Issue #000

Homeschool Tech Topics

News, reviews, and ideas for using and teaching tech in your homeschool.

In This Issue:

For subscription information, please visit the web site: HomeschoolTechTopics.com

For suggestions, feedback, to submit questions for the Q&A section, and all other correspondence, send email to: Feedback@HomeschoolTechTopics.com

Read Me First.txt

Welcome to the Homeschool Tech Topics magazine, web site, and blog!

As I write this in late 2021, I'm seeing many references to the exploding growth of homeschooling in the United States. I feel there are many reasons for this growth, but the "top few" reasons on the list have to be the pandemic, politics, and the rampant perversion in public schools. My name is Farren, and my wife Shelly and I are in our 29th year of homeschooling our seven children. I grew up on a farm in N.E. Kansas and still live on a small "farm-stead". But, I've also had a life-long interest in all things "tech". In short, I'm a geek. If something uses electricity, I'm probably interested in it at some level. Computers, electronics, amateur radio, photography, video, audio, astronomy, rocketry, and more have all been hobbies/interests of mine over the years. However, my career has been I.T. -- Information Technology -- for the last 30+ years. The intersection of homeschooling and technology is extremely interesting to me, and I want to share that passion here.

I consider my audience to be parents who are (or are considering) homeschooling their children. I define homeschooling as that which is not "under the thumb" of any government. Doing Government School (AKA, Public School) at home, as was popular during the Covid-19 scare, is not, in my opinion, homeschooling. In spite of all that, anyone with decent manners and civility is welcome. My worldview is Christian and that will be unabashedly obvious in this magazine and accompanying website.

What I've noticed over my many years of being involved in a homeschool community is that tech content specific to homeschooling is severely lacking. And, tech content that targets government schools really isn't appropriate for homeschools. This has bothered me for many years, and I've finally decided to see if I can do something about it! I plan to start slow, but I hope that it grows!

This inaugural issue is free and I'm asking everyone to share it as far and wide as you can. Send it to everyone you know who either is homeschooling or considering it. Please help me to market this!

-Farren

Q&A

Q: Is this e-zine all there is?
A: No! There's the web site at https://HomeschoolTechTopics.com. The web site is for more "current events" and "news" type of articles have have shorter-term lifespans. I'll post links to other sites that I find valuable and I'm asking for suggestions for links. I'm considering a Q&A formatted podcast. I'm considering a forum. I'm open to suggestions. The e-zine is for the long-format material that will hopefully have long-term value.

Q: How do I subscibe?
A: Visit the web site at https://HomeschoolTechTopics.com/signup and put in your email address. For starting out, I'm not offering a traditional subscription. Why? Because at this point I'm not sure at what frequency I'll be publishing and thus I don't know what to charge for an annual subscription. So, for now, here's what I'm planning: Sign up on the website. I'll send an email whenever I publish a new issue. If you want that issue, you buy it and you'll be able to download it immediately. I'll make the transaction as frictionless as possible. Once I stabilize on a regular frequency for publication, I plan to offer more traditional annual subscription plans.

Q: What is the current frequency?
A: For the first year, I'm hoping to publish four issues. Over time, I'd like to grow that to 6 or more issues per year.

Q: I'm interested in writing articles -- are you accepting articles?
A: YES! email me: Feedback@HomeschoolTechTopics.com

Q: How do I submit a question for the Q&A section?
A: Send it to Feedback@HomeschoolTechTopics.com

Whether? Wether? Weather!

The weather can be a source of endless discussion. Here in Kansas we're fond of saying that if you don't like the weather, just wait 5 minutes as it'll be different then. I always figured that was true just about everywhere until I spent a week in California. An entire week of exactly the same weather. Talk about boring!

Weather can also be an endless source of scientific study. Logging & documenting your local weather is simple and inexpensive, possibly even free depending on what you already have access to. For example, is there an instrument something like the one in this picture hanging on the wall of your house?

We have a globe that has the same 3 gauges on its base. They may not be super accurate, but if the gauges move at all, you can use them to track changes. And what are those 3 gauges? Temperature, Humidity, and Barometric pressure. The 3 staples of current weather condition. Of course, if those gauges are in your house, the temperature won't mean much and humidity might also be incorrect depending on if you're running a humidifier or dehumidifier in your house. The barometric pressure will be the same inside or outside. So, how do you get outside readings? Well, that's the start of having some fun with weather technology!

Of course you could just buy a complete weather station from a company such as Davis Instruments, but that's expensive and not nearly as educational as building your own! A quick search of the Internet (with DuckDuckGo.com, of course) for "DIY weather station Arduino kit" will give many, many results. Here's a few in particular from sites that hopefully will be around for a while so these links will stay valid:

- https://store-usa.arduino.cc/products/weather-station-kit-with-solar-panel
- https://maker.pro/arduino/projects/arduino-weather-station/
- https://www.amazon.com/Temperature-Humidity-Atmosphetic-BH1750FVI-YellowBlue/dp/B07GPBBY7F/
- https://www.instructables.com/Arduino-Wireless-Weather-Station/

Future articles on weather may dive into reviewing one or more of those kits.

So, what would you do with a weather station? I can think of several things:

- Log the measurements hourly and create graphs, either on paper or via a spreadsheet.
- Log your weather observations: sunny/cloudy, calm/windy, dry/raining, etc.
- Over time, see if you can correlate the temperature/humidity/pressure changes to your observations. For example, if the pressure is dropping, what does that mean for your local weather? What if the temperature and humidity are

trending up, what does that correlate to for the observed weather? How much time is there between a change in the pressure and a change in the observed weather? With time and practice, you'll be able to predict your local weather based on how the temperature, humidity, and pressure are changing! Keeping all this data in a spreadsheet will aid in your predictions. You might even write some formulas to predict the weather.

If you want even more data for your local conditions, you can add in wind speed and direction sensors. Put "DIY weather station Arduino kit wind speed direction" into DuckDuckGo.com and you'll get plenty of ideas.

Here are just a few Teachable Tech Topics that come to mind:

- Electronics
- Programming
- Spreadsheets for logging/graphing your local conditions
- If you have a printer, 3D printing some of the components and enclosures for your own DIY weather station
- Meteorology - There are many interesting careers in the field of meteorology!

Here's a fun fact: did you know that a cricket's speed of chirping varies depending on the temperature? So, find a cricket, get a stopwatch, and count how many chirps it makes in 14 seconds. Add 40 to that number to get the temperature in degrees Fahrenheit. Compare that with your analog or digital thermometer to see how accurate the cricket really is!

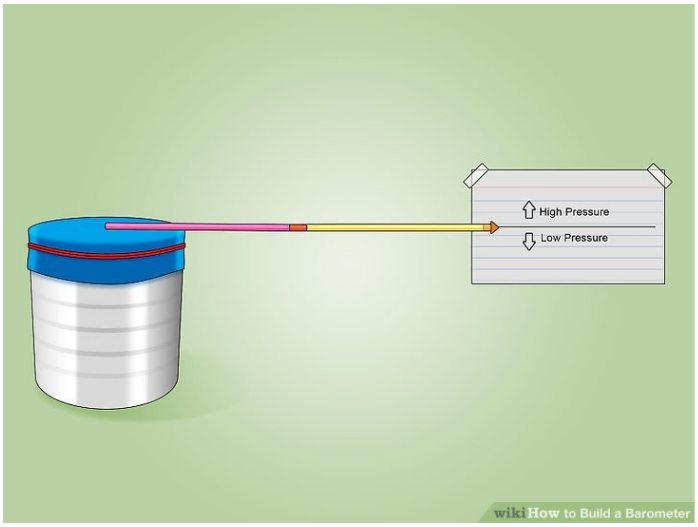
If you can use a cricket to get the temperature, can you make your own instruments for humidity and pressure?

If you have a student interested in chemistry, try making a "storm glass": https://www.thoughtco.com/make-storm-glass-to-predict-weather-605983

Here are a few links for further study:

- https://en.wikipedia.org/wiki/Thermometer
- https://en.wikipedia.org/wiki/Hygrometer
- https://en.wikipedia.org/wiki/Barometer
- https://en.wikipedia.org/wiki/Storm_glass
- https://www.wikihow.com/Make-a-Thermometer
- https://www.wikihow.com/Make-a-Hygrometer
- https://www.wikihow.com/Build-a-Barometer (photo below)

-Farren



The Allure of Radio

The word 'radio' brings to mind images of the AM/FM radio in the dash of most vehicles or maybe a big old console radio at the grandparents' house. And while that is valid, it's no where near complete. There's a surprising amount of 'radio' in ordinary technology. The WiFi in your laptop/tablet/phone is radio. Your cell phone's connection to the cell tower is radio. Bluetooth is radio. NFC is radio. Your car's key-fob uses radio. Satellite TV is radio. And the list goes on. Having some fundamental understanding of radio can be a big benefit to using the technology that's using radio. And yes, before you ask, amateur (ham) radio will be the subject of many future posts.

But for now, let me share a bit about shortwave listening (SWL).....

As I'm typing this, sitting to my left is an amateur radio HF (High Frequency) transceiver that also makes an excellent general coverage shortwave receiver. For the last hour I've been turning the big knob and 'surfing' the radio spectrum between about 3Mhz and 10Mhz. Several amateur (ham) bands are in that range as well as several commercial shortwave broadcast bands. At this moment, the dial is on 5.850Mhz which happens to be Radio Miami International (RMI) out of Okeechobee, Florida. I'm in Kansas. The program that just finished was Radio Slovakia International in English. It was very interesting news and commentary directly from Slovakia. Note that unlike the Internet or cellular systems, there's absolutely no infrastructure between my antenna in Kansas and the transmitting antenna in Florida.

Now, maybe I could find a web site for Radio Slovakia International and read the news. Maybe I could even listen online. But, where's the fun in that?!? There's an allure to radio, a dynamic that's hard to explain. Besides, if I were to stream that program over the Internet or over my cell phone, there would be billions of dollars of infrastructure in the middle, any of which can fail at any time. In the event of a wide-area power outage, not only can the Internet and cellular systems fail, but your local AM/FM radio stations may be off the air as well. If you have a battery powered shortwave radio, you can pick up stations from hundreds of miles away to find out what's going on in the world -- no infrastructure required.

Here's a fun exercise: After dark, go out to your vehicle and switch the radio to AM and slowly scan across the band. You'll likely be surprised by how far away some of the stations are. I do this often and can almost always pick up stations that are 2 or 3 states away from me. But, this won't work during daylight hours. Why? This puzzle is left as an exercise for the student, but I'll give a hint: ionosphere!

So, how can radio, and in particular SWL (shortwave listening), be used in homeschooling?
Studying world events or world politics? Shortwave radio will give you the news from the other countries' perspectives, not ours. (If the only perspective on world events that you're getting is from the US mainstream media and/or social media, you really don't have any idea what's going on in the world!)

Studying a foreign language? Find a shortwave station broadcasting in that language, and listen to native-language speakers.

Studying geography? Get out a map and find the location of the signals you're receiving or the location of places in the news.
Studying science? The propagation of radio waves of different frequencies through the Earth's atmosphere is a huge field of study. It is a field that has many unanswered questions that your students might someday answer! Did you know that our Sun has weather? It does. There are scientists who do nothing but study the weather on our Sun. And, the current weather on our Sun has a direct impact on propagation of radio waves via the Earth's ionosphere. Interested in deep space? You'd be amazed at how much radio-astronomy "citizen science" you can do with inexpensive SDR receivers. There's a lot of science in radio and a lot of radio in science!

I understand that not everyone can or wants to own a shortwave radio and/or the large outdoor antenna that is required for good reception. If you have the Internet, there are alternatives. In my opinion, the Internet takes away some of the appeal of the radio, but it's still a radio -- just someone else's radio receiver that they share with you over the Internet. In reality, these systems give you access to many more stations than you'd ever get with just your one receiver at your house because you can select receivers from all over the world to listen to. I'll have much more on this in the future, but for now, here are two links to explore: https://sdr.hu/
and http://websdr.org/

Radio may not be a technology that you teach in your homeschool, but it's a technology that you can use to greatly enhance your student's experience! There will be many radio-themed articles coming in the future. -Farren

What "Tech" Should I Be Teaching?

A computer is a ubiquitous tool in most homes today. And yet I'm continually surprised by how little is understood about this tool. While I'm not advocating that everybody be required to have a computer science degree or some sort of "computer license" before using a computer, you do need to understand that the computer can be a dangerous thing and that you need to treat it with intelligent respect, much as you would take proper safety precautions when running a chainsaw.

Computer skills such as proper keyboarding, text editing, or coding are important, but those are skills, and this article isn't about skills. Instead, this is about the tool that those skills are built on: the computer.

Actually, there's way more in the question than I can answer in a single article! Not to mention that the answer will change over time as technology changes over time. But, there are some general, fundamental computer topics that I think are important for all students. I will cover just a few of those in this article -- more in the future.

1) The concept of "data" and how to properly manage, manipulate, and secure it.

A computer is basically a machine that can store, retrieve, and manipulate data. How a computer does that is a topic of future investigation. The data is the "human" part and everyone should have a basic idea of what data is and how it can be manipulated with a computer. A word processor document is data. A spreadsheet is data. An audio file is data. A photo is data. A video file is data. To a computer, everything is data. To the human using the computer, the data is everything they care about. To use a computer is to store, organize, and manipulate data.

The fundamental unit of data on a computer is a file. Everything is stored in files. Photos are files. Documents are files. Spreadsheets are files. You get the idea! Files have names and the folders that files are stored in also have names. We, the users, get to pick those names, and we should do so wisely. Trust me when I say that having thousands of files with names like IMG_5743.JPG is not helpful when I want to find photos of a kid's 10th birthday! Make appropriately named folders and name your files as you go. If you don't, it'll be an insurmountable problem later!

I recently read an article that pointed out that many younger computer users these days don't know how or even why to organize files because they are so used to just searching for everything they want. The Internet has trained us to search for what we want, so why wouldn't we do the same on our computers and devices? Because the data is different. There's currently no way for me to ask my computer for all the photos of my kids' birthdays. Searching by date doesn't even work because much of the time the clock wasn't set on the camera, so all the photos have the same wrong date. So, don't rely on search to find your files!

Finally, ***ALL DATA MUST BE BACKED UP!!!*** Computer storage devices - hard drives, solid state drives, flash drives, (floppy drives if you're old enough), etc. - all have one thing in common -- they will fail. It's not a matter of IF, but WHEN. They. Will. Fail. And, when they fail, all of your precious data is usually lost forever. The only protection you have against losing your data is to make backups -- multiple copies. Teach your students to manage their files and to always make backups! Future articles will address this in depth.

2) How does the Internet work?

Since the Internet is simply a collection of networks, perhaps the better question is how do networks work? Networks move computer data from one computer to another. The how and why of that simple idea is great in both breadth and depth. An un-networked computer is about as rare these days as seeing a Model T Ford on the open road. Almost any productive use of technology is going to require networks to move data, and therefore, a foundational concept of what a network is and does is important.

You probably have WiFi in your house -- that's a network on which computers and other devices in your home can move and share data. There are also wired connections for things that should be plugged in. In short, you have a computer network in your home. Your home network connects to your ISP's network (Internet Service Provider). The ISP's network connects to other networks and on it goes to the "Internet Backbone" that spans the globe. Your home network is connected to other networks literally all over the world. With that connectivity comes great responsibility! It's hard to even describe the quantity of malicious activity happening on the Internet every second of every day, and it only gets worse.

That network in your house is your responsibility! What data you allow to move on it is your responsibility. When and how that data leaves your network for the "outside" network is your responsibility. As a homeschooling parent, you have a double duty here: to be responsible for your network and to teach your children to be responsible on your network and the wider network we call the Internet. I have many future articles planned on this topic!

3) Privacy and security are absolutely critical.

Your personal data on your personal computer/device that's connected to the Internet is under attack. Everything you post on the Internet is up for sale. One mistake can haunt you for the rest of your life! The Internet should be thought of as an eternal war zone and if you don't take precautions and protect yourself, you will be caught in the crossfire! Not understanding the ramifications (or simply ignoring them) of being lazy with your privacy and security can be deadly. And, closing the barn door after the horse has escaped is futile. Social media is the worst offender is this area! Always remember that there is no "delete" button on the Internet!

There's no end of stories of people whose social media posts from years earlier come back to haunt them later in life, usually when they're applying for a job or need some sort of security clearance or background check. Teach and train your children to use great wisdom when they're on the Internet and

especially when they use social media. Better yet, just don't let them use social media! Remember this: if a service is free then you and your children are the product that is being commoditized -- your time, attention, personal details, buying habits, home address, phone numbers, etc. are the payment for the "free" service.

Likewise privacy, once lost on the Internet, can be extremely difficult to regain. And when it's lost, it can be painful. The Internet is full of the worst bullies you can imagine. Triggering just one of these bullies can result in an attack on you, your family, your property, your reputation, etc. Again, you the homeschool parent have double duty: to use wisdom and discernment yourself and to teach the same to your children. You can NOT just buy a piece of software that makes outrageous claims about keeping you safe and secure, install it, and forget about it!

Government schools have I.T. administrators whose full-time job is to keep the network running, safe, and secure. You, the homeschooling parent, must take that job duty on yourself, and you need to take it seriously, and you need to teach it to your children. To turn a child lose on the Internet without any safety training could be as dangerous to them and others as turning them lose with a loaded gun without any safety training. As with the other topics, I have more in-depth coverage planned for this topic as well.

There's much more to answering this question fully than I've listed here, and I will continue this in future articles. Meanwhile, tell me what you think: what is the fundamental, foundational "tech" that you feel students need today? Send me an email!
-Farren

DIY Mars Rover

An entire generation was inspired by the "space race"(1) in the 1960's which led many people into science and engineering careers. Being born in the mid 60's, I don't remember much of it! The Space Shuttle(2) was the exciting and inspiring item of my youth. I clearly remember my highschool science teacher setting up a TV at the school, and anyone who was interested in watching the STS-1 launch was allowed to do so. Space was "cool", and many kids were inspired to the sciences because of it. Many Estes model rocket kits(3)(4) in the form of the Saturn V, Mercury Redstone, Apollo, Gemini, Space Shuttle, and more, were built and flown by budding astronauts hoping for their chance to ride in the real thing.

Today, getting to Low Earth Orbit (LEO) is almost commonplace. As I write this, 90yr old William Shatner just got his turn to experience space for real. What is there to excite and inspire the next generation of scientists and engineers to pursue space exploration as a career? Plenty!! But for today, I want to talk about rovers!

While there are lunar rovers, both current and planned(5), and while those are pretty cool, I want to focus on Mars rovers(6) for this article. As of this writing, there have been six Mars rovers deployed successfully. The Sojourner in 1997, Opportunity in 2004, Spirit in 2004, Curiosity(7) in 2012, Perseverance(8) in 2021 and the Chinese Zhurong in 2021. Studying the history, planning, construction, launch, landing, and science performed by any one of these rovers could be an entire unit study! Perseverance even had the additional experiment of a mini-helicopter named Ingenuity which became the first powered flight vehicle on another planet. Now that's cool!

So, along with model rocket kits for aspiring astronauts, aspiring space engineers can build model "mini-helicopters" (drones) and model rovers!

Did you know: The name Perseverance came from a seventh-grade student, Alexander Mather. NASA has a long tradition of involving school-age children in their programs because they know that those students are the next generation of scientists and engineers that they'll be hiring. NASA has many resources that can be put to use by the homeschool student as well.

A toy remote controlled car or truck could be thought of as a "rover", but that's not how the real rovers work. The real rovers are sent instructions and they attempt to carry them out while avoiding doing anything dangerous. For example, NASA may instruct a rover to move forward a few meters, but when the rover attempts to carry out the instruction, one of the Hazard Avoidance Cameras may detect a large rock in the path. The rover has to deal with these exceptions on its own. And, let's not forget that there is an average round-trip delay time of about 15 minutes. There's no such thing as "live" remote control of the Mars rovers!

So, is building a rover within the scope of your homeschool? Maybe! You can make it as simple or as sophisticated as you'd like. Lego Mindstorms comes to my mind, and when I do an Internet search for "Lego Mindstorms Mars Rover" I get lots of ideas on how one can be constructed. Does your rover need to look like the Mars rovers? Not at all! Any vehicle capable of moving itself could be considered a 'rover'. I'm going to GREATLY over-simplify here, but the basic idea is to put a computer/camera/radio package on a mobile platform. The platform could be run indoors or outdoors. With your computer you'd send it commands and wait for the results. Here are just a few ideas for getting started:

https://www.nasa.gov/sites/default/files/atoms/files/mars_survival_kit_-_rover_final_4.pdf
https://www.robotlab.com/store/nasa-curiosity-rover-diy
https://shop.4tronix.co.uk/products/marsrover

Now, I'll be the first to admit that the second link, coming in at over $8000, is beyond the budget of any homeschoolers I know! But, you can get ideas and inspiration from it, and that's free! There are many more kits and plans available -- I don't need to search the Internet for you.

The command and control does not need to be fancy electronics with computers and 2-way radios. Build a simple cardboard or wood rover and place it somewhere out of sight of the "driving" student. Have the driving student write instructions for the rover. Have a second student or parent attempt to carry out those instructions and then take a photo of the end result. Take the photo back to the "driving" student and have them write the next set of instructions based only on what they can see in the photo. I expect there will be lots of "that's not what I meant!!" when the driving student sees the photos! If you have two "smart" phones (I question that name!) then you could take this game up a notch: put one phone on the rover and one with the driver, and use your favorite video chat app. The driver only gets to see the camera view from the rover and gives driving instructions over the phone. The person at the rover moves it based on the instructions given. Put in a 15 minute delay between instructions and you might teach some patience along with the science and engineering!

A few Teachable Tech Topic ideas:

Orbital Math:
Just how do they do the math to get a spaceship to another planet?
How do they do the math to know where to point the radio antennas to transmit and receive the signals?
Sensors: What kinds of sensors are available and what would you put on your rover before sending it to Mars?
Planetary Science(9): What kinds of science experiments would you have your rover perform?

Here are just a few links to get you started:

https://opensourcerover.jpl.nasa.gov/#!/home
https://eyes.nasa.gov/curiosity/
https://mars.nasa.gov/gamee-rover/
https://eyes.nasa.gov/apps/mars2020/#/home

Space exploration will be the basis of many future articles, including the fact that it's totally within the realm of possibility for a homeschool family to send an object to "near space" or the "edge of space"(10). Yes, that's yet another topic for future articles.

Footnotes:
1: https://en.wikipedia.org/wiki/Space_Race
2: https://en.wikipedia.org/wiki/Space_Shuttle_program
3: https://en.wikipedia.org/wiki/Model_rocket
4: https://estesrockets.com/product-category/rockets/scale/
5: https://en.wikipedia.org/wiki/Lunar_rover
6: https://en.wikipedia.org/wiki/Mars_rover
7: https://mars.nasa.gov/msl/home/
8: https://mars.nasa.gov/mars2020/spacecraft/overview/
9: https://en.wikipedia.org/wiki/Planetary_science
10: http://nearspacescience.com/category/high-altitude-ballooning/

Upgrade an Older Computer

If you have a computer that is old enough to have a mechanical hard drive, you can make it run "better than new" by replacing the drive with an SSD (Solid State Drive).

First, some definitions:

Hard drive: The main storage component of a computer. Keeps your operating system, files, etc. stored while the power is off. We have the term "hard" drives to distinguish from the now obsolete "floppy" drives that some of you may remember.

Mechanical hard drive (The old-school style of drive): it has motors that spin platters and move the read/write heads over those platters. They make noise -- there was a time in my IT career when I could tell you what brand of drive was in a computer by the sounds it made when turned on! They are fragile -- a sudden shock to one while it is running can ruin it. They are slow -- by today's SSD standards, the rate of data transfer from the drive to the computer is very slow. They WILL FAIL -- they are mechanical with extremely high precision moving parts. They will wear out. When they fail, you lose everything you have stored on them. This is why you need a backup strategy, something I'll mention a lot in this magazine.

SSD (Solid State Drive): A newer technology storage device with no moving parts. You can think of it as a USB Flash Drive but internal to your computer and much faster. However, just because they have no moving parts does not mean they will not fail! SSD's absolutely do fail and will lose all of your data, often in a manner which is even more catastrophic than when a mechanical drive fails. So, having a backup strategy is just as essential with an SSD as it is with a mechanical drive.

How do you find out which drive type you currently have? Well, the simple way is to listen while turning your computer on. Or, you can get the model number of your drive and look it up on the Internet. In Windows, open up the File Explorer and right click on the C:\ drive. In the pop-up menu, click on Properties. That will open a dialog box with several tabs -- click on the Hardware tab. In there you'll see a list of your drives -- find your hard drive and do an internet search on the model number to find out if it's mechanical or not.

Doing this drive swap yourself will require some tools and a willingness to open up your computer. A desktop computer is easier to work on than a laptop. Some laptops are easier to work on than others, with Apple products being at the top of the list of "most difficult". If your laptop has a simple to remove door or plate on the bottom, then it'll be much easier than the ones that have to be split apart using special plastic tools. My goal here isn't to give you a step-by-step on how to open up your computer to access the drive. The Internet is full of that kind of information.

What I do want to give is advice on the brand of drive and how to move your existing data to it.

Step 1: Buy a Samsung EVO drive. As of this writing the 870 series is the current model. Sizes vary from 250GB to 2TB. You need to buy one that has enough capacity to hold your current data. Look at how much storage is currently in use on your computer and buy a drive that's larger. The simplest way to do that is in the File Explorer: right-click on your C:\ drive and then click on Properties in the pop-up menu.

Why Samsung? Two reasons: 1) I've never had one fail yet. 2) Samsung offers free software that makes moving your data very easy.

Step 2: Buy an StarTech USB 3.0 to SATA adapter cable. (Other brands work just as well. I own an Apricorn brand but I didn't find a link for it on Amazon.)

When you have those items and the computer that's receiving the transplant, start by downloading and installing the Samsung Data Migration software . https://www.samsung.com/semiconductor/minisite/ssd/download/tools/

The process is simple:

- Plug the SATA adapter into a USB port on your computer. Preferably a USB 3.0 port if you have one. Give the computer a few moments to install drivers -- this should happen automatically.
- Plug the new SSD into the adapter cable. Because new SSD's are not pre-formatted like USB thumb-drives are, you won't see a new drive letter show up in your file browser, and that's fine.
- Run the Samsung Data Migration software It's a very simple wizard driven process. You select your "source" drive -- that's the one that's installed in the computer. The tool should select the correct drive automatically. The next step is to select the "destination" drive -- your shiny new SSD. A few more clicks and it'll tell you that it will shut the computer down when the copy is complete. Let it run.
- Open up the computer and swap the drives. Yes, that's possibly over-simplified. There are MANY web sites with step-by-step instructions and many videos on YouTube. Do a search for

your computer make & model and "install new drive" and I'm sure you'll find instructions. There's no way I can cover every possibility in this article. If you only have one computer, you need to study this in advance – don't try watching a how-to video on the computer you're taking apart!

- Close up the computer, turn it on, and enjoy a system that will be faster than it was when it was new.

If you've never been inside a computer before, this may intimidate you. If you have a desktop computer, I think you can do it! If you have a laptop that requires splitting the case in half, then I'd probably not recommend this as your first project. If you have an older laptop you can practice on where it won't matter if you don't get it back together, then I'd suggest practicing on it. However, many older laptops are easier to work on than newer ones so even that doesn't always give a full appreciation for what it's like to split a new laptop.

Once you've upgraded the drive, keep the old drive as a backup. Eventually you could put it in a case and use it as an external USB hard drive.

Teachable Tech Topics:

- Make something last longer instead of throwing it away.
- Why are SSD's faster than old mechanical drives?
- How to work on a computer

-Farren

Book Review: Forrest Mims' Science Experiments

Summary: You can't go wrong with any book by Forrest Mims!

Anyone who has ever browsed a Radio Shack store probably remembers the book rack full of small electronics books by Forrest M. Mims III. I think I own all of them! In recent years Forrest wrote articles for Make: Magazine. This book is a compilation of those articles, and it's an excellent book!

There are 30 chapters, most of which are a single experiment. A few chapters towards the end of the book are more tutorial and editorial but are still very interesting. Many of the experiments are based on the earth science or natural science categories. Examples include: "How to study tree rings", "Snow science", "Capturing and studying airborne dust, smoke, and spores", and "How to photograph the solar aureole".

One favorite of mine is "The infrared thermometer: An essential science gadget". I had no idea that such a simple tool could be used for some real science!

Another favorite is "Make an experimental optical fiber seismometer" simply because I've had a fascination with building my own seismometer since grade school after reading a fiction book where seismometers were used to catch bank robbers. I have yet to build one, but I've collected many plans for DIY projects. There is also a Raspberry Pi based product you can buy that is a ready-to-go seismometer that is designed for education. I hope to review one of those units here in the future. (https://shop.raspberryshake.org/)

Forrest Mims' Science Experiments also contains a couple photography based experiments including one called "Digital Pinhole Photography" that I thought sounded very interesting, and I hope to try it out with my kids sometime soon.

Overall, I found this to be yet another excellent book by Forrest Mims. I have yet to find a book by Forrest that wasn't excellent. If you have students interested in electronics, you can't go wrong with any of his electronics books.

Available here: https://amzn.to/3GA8eaP