

Homeschool science isn't always easy. There's a lot more to it than most traditional science books and programs accomplish. If your kid doesn't remember the science they learned last year, you have a problem.

What do kids really need to know when it comes to science?

Kids who have a solid science and technology background are better equipped to go to college, and will have many more choices once they get out into the real world.

Learning science isn't just a matter of memorizing facts and theories. On the contrary, it's developing a deep curiosity about the world around us, AND having a set of tools that lets kids explore that curiosity to answer their questions.

Teaching science in this kind of way isn't just a matter of putting together a textbook with a few science experiments and kits.

Science education is a three-step process (and I mean teaching science in a way that your kids will really understand and remember).

Here are the steps:

1. Get kids genuinely interested and excited about a topic.
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There is a better way. When you provide your kids with these three keys (in order), you can give your kids the kind of science education that not only excites them, but that they remember for many years to come.

Don't let this happen to you... you buy science books that were never really used and now your kids are filling out college applications and realizing they're missing a piece of their education—a REALLY big piece. Now that's a setback.

So what do you do?

First, don't worry. It's not something that takes years and years to do. In fact, I am actually going to do a lot of the heavy lifting when it comes to science education for your student.

Here's how we're going to do it:

Step one: Get kids genuinely interested and excited about a topic.

Start by deciding what topic you want your kids to learn. Then, you're going to get them really interested in it.

For example, suppose I want my 10-year old son to learn about aerodynamics. I'll arrange for him to go up in a small plane with a friend who is a pilot. This is the kind of experience that will really excite him.

Step two: Give them hands-on activities and experiments to make the topic meaningful.

This is where I take that excitement and let him explore it. I have him ask my friend for other chances to go flying. I'll also have my friend show him how he plans for a flight. My son will learn about navigation, figuring out how much fuel is needed for the flight, how the weight the plane carries affects the aerodynamics of it, and so much more.

I'll use pilot training videos to help us figure this out (short of a live demo, video is incredibly powerful for learning).

My son is incredibly excited at this point about anything that has to do with airplanes and flying. He's sure he wants to be a pilot someday and is already wanting flying lessons (he's only 10 now).

Step three: Teach the supporting academics and theory.

Now it's time to introduce academics. Honestly, I have my pick of so many topics, because flying includes so many different fields. I mean he's using angles and math in flight planning, mechanics and energy in how the engine works, electricity in all the equipment on board the plane, and of course, aerodynamics in keeping the plane in the air (to name just a few).

I'm going to use this as the foundation to teach the academic side of all the topics that are appropriate.

We start with aerodynamics. He learns about lift and drag, makes his own balsa-wood gliders and experiments by changing different parts. He calculates how big the wings need to be to

carry more weight and then tries his model with bigger wings. (By the way, I got a video on model planes so I could understand this well enough to work with him on it).

Then we move on to the geometry used in navigation. Instead of drawing angles on a blank sheet of paper, our workspace is made of airplane maps.

We're actually planning part of the next flight my son and my pilot buddy will take. Suddenly angles are a lot more interesting. In fact, it turns out that we need a bit of trigonometry to figure out some things.

Of course, a 10-year old can't do trigonometry, right? Wrong! He has no idea that it's usually for high school and learns about cosines and tangents.

Throughout this, I'm giving him chances to get together with my pilot friend, share what he's learned, and even use it on real flights. How cool is that to a kid?!

You get the idea. The key is to focus on building interest and excitement first, then the academics are easy to get a kid to learn.

Try starting with the academics and...well, we've all had the experience of trying to get kids do something they don't really want to do.

The Shortcut

Okay, so this might sound like it's time-intensive. If you're thinking "I just don't have the time to do this!" or maybe "I just don't understand science well enough myself to teach it to my kid." If this is you, you're not alone.

The good news is, you don't have to. The shortcut is to find someone who already specializes in the area you want your kids to learn about and expose them to the excitement that persons gets from the field.

Then, instead of you being the one to take them through the hands-on part and the academics, use a solid video-based homeschool science program or curriculum (live videos, not cartoons).

This will provide them with both the hands-on experiments and the academic background they need. If you use a program that is self-guided (that is, it guides your kinds through it step-by-step), you don't need to be involved unless you want to be.

I'm partial to the "e-Science" program from SuperchargedScience.com (after all, I'm in it), but honestly, as long as a program uses these components and matches your educational goals, it should be fine.

Your next step should be to take a look at how you're teaching science now and simply ask "Is my kid getting the results I want from his or her science education?"

After this, consider how you can implement the three key steps we just talked about. Either go through the steps yourself, or use a program that does this for you.

If you want to learn more about how to teach science this way, we regularly give free online tele-seminars for parents. To learn more about them, visit:

My hope is that you have some new tools in your homeschool parent toolbox to give your kids the best start you can in life.

Again, I want to thank you for taking the kind of interest in your child that it takes to homeschool. I know it's like a wild roller coaster ride some days, but I also know it's worth it. Have no doubt that that the caring and attention you give to your child's education today will pay off manyfold in the future.

My best wishes to you and your family.

Aurora

Are you ready for your child to have an amazing science experience?

Supercharged Science

Then slide into the cockpit, buckle up, hang on tight, because here we go!!

Go here to get started:

www.SuperchargedScience.com