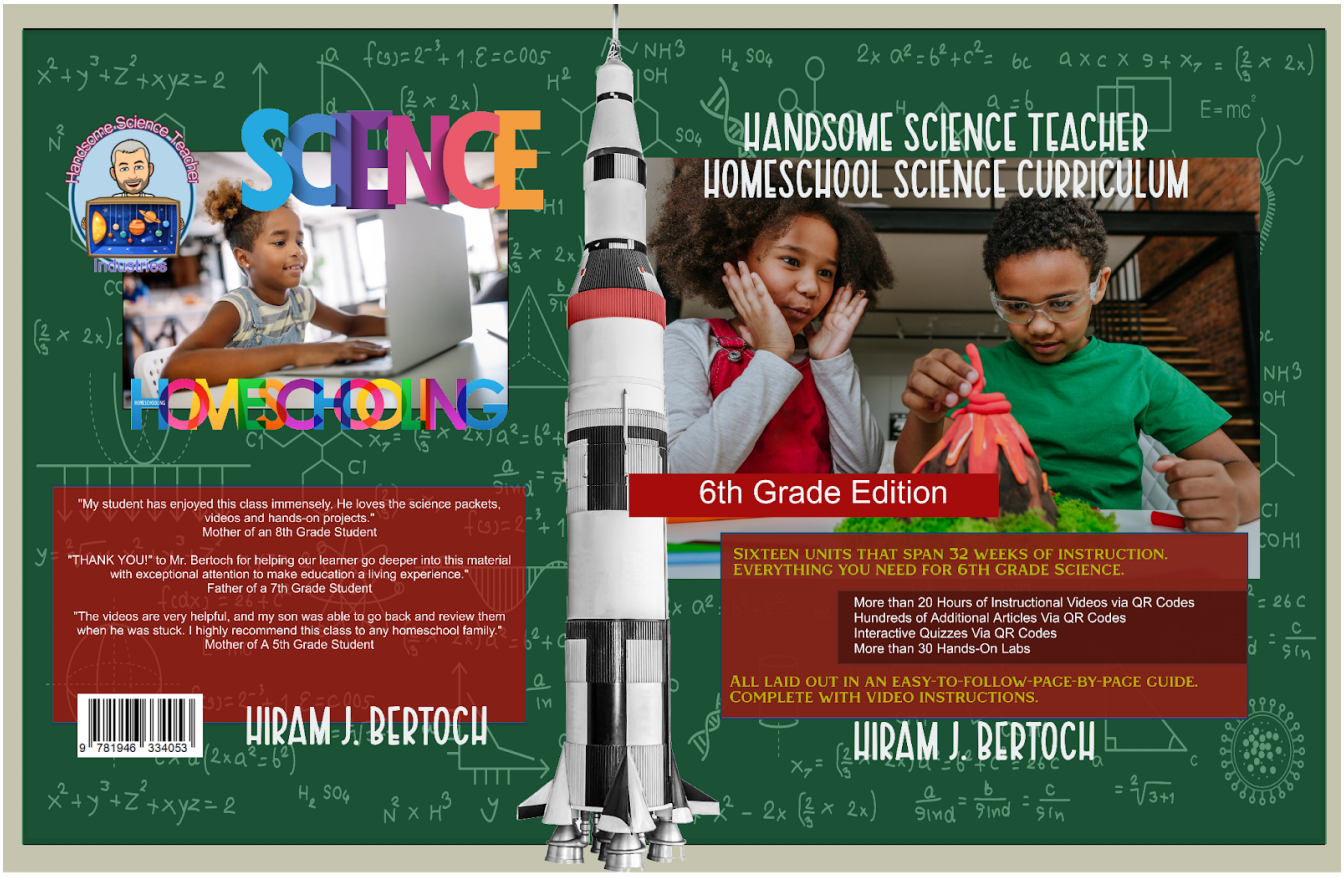

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HOMESCHOOLING

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Sixth Grade Edition

Sixth Grade Science
Welcome to the next chapter of your exciting science journey! When you complete this course you will be one of the smartest kids around. Okay, you probably already are, since homeschooled students tend to be super smart! This course is designed to help you push yourself even further by learning to think intelligently and work like a scientist.

The next sixteen units, which we call “**Mastery Badges**” and which are all found in this book, are designed for you to complete while you are in sixth grade. There are 64 mastery badges altogether. Taking four years (5th-8th grade) to complete.

You have plenty of time, so don’t rush!
Plan to spend about two weeks per mastery badge.

You Can Do Hard Things!
Remember that anything important is usually challenging. However, challenging doesn’t mean impossible! You can do hard things! If you find yourself stressed out or confused, know something really important. Know that everyone feels that way sometimes. Feeling overwhelmed just means that your brain is making room for all the new things you are learning.

Trust In Yourself
Learn to believe in yourself and to recognize your own learning patterns. When you do feel overwhelmed remind yourself that you have felt that way before and that you got through those feelings. You didn't give up then, and because you didn't give up, you mastered the things that used to be hard for you, and you will master these new things as well.

Learning To Be A Scientist
I have been teaching science for many years, and I am sometimes asked a question that sounds something like this:

"Mr. Bertoch, what is the point of science? Why do I have to learn this? How will it EVER help me in life?"

Can you hear the sarcasm? Fortunately, this question has a very easy answer. It is true that learning the job of the mitochondria (a microscopic mini-organ found inside of cells) will probably never come up on a job interview, a tax form, a driving test, or a future business meeting. It is true that unless you grow up to work in the field of medicine you will likely be just fine not knowing what this little bio-machine does. However, this misses a very important point.

When we learn about the mitochondria, we don't just memorize its function. We also learn to be curious. We learn how to do research, make observations, collect data, analyze data, look for patterns, make inferences, and how to support our views and opinions using evidence.

THAT IS WHAT MATTERS! That is why science is so important!

Years from now, you may forget some of the topics we study. I hope you don't. I hope you remember everything. But I harbor no unrealistic expectations. The fact is that you almost certainly will forget some of the topics we studied together during your time with me.

What you will not forget though, and what will absolutely change your life forever, are the practices that make you a more intelligent adult.

You will learn to think. To demand evidence. To use logic. To be curious. To make observations. To invent and create. To solve problems. To trust in your own intelligence and in your own abilities to be successful.

These are thing things that will lead to your success in any future job you choose to work in.

Enjoy Your Science Journey! Science Is So Much Fun!

Topics Studied In The Sixth Grade

During your time in fifth grade science you will study each of the following topics. By the end of your journey through this grade, you will be an expert on each of these things.

Your goal is to hold yourself accountable to a high standard. You are after all a homeschool student, and everyone knows that homeschooled students are the most successful kind. You have a high bar, but you are up to the challenge!

Topics of Study This Year

- Cycles of The Earth (Water, Carbon, Nitrogen)
- Pollution
- Water Filtration - A STEM Lab
- Soil Erosion - A STEM Lab
- Biotic / Abiotic Factors. Predator Vs. Prey
- Food Webs
- Modeling Waves
- Wave Energy
- Transmission, Absorption, Reflection, Opaque, Transparent, Translucent
- Waves & Communication
- Eclipses
- Our Moon
- Lunar Phases
- Tides
- Oceans
- Physical Changes vs Chemical Changes

Each of these topics are broken down and explored in great depth using hands-on labs, videos, reading and writing assignments, quizzes, and many other fun and engaging activities.

Before we begin your science journey, I need to share some information with your parents or guardians about how this science curriculum works. Go ahead and hand this book over to them, and have them read the next few pages.

It would be a good idea to review the things discussed on the next few pages together so that both of you understand how this science class works.

Introduction For Parents

Welcome to HandsomeScienceTeacher's Complete Science Curriculum! Welcome also to a fun, engaging, and hands-on science learning journey. Before we jump into the curriculum, let's first take a minute and talk about some routine housekeeping items. Important things like… why this curriculum was created, the pedagogy that it is built on, and how to utilize this resource to achieve the best possible results.

Even before we do that though, I should take a moment and introduce myself to you. Until you know who I am, and you know… why you should listen to me… there is really very little reason for you to continue using the rest of this article. When it comes to educating your child, it is important that you know who you're dealing with. Your children matter to you more than anything in this world. Which is exactly how it should be. Consider the next section my job interview with you. Where I answer your questions about why I am hopefully a worthy candidate to be entrusted with the science instruction of your precious children.

Questions like: Who is this incredibly handsome science teacher? What does he know about teaching science? What experience does he have with homeschooling? What is his personal agenda? What are his credentials? And most importantly… why does he think he is so handsome? Okay, so I won't answer the last question, since no one but me actually thinks that I truly am handsome… I'll do my best with the rest though, and then you can determine whether or not you think the curriculum I have created is worthy of use by your family.

About Mr. Bertoch

I began my career in education way back in 1998. Though my experience with science goes back to my childhood. As a young man, I used to stay up late at night, lay in the backyard, and stare up at the stars. During my idyllic childhood growing up on a farm in Hunter, Utah I was a science addict! Kind of geeky, I know, but I adored science, and absolutely couldn't get enough of it.

In 1998, at the age of 21, I founded a company called The KidsKnowIt Network, which would eventually grow to become the most popular (by traffic) educational portal on the Internet, serving tens of millions of students all over the world every single month. In 2012 when I sold it, no other online educational company was receiving more traffic than ours.

We had the largest (by traffic) Astronomy website, Biology website, Geology website, Geography website, Dinosaur website, History website, and spelling website in the entire world. We also had the

second most popular math website. Our math website never got bigger than CoolMath.com. In that area we had to settle for second place, but that's okay, because the people at CoolMath.com were pretty… well… cool! And hey… you can't win every battle!

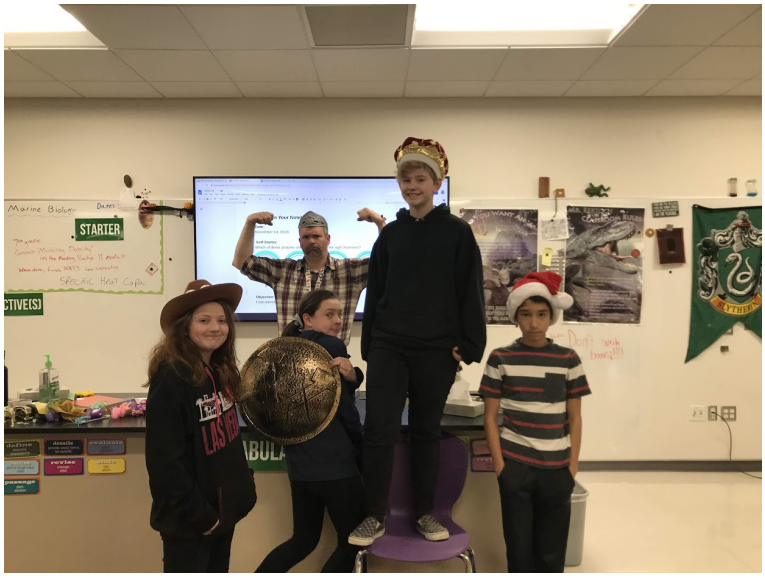
I loved building and working at The KidsKnowIt Network. It gave me some amazing opportunities. I got to meet and work with some impressive individuals. Including governments all over the world, in order to develop their science standards and curriculums. As well as top executives for companies like Microsoft, Lenovo, Adobe, Home Depot, and others, as we worked to create educational opportunities in the private sector. I also was given the opportunity to speak at education and technology conferences around the world as a featured presenter. During this era of my life, I was a sought-after expert in the areas of education and technology, especially as it pertains to the sciences. Incidentally, we also published educational books and produced educational videos that went out to school systems around the globe.

In 2012 I had a life-changing epiphany though. As much as I loved my job, one day as I sat in my office, I realized something very important. I remembered that ever since I had been a young boy, I had always dreamed about being a science teacher. Not a speaker, not a presenter, not a CEO, not a science consultant to governments around the world… but a science teacher, in a classroom, working with students.

I was happy, but not entirely fulfilled. This realization ate at me, and in time I set out to find investors to take over The KidsKnowIt Network so that I could move myself toward my childhood ambition. To teach! My wife was kind in supporting me in this effort. Which is good, because leaving my influential position behind led to a 95% pay cut. Teachers make WAY less money than CEO's. That's okay though because my decision to enter the classroom also led to a 1000% increase in my overall state of happiness!

Within a year I had earned my teaching certificate, and then found myself hired to teach as a 7th-grade science teacher at West Jordan Middle School in a suburb just outside of Salt Lake City, Utah.

I continued teaching at West Jordan Middle School for the next seven years and absolutely loved it. During my time there I was awarded teacher of the year, as well as science department chair of the year (two different years). During this time, I was privileged to build a science fair program that dominated the State of Utah.



Eventually, my wife and I moved to Charleston, West Virginia where I then began teaching in a 6th-grade science class at West Side Middle School. A position that I continued working in for 3 years. Making my total time in public education 10 years. During my time at West Side Middle School, I was nominated for teacher of the year yet again. An honor that means more to me than I can express.

Following my departure from public education, I spent the next year developing the curriculum in this book and teaching it to homeschool students around the world.

During this time, I taught more than 90 students from all over the world in small classes via Zoom. These students helped me to really refine and improve these learning resources so that they could become as effective as possible for families working outside of a school system. Taking into account the need to modify labs so that they utilize, as much as possible, supplies commonly found at home, adapting lessons so that they are effective without a teacher being in the same room via video instruction, and so forth.

And that pretty much takes me through the present day. But, what about my credentials?

My Credentials

Before you begin using HandsomeScienceTeacher.com’s materials, you deserve to have the peace of mind of knowing what my credentials are. What gives me the right to put these materials together? How do you know they will be effective? How do you know that they are built on sound pedagogy? Let’s start with my degrees.

Please don’t hold the fact that I have multiple degrees against me! I built my business empire without any degrees. During that time, I found that degrees matter far less than experience. Indeed, some of the best employees I ever hired did not have a degree. When it came time to teach though, I had to have them, and so I earned several over my decade as a teacher.

My Degrees

I am lucky enough to have had the opportunity to have earned three degrees. Two in science and one in instructional design. I have a bachelors in Earth Science which covers astronomy, geology, atmospheric science, and oceanography. I have a masters in Biology, and I have a second masters in

instructional design. Instructional design is the methodical study of, and science behind, teaching and learning. With a particular focus on creating effective courses for students.

My Understanding of The Various Science Standards

Don’t hold this against me either. I know the standards well, and I know that can be a handicap, if not managed correctly. Please know that I am careful in my application of the standards, and I believe I know them well enough to know when to depart from them.

During my career I have had numerous opportunities to work on the International, National, and state, district, and even school levels in the areas of developing and unpacking science standards. During my time at The KidsKnowIt Network I sat on a number of councils that helped to design and influence the current national science standards in The Unitied States, as well as the science standards used by other countries. During that time my company was also hired by various states and organizations to consult on the creation of their standards. In these efforts, I always focused on using my influence to encourage school systems toward curricula that engendered an independent and logical mindset, where students learned to depend on their own skepticism and ability to think, rather than trusting experts.

During my time as a teacher I worked on the state and district levels to unpack science standards as well as to train other teachers in the district and state on how to teach those standards. When the State of Utah adopted the NGSS standards I sat on the State committee that went through and explored the implementation of the standards, and also spent weeks on the district level training other science teachers on how to utilize the standards.

Once again, my focus was on the important of teaching students to think for themselves, to demand evidence from the so-called experts, and to question everything. I wanted to create scientists, who don’t believe me, rather than loyalists who follow what they are taught without question. Science is the process of questioning the experts, not worshipping them. My goal was always and foremost to get students to believe in their own intelligence.

Because of these experiences, I am intimately familiar with The Next Generation Science Standards, which are utilized by most states in the United States, having been part of the discussions and trainings from their creation down through their implementation, and having played at least a minor role in nudging these standards toward a student-centered approach.

My Understanding of Science Pedagogy

What is Pedagogy? It is just a big word that essentially means the science of teaching. In this case, the science of teaching science… which sounds a little strange to say outloud. Science pedagogy is different than reading pedagogy, and different again from math pedagogy. Each content area touches different parts of the human mind, and so different strategies are required to reach learners.

So, what do I know about science pedagogy?

It turns out, quite a lot. Teaching science is something I am very good at. I know this sounds prideful, and I hope you will forgive me for saying as much. I don’t mean to sound arrogant, but I am very good at teaching. Especially science.

At both middle schools where I taught, we worked with the most underprivileged kids in our communities. My first school, West Jordan Middle School, was the most highly impacted school in our district and one of the most highly impacted schools in the State of Utah. Our students experienced significant challenges relating to poverty.

My second school, West Side Middle School, was even more challenging. It was located in the highest crime community in the State of West Virginia, were our students lived in conditions that you cannot imagine. These students witnessed atrocities that most adults never see. They were sadly also frequently the victims of these crimes. Many of them lived in homes without utilities and were in constant survival mode.

Despite the many challenges and setbacks that our students faced, I was able to lead them on to scoring on average 20% higher on standardized tests than their peers. When I say this, I don’t mean that they scored higher than their peers at the same school. Rather I mean that our poverty-stricken minority students were scoring 20% higher than students in other much more affluent schools and communities. This was an accomplishment that I am very proud of. It proved that our students were every bit as capable as those in more affluent communities.

I mentioned earlier a science fair program that I was lucky enough to get to build. During my time at West Jordan Middle School, I built this science fair dynasty which was unrivaled in the State of Utah.

At its height, we absolutely dominated the district, regional, and state science fairs. Averaging 30-40 kids every year going to the Central Utah State Science Fair, and 5-7 kids every year winning at the state science fair. I was even able to take 3 kids all the way to the national science fair where 2 of them won 3rd place in their division. **All of this from within these highly impacted schools!**

My students learn. They don’t just memorize facts. They actually understand the content and are able to use it to do real science on their own. I know how to teach science in a way that builds scientists, rather than just making them memorize facts.

The strategies used in this curriculum are proven to be successful. I do not believe in busy work! Busy work is a waste of time. Everything we do is intentional, has a purpose, and is tied directly back to helping students become intelligent thinkers. Likewise, the order of how I present the content is intentional.

Touching Students Brains As Many Times As Possible!

This curriculum is designed to touch students' brains. Not literally! Thank goodness. That would be gross. But rather, my curriculum is designed to repeatedly touch a child’s mind in a way that forces their brains to retain what they learn. Every time we poke the brain neuropathways in their mind for that content become stronger.

Here’s the deal though. We don’t want to just touch one part of their brain over and over again. To be truly effective, we need to touch as many different parts of their brain as possible. This is because each time we engage another part of their brain, we once again strengthen the pathways that store the knowledge they are learning.

Thus, we want to use the part of their brain that listens, the part of their brain that talks, the part of their brain that reads, the part of their brain that writes, the part of their brain that is creative, the part of their brain that is analytical, and above all, the part of their brain that is responsible for physical movement.

My curriculum engages their entire mind and body in the learning process. Forcing them to activate all of these parts of their brain. Which most other curriculums ignore. Most curriculums focus solely on memorization and reading. We will be engaging the entire mind, and in so doing, students will end each unit having created a very well-laid-down neuro network.

They will not just be able to recall a memorized fact. They will understand the fact, and how it relates to other facts. They will be able to utilize what they know to solve new problems. Their science education will form an integrated whole that will help them to understand the world for what it really is, and to think analytically about it.

Most importantly, they will learn to question the experts. They will learn to view themselves as every bit as smart as any expert, and as capable as anyone else of looking at data and drawing their own intelligent conclusions. Instead of being dependent on others to spoonfeed them knowledge, they will learn to seek out knowledge on their own and to determine for themselves what is true, and what isn’t.

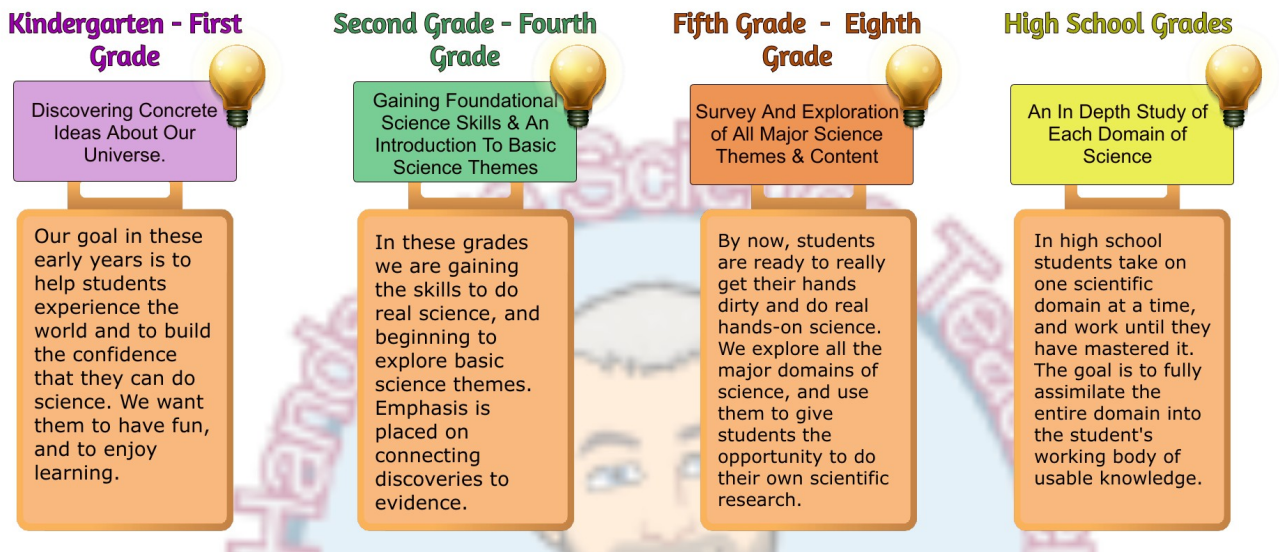
At no point in this curriculum do I tell them what they have to believe. Rather, I empower them to find truth on their own. It is not my job to impart my own agenda to them. Rather, it is my job to teach them to be skeptical of me as the teacher and to do their own research.

How This Curriculum Is Organized

A lot of thought and experience has gone into organizing this curriculum so that it is as effective as possible. To get the most from these activities it is important that your student complete them in the order that they are presented.

First Let's Look At The Curriculum As A Whole

The curriculum, which spans K-12 grade was created in order to achieve two very important purposes. Firstly, to develop intelligent, confident, and independent thinkers. Secondly, to impart a very deep understanding of all domains of science. To achieve this goal, the curriculum follows the framework expressed in this diagram.



As students progress through the curriculum mastery badges will become increasingly challenging. However, they all follow the pattern outlined below.

We Always Start With Discovering Labs

Every unit, or "Mastery Badges" (more on mastery badges later) starts with what I call a Discovering Lab. Research shows that students learn and retain their knowledge best when they "discover" it for themselves, rather than when they have a teacher simply lecture to them. These discovering labs are designed to give students the opportunity to make their own discoveries.

When students begin a new Mastery Badge they won't yet know a lot of the vocabulary associated with it, and that is okay. When completing a Discovering Lab, we are not yet concerned with vocabulary. Instead, we are only working to give students experience and exposure to the concepts. These are hands-on projects that allow the students to get their feet wet with the material.

When scientists make new discoveries, they too lack the vocabulary. Because they haven't yet made up these new words. In other words, a real-world scientist makes up the vocabulary words only after they make the discoveries. Thus, in the same way, it is okay that your learner doesn’t yet have the vocabulary words to describe what they are learning from a discovering lab. These words will come later on.

Students should complete the Discovering Labs carefully and do high-quality work. If they do not know what something means, they can and should research it using available resources such as books and online articles. **It will be tempting for students to look ahead to the instructional video or the article that go with the Mastery Badge.** Encourage them not to do this. They will gain more by doing their own research than by looking ahead.

How is doing research any different than looking ahead to the video or article that go with a Mastery Badge? It may seem like a subtle difference but it is important. By looking ahead to see what I teach in the video, they find answers that they will be tempted to accept as empirical. Because I am the teacher they will view what I say as the “correct” answer.

However, by doing their own research and watching outside videos, or reading outside articles, they will come across a wider array of opinions and views on a topic. They will have to read and evaluate these for themselves and decide what they believe. This is an important part of science. Scientists do research all the time. They read scientific journals and analyze articles as they try to learn what other scientists have already discovered.

It is okay for your learner to do research while completing a Discovering Lab (outside videos and articles) but resist the temptation to watch MY videos or read MY articles until after the lab is complete.

Scan the QR Code above to watch a video of me talking about Discovering Labs.

The Second Part of Every Mastery Badge Is Instructional Videos

Every Mastery Badge includes one or more instructional videos, where I teach your student the material. Again, it is very important that students complete the Discovering Lab before watching these videos. It seems like a small thing, but it is actually huge. We want students to make their own discoveries prior to listening to me talk about the science behind what they have observed or researched. We want them to have formed their own opinions before I bias them with my teaching.

These science videos are easily accessed using any device via a QR code located within each Mastery Badge. They are free and included with this book. On average each video is about 10-20 minutes long, though younger grades tend to be shorter, and older grades tend to be longer.

Encourage students to really pay attention and to pause whenever they don’t understand something. If they are confused they can rewind and rewatch, and even research online or in books to better understand a confusing topic. Your student’s goal should be to not move beyond the video until they fully understand what is being taught.

In the older grades students are asked to write down 10 things that they learn from each video. Which helps them organize their thoughts. In younger grades they draw pictures, or do a combination of both. This engages the parts of their brain that both listen and write, and helps to create greater pathways in the brain.

The Third Part of Every Mastery Badge Is Literacy Assignments

It goes without saying that reading and writing are very important. In fact, I don’t think you could overstate just how important these skills are. Reading and writing cut across all content areas and for that matter, pretty much all aspects of life. In science, we read whenever we are doing research, and we write whenever we are communicating our discoveries to other people.

Each Mastery Badge includes a Literacy Assignment. In this assignment, students read an assigned article on HandsomeScienceTeacher.com (accessible by QR code) and where they will then write about what they read. They will also complete an online quiz that goes along with the article in order to check their understanding.

Take the time to really stress the importance of “Reading For Understanding” and “Writing To Communicate.” Help students take ownership over their own reading and writing journeys. Younger students will need help reading and writing. Older students should be able to work on these literacy assignments more independently.

What does it mean to read for understanding?
All of us can relate to reading something while not being present in our own minds. All of us have experienced having read something only to get to the end of it, and realized that we didn’t retain any of what we read.

Reading For Understanding means that the student holds themselves accountable for their reading. This is an important learned skill. One strategy they can use is to stop every few sentences and intentionally ask themselves whether or not they are still paying attention. Other strategies include looking up vocabulary words they don’t understand, and repeating back in their own minds what they are learning after each paragraph.

There are many strategies that can be used when working to read for understanding. Discuss these with your learner, and teach them to hold themselves accountable, so that they don’t simply skim articles or race through them.

What does it mean to write to communicate?
Writing To Communicate means that students write clearly, concisely, and in a way that communicates complete thoughts. I tell students that it is helpful to imagine that they are writting to someone younger than themselves. We tend to write much better when we imagine that our audience is someone younger and less experienced than ourselves, than we do when we write to a teacher or an adult. Write in a way that instructs the reader, and helps them fully understand the topic.

This means planning your writing out, and being intentional in how you present your arguements.

Note that many of the writing prompts presented in these literacy assignments call for a student to write two or more paragraphs. However, they do not specify a definition for what a paragraph is. There is nothing in this curriculum that specifies a paragraph must be a certain number of sentences long, or that it must follow a particular standard format.

This is intentional, in order to allow this curriculum to play nice with other curriculums that you may be using in your homeschool journey. When a prompt says to write a paragraph, this should be interpreted according to whatever standard you are currently holding your students accountable against. If your definition of a paragraph is five sentences long, then students should write accordingly. If it eight sentences long, then likewise, you should have your students follow that standard.

Scan the QR code above to watch a video of me talking about how to Read For Understanding and Write To Communicate.

Online Quizzes
Every article includes an online quiz that checks your learning. This is an opportunity for your student to see how much they really understood from the reading assignment. A standard goal would be that students score at least 75% or higher on these quizzes before moving on. However, you are free to adapt this to your own use and alter the requirements to fit your own needs. If students don’t meet your expectation for them, have them re-read the article, and retake the quiz.

All Mastery Badges End With A Capstone Applying Labs

The capstone of every Mastery Badge is an Applying Lab. These Applying Labs should be the last thing that your student does before passing off a Mastery Badge. They are culminating activities that require your student to use everything they have learned throughout the Mastery Badge.

In order to truly prove their competency with a Mastery Badge, and that they are indeed ready to pass it off, students should complete these Applying Labs from memory. If your student is able to complete the entire lab from memory, then that is a pretty good indication that they are ready to pass off the badge.

Note an important caveat though. When I say “complete the lab by memory” I am not referring to data or experiment results. I am referring to concepts and procedures. It is okay for students to look up data. Indeed many of the Applying Labs specifically call for them to do this in the directions and procedures.

Part of being a scientist is knowing how to look up data and how to complete experiments and simulations. What we care about isn’t that they don’t look up any data. Rather it is that they don’t have to look up any of the procedures, or core content. **In other words, do they understand the science, and can they use it to solve problems?**

What Are Mastery Badges

As a middle school teacher, one of the things I learned very early on was how meaningless grades are. They truly are completely and absolutely worthless. Or, at least mostly so. **The only thing a grade really shows is how well a student is able to meet the arbitrary expectations of a particular teacher.**

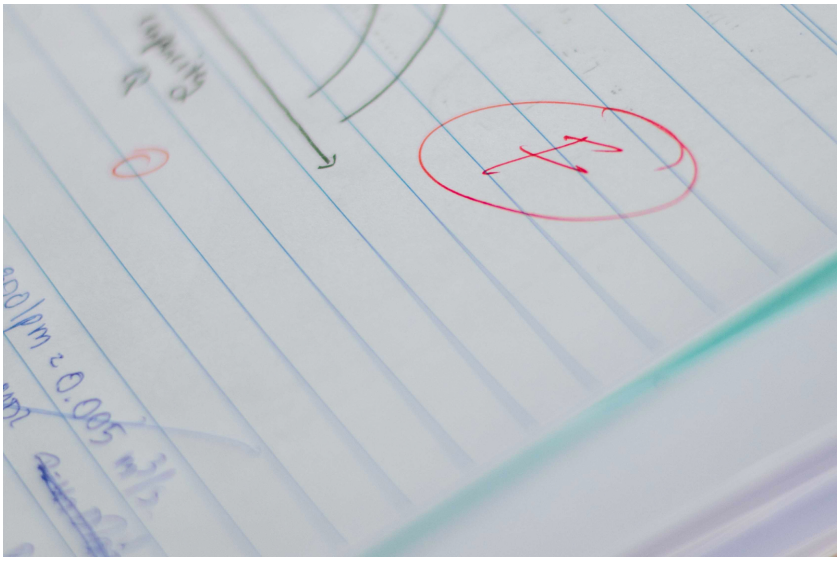
What they do not show though is how the grades of one teachers stack up against those of another. Johnny may earn an "A" in one class, but perhaps the same amount of work would have only earned him a "C" in another class down the hall.

More importantly neither grade tells us anything about how well Johnny actually understands the content. It is very possible to get an "A" in a class, without ever actually understanding anything that the teacher was teaching. All of us have undoubtedly BS'd (Bologna Sandwhiched) our way through a class. Often, it is enough to just turn in completed assignments and be likable to the teacher. Our work may not even have correct answers! Because teachers are busy, and if the assignment looks complete they will often give you a good grade on it, without actually checking your work (yes, teachers really do this).

An "A" can mean a lot of things. None of which are consistent from class to class, school to school, or teacher to teacher. But, what about an "F"?

Failure In Education Doesn't Make Any Sense To Me!

The biggest reason of all for my absolute loathing of the letter grading system has to do with the letter F! The big FAIL! What a stupid concept!



Children work really hard to try and learn something, and then when an arbitrary date on a calendar arrives the teacher decides that students are no longer allowed to continue trying.

These teachers pronounce any students who did not accomplish whatever task they were supposed to accomplish by that date to be FAILURES. Not because they can't learn. Not because they are unwilling to keep trying. But simply because the calendar says they are out of time, and its too bad for them!

I can't imagine doing that in any other aspect of childhood. Can you? Imagine if a piano teacher worked that way. A child sits down to play the piano, and the teacher tells them that they have two weeks to learn a song, and if they don't do it by then, they will be a failure. Imagine if a basketball coach worked that way! An eager little budding athlete shows up to practice each night and faithfully works to improve their free throw, only to have the coach tell them after two weeks that they are a failure.

Yet, this is exactly and precisely what we do in education. **It is almost child abuse in my opinion.** It destroys that child's sense of well-being for no valid reason whatsoever. Declaring students to be failures accomplishes no good purpose. It neither motivates nor instructs. It is simply cruel and lazy on the part of the education system. What needs to happen is, like the piano teacher or the basketball coach, constructive feedback be given so that the student can continue to progress.

Learning Doesn't Work The Way Public Education Insists On Teaching
Learning doesn't happen on the same timeline for every student. Some students learn some topics more quickly, while requiring addigtional time to learn others.

Returning to our example of a music teacher. A student who learns to play a song on the piano in three weeks is every bit as successful as the student who learned to play it in two. A child who needs a few extra seasons to master their free throw is every bit as valuable to a professional recruiter as the athlete who mastered it in a few months.

It is the final result that matters, not the time it took to get there.
Mastery Badges allow me to give each student their just reward when they complete a unit by mastering all the content associated with that unit. I created Mastery Badges during my first year as a public school teacher and I have never looked back.

Think of them as merit badges in scouting. In order to earn a Mastery Badge a student needs to complete all the assignments associated with each Mastery Badge. This includes passing off the quiz and completing the Capstone Applying Lab (from memory).

Student Self-Evaluation
Throughout each Mastery Badge your student will repeatedly be asked to stop and self-evaluate or "check" their own progress. **Research shows that the single most influential factor in a student's learning success has to do with their ability to self-evaluate.** Students who stop and review their own progress do significantly better than students who don't take ownership of their learning.

As their adult guide, make sure that students are taking the time to honestly evaluate and own their progress. At the end of each Mastery Badge, before awarding the badge to them, have students honestly look back over their work and reflect on their efforts.

Your Role As A Mastery Badge Counselor

Ultimately, it is up to you, the adult to determine whether or not a student has passed off a Mastery Badge. It is you who will act as their Mastery Badge Counselor, and who will be responsible for passing them off. Be honest, supportive, and kind in this role. Hold students accountable with constructive feedback. Discuss and decide together whether or not a student has achieved mastery of the content.

What Does Mastery Mean?

Mastery refers to the student's ability to recall and use the knowledge and practices taught in the Mastery Badge. This includes the content as well as the Science And Engineering Practices. If students are able to easily recall the content and vocabulary, and if they are able to use this content to solve real world problems then they have "mastered" it and are ready to move on. If not, that's okay! We are not in a rush. Take the time to go back over the content and fill in the gaps.

Save The Mastery Badge Certificates

The Mastery Badge Certificates in this book are meant to be saved in your homeschool files. They provide evidence to the state, should you ever be audited. Showing that your student has completed a valid and thorough science curriculum and that they mastered the concepts.

The Eight Science & Engineering Practices And The Crosscutting Concepts

Over the past decade most school systems have been moving toward the Next Generation Science Standards (NGSS), which are built using what is often referred to as 3D science. These three dimensions include content, crosscutting concepts, and the eight science and engineering practices.

HandsomeScienceTeacher's Science Curriculum is built on these three dimensions of science. You will see both the crosscutting concepts and the eight science and engineering practices throughout each Mastery Badge.

Sometimes national and state standards get things very wrong. Other times they get them very right. This is a case of the latter. The eight science and engineering practices are tools that help us create intelligent thinkers. They go way beyond the scientific method that you and I were taught when we were young.

The Eight Science & Engineering Practices Include:

- Ask Questions.
- Develop and Use Models.
- Plan and Carry out Investigations.
- Analyze and Interpret Data.
- Use Mathematics and Computational Thinking.
- Construct Explanations.
- Engage in Argument from Evidence.
- Obtain, Evaluate, and Communicate Information.

The purpose behind these practices is to help students become scientists. It isn't enough to simply memorize Newton's Laws of Motion. We want students to be able to use these laws to do actual science and to solve problems. We want to create scientifically minded students.

The more than 400 labs that your student will complete throughout their years working in this curriculum are built on these eight science and engineering practices, as well as on the crosscutting concepts.

The Crosscutting Concepts Include:

- Patterns
- Cause and Effect
- Scale, Proportion, and Quantity
- Systems and System Models
- Energy and Matter
- Structure and Function
- Stability and Change

Your Child Is Every Bit As Smart As Any Expert

Let's be honest. Your child is smarter than most experts. Sadly, in today's world, there are a lot of so-called experts, who really are not that intelligent. They may have degrees and lots of letters after their names, but they aren't thinkers.

They aren't the people who developed the domains they now rule over. Those great thinkers of the past came, created new knowledge, and then retired, inevitably passing on. The ideas they created were passed on to people who studied their works but never really learned to create new knowledge themselves. These experts are all too often devoted disciples of the great minds of the past, rather than self-informed thinkers in their own right.

This curriculum teaches your child to trust their own intelligence and to demand that the experts prove the claims they are making.

How Much Time To Spend On Each Mastery Badge

Each Mastery Badge is designed to take approximately two weeks to complete. You may finish some more quickly while others may take longer, but as a general rule plan your pacing around two weeks per badge.

Remember that you are not in a race. Mastery is far more important than finishing quickly. If a badge takes three or four weeks don’t worry about it. There is space in your schedule for some badges to run a little longer.

Goal: Complete 16 Badges Per School Year
The curriculum has been designed so that you only need to complete 16 badges per school year. If you complete these badges at the suggested pace of one every two weeks then you will only need 32 school weeks to finish all 16 badges. A typical school year includes 40 weeks, which means that you have time for Christmas break, Spring break, and also for some badges to take a little more time to finish.

If you finish in April, is that really so bad? You can move on if you want and work ahead, but it is also okay (and even encouraged) to just deschool a bit and enjoy an early summer break. Go outside, go for walks, and enjoy childhood!

These little ones only get one childhood!

Everything Your Student Needs To Know For Science

This curriculum covers everything your student needs to know for their entire science education. By the time they finish this curriculum if they work hard and keep themselves accountable to their own success, and if their results are like those of my other students, **they will score higher on standardized science tests than the vast majority of their peers**. Including those who have been taught in public and private schools.

Likewise, they will have a very strong footing preparing them for college and beyond. They won't just have memorized a bunch of disconnected random scientific facts in order to pass a class. Instead, they will have become functioning scientists, who think analytically and who are able to use data and evidence to solve real-world problems.

What Is My Agenda?

Unfortunately, in today's world parents have to be concerned about the various agendas hidden beneath the curriculum that is presented to their students. It is sad that this is the case, but it is a reality. Rest assured that great effort has gone into making sure that HandsomeScienceTeacher's Curriculum is completely agenda-free. Or at least in so far as it is possible for me to hide my own biases I have done so.

It is not my job to teach your student my values. It is my job to teach them science, and I stick to that very strictly. To that end, you have access to every lesson, every video, and every article before your child accesses them.

I have opinions, but I do my utmost to keep them out of the instruction.

Why I Created This Curriculum

I am going to be very honest here. Perhaps too honest, considering I just got done discussing how I do not allow agendas to surface in my teaching. I will permit myself this one single exception, and I hope you will forgive me for indulging in it.

I recently left the public education system. I did this because I have grown increasingly alarmed and concerned by some of the things I have seen. In my opinion, it is wrong, incredibly wrong, for school systems to teach students things without parental consent that may run counter to the values held in the student's home. Likewise, it is wrong for teachers to ask students to confide in them, and to

promise these students that the teacher will not disclose what has been confided to their parents. I have watched over the past decade as wonderful teachers have retired and as their younger replacements have come in much more willing to hide things from parents or promote their own agendas.

I have sat in meetings where teachers have openly discussed the most basic psychological needs of students while advocating against bringing parents into the loop and even suggesting that parents don’t have a right to be involved.

As a person who tries to live a life of integrity, I could frankly no longer be part of a system that increasingly advocates teaching ideas, values, and concepts that parents object to. Especially when these school systems have publicly denied doing the very thing they aggressively pursue behind closed doors.

In fairness, I have had some wonderful principals and have worked under fantastic leadership. However, as the years have progressed, those stepping up into new leadership positions have become increasingly willing to suppress parent access or mislead families in what is actually being covered in classes.

People of integrity teach in the light of day. They are not afraid to let parents see behind the curtain, and they certainly do not mislead parents. If you feel a conviction within your heart to teach something then its rightness should be so self-evident that it can withstand the scrutiny of parental oversight. If you believe that the parents are wrong, this can never justify lying or misrepresenting what is being taught.

The final straw for me came when I found myself debating fellow teachers over the rights of parents. I found myself exasperated by my inability to convince a growing number of my colleagues that it was wrong to lie. Each year more and more teachers were resolutely convinced of the rightness of their efforts to promote ideas contrary to the will of parents. As these attitudes crept into leadership mandates were beginning to be written that required teachers to participate in this kind of disingenuous behavior.

People of integrity do not behave in such a manner, and again, being someone who strives, though admittedly often falls short, of such an ideal, I felt I could no longer participate in such a system, and still maintain my honor.

Fortunately, due to my earlier success in business, I didn’t need the income, and though I loved working with my students, I made the decision to step into the world of homeschooling.

A Massive Wave of Homeschoolers

Beginning in 2019 a massive wave of students left public education to begin homeschooling. This is nothing short of an absolute tidal wave! We are talking about millions of families who made the decision to leave the school system. My family was among them. We took our children out of public schools and into the wonderful and exciting world of homeschooling.

I Wanted To Be Part of The Solution

I have a lot to offer my fellow homeschooling families. My journey in the education system has been long and thorough. My credentials are deep and extensive. I was part of the initial group of “influencers” though the word didn’t exist at that time, who built the first meaningful educational websites and portals. I have worked in the trenches designing national and state standards. I have taught in the classroom. I have all the degrees and credentials. I was teacher of the year and science chair of the year, and I understand homeschooling from the perspective of a parent.

I left public education at the end of 2021 so that I could begin to build this curriculum and **make it available completely free of charge** to you. There are other very excellent curriculums out there already. However, to my knowledge, there are very few if any others that are built on three-dimensional science or that take into account the best pedagogical strategies

Why Is This Curriculum Free?

Firstly, let me explain what I mean by free. Since many who encounter this curriculum will have paid for it. If you purchased this curriculum in book form, then yes, it was certainly not free. There was a cost associated with the binding and production of the physical book. However, many of you will have come across this curriculum in digital form. Which is freely available for download and distribution without remuneration to the author.

If you have a digital copy of this curriculum please share it! Post it freely. So long as you do not alter the file, you are welcome to print it, photocopy it, and use it to your heart's content.

My purpose in creating this curriculum has never been to make money. **It is and will always be about being part of the solution.** It is about giving back and helping to fix a very broken education system.

There are millions of families who have pulled their students out of the public education system. These parents showed great courage in these actions. It is scary to take your student's education into your own hands. The trends we are seeing right now in public education put many families in a very difficult spot. Torn between a desire to protect their kids from the predations of decaying agendas, and the utter terror around the many unknowns of teaching at home.

These families deserve the very best without having to spend a lot of money. It is to these families, that I offer this curriculum at no cost.

A lot of effort has gone into making sure that this curriculum meets the highest standards. Free can sometimes equate to low quality, however at least in the case of these materials, free does not mean that you are getting something that is less effective.

In my very experienced opinion, you are simply not going to find a better curriculum on the market, than what I have produced in these books.

Lab Supplies Available on HandsomeScienceTeacher.com

Having said that, I do sell lab supplies on my website www.HandsomeScienceTeacher.com. These supplies are provided at or below market cost, as a service to those families who may need them. Please do not feel pressured to buy these supplies from me. In fact, I go out of my way in the content to provide alternative supplies you can use if something is not available to you.

However, in those cases where families do desire to purchase (or rent) lab supplies they are available. If you are considering investing in lab supplies, may I recommend **The Lab Essentials Kit**, which contains the most common items used in the labs found throughout this program? These are the items that I find students usually do not have at home, including a small pocket microscope, a graduated cylinder, a precision scale, a compass, a metric ruler / magnifying glass, tweezers, specimen jars, safety glasses, and a few other odds and ends. This kit is sold significantly below retail value.

We also rent out a limited number of higher-end items including professional-grade microscopes, microscope slides, models, and various other things you might find in a school laboratory, but that you might not have access to at home.

To look through our inventory go to www.HandsomeScienceTeacher.com.

What Can You Do To Help?

In exchange for utilizing these free resources, I ask for very little in return. All I really hope is that you will pay it forward. If you find this curriculum useful, please consider doing some of the following to help others find it.

- Consider posting a .pdf of this curriculum (available on HandsomeScienceTeacher.com) to your various homeschool groups online.
- Consider leaving a review of this book on Amazon and in other places. This helps so much more than you know, because it pushes the book up further in their searches, helping others to find it.
- Consider subscribing to my YouTube channel. Again, this helps by lending credibility to the channel, and as a result, helping the science videos climb higher in the results.
- Post our videos anywhere and everywhere. Feel free to incorporate our YouTube videos into your own projects. So long as they are not edited, and are imported via our YouTube channel. This helps us get the word out about these resources.
- Talk about this curriculum with family and friends who also homeschool.

I am deeply grateful for any and all such gestures, that help me let families know about these free resources.

Errors In This Book

Creating these books was a monumental task that has already taken more than two years and thousands of hours to complete, and that will involve at minimum two more years of full-time work. While I am 100% confident in the scientific principles and the pedagogy, I am not 100% confident that there are not some typos or grammatical errors that I missed during editing.

A project like this usually is overseen by a vast team. Just look at the credits page of a typical textbook! I do not have a team to help me. For me, this has been a labor of love. That I have funded out of my own pocket, and that I am giving away freely once it is completed. When it is done it will include more than 15 textbooks with over 500,000 words of copy, hundreds of online articles with an additional 500,000 words of copy, and hundreds of videos and online quizzes.

A project this massively immense would take an education publishing firm 5-10 years to produce and would be overseen by a team of hundreds of people working full-time. The books would go through editors and proofreaders.

I am the writer, the editor, the proofreader, the video editor, the website programmer, and every other role associated with bringing this project to market. Each time I have gone over the text I have found errors. Again, not with the science or pedagogy, but with grammar, copy and paste errors, and so forth. It is absolutely inevitable that I missed some.

My options were to never release it or to put it out there and crowd-source the proofreading. In the end, I choose the latter.

If you find a mistake, please visit HandsomeScienceTeacher.com and report it. There is a link for reporting errors at the bottom of every page. I will correct the errors you report and update the project as we move forward together.

The Earth Has Cycles

What I Will Be Learning In This Mastery Badge:
In this mastery badge we will learn about the cycles of the Earth. Including The Water Cycle, The Carbon Cycle, and the Nitrogen Cycle. We will explore what causes these cycles to occur, and the major reservoirs of each one.

What This Packet Includes:
It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.

II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.

III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.

IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- What are cycles?
- What is a reservoir?
- What is a flux?
- The Water Cycle
- The Carbon Cycle
- The Nitrogen Cycle

Name:_____ Date:_____

Activity: Discovering The Water Cycle

Directions: Follow the directions below to recreate different parts of the water cycle.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about how water moves from one part of the water cycle to another.

Step 1. Let's Make Water Evaporate:

DO NOT DO THIS ALONE. MAKE SURE YOU HAVE ADULT SUPERVISION!

- Using a measuring cup, measure out exactly one cup of water.
- Place the water into a saucepan, and boil it.
- Once it begins to boil observe what you see, both in the pan and also above it.
- When the water starts to boil, set a timer for five minutes. After five minutes turn off the stove, and allow your water to cool for several minutes.
- Carefully pour the water back into the same measuring cup.

Did you observe any steam? Why do you think there was steam? What is steam?

Now that you have poured the water back into the measuring cup, do you still have the same amount of water that you started with? Is there still 1 cup of water? Explain your answer.

Where do you think the water went?

How does this relate to what we see in nature?

Step 2. Make Water Appear From Thin Air

This experiment works best in a humid environment. If you live in a dry climate, your results may not be as good, but try anyway and see what happens.

- Fill a glass jar to the top with ice and cold water. Be very careful not to get any water on the outside of the jar. If you do, dry the outside of the jar. It is important that you start this experiment with the outside of the jar being totally dry.
- Observe the jar for several minutes.

After several minutes of observation, you should begin to see water droplets forming on the outside of the glass jar. Why do you think this is happening?

It is tempting to think that the water on the outside of the glass is coming from inside the glass, but notice that all the water inside the glass is still there. Where do you think the water on the outside of the jar is coming from?

How does this relate to what we see in nature?

Final Questions:

Remember that your answers should ALWAYS be written using complete sentences.

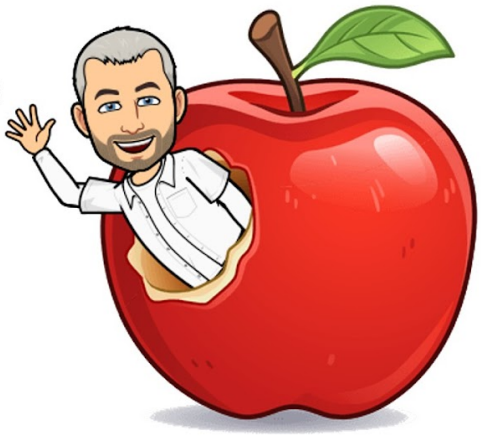
1. Where does water go when it evaporates?

2. Where does water come from when it condenses onto things like windows, grass, or other objects?

3. Where are some places on Earth where we often find water?

4. How did the water get to the places you described in the last question?

5. Where is the largest amount of water on Earth?



Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let’s watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

Take Your Time, Pause And Rewind As needed

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don’t understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

When you finish this video, you should have a good understanding of the concepts that have been taught. If you find yourself confused, rewind, and rewatch.

The Video For This Mastery Badge Can Be Opened Using This QR Code

This Mastery Badge includes one video:

Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

Check Point

Let’s make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I watched the video carefully, and paused to look up anything I didn’t understand.

Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

Ten Things I Learned From This Video

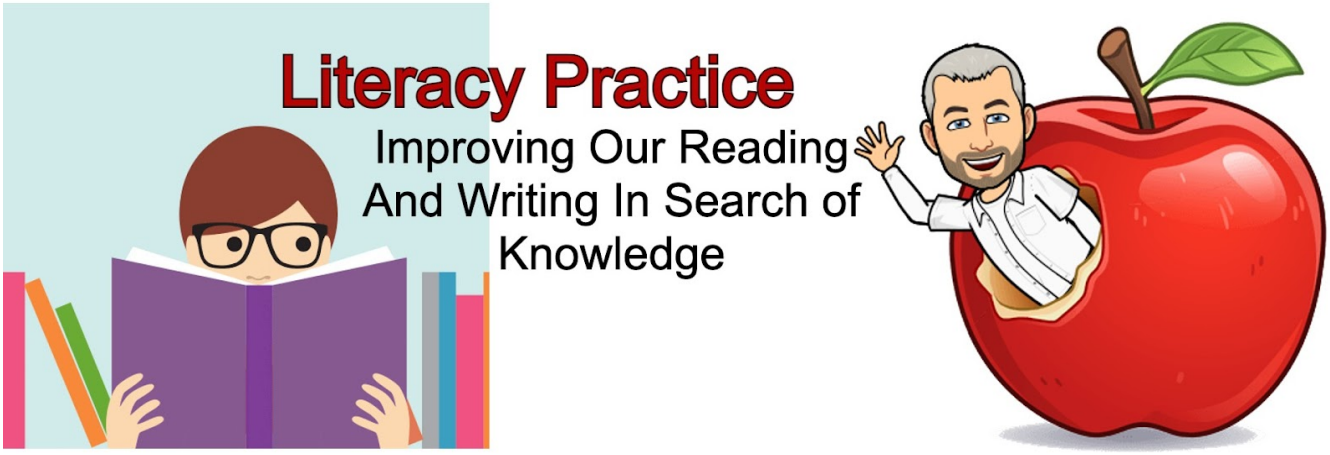
A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

Now, Let’s Connect These New Concepts To Things You Already Knew

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



Activity: Reading And Writing About Lunar Phases

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

1. **Practice Reading For Understanding**
   Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it.**

2. **Practice Writing To Communicate**
   Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:

Read The Assigned Article Carefully For Understanding.
https://handsomescienceteacher.com/Online-science-classes-kids/the-earths-cycles/

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

Check Point

Let’s make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

Now Let’s Write To Communicate

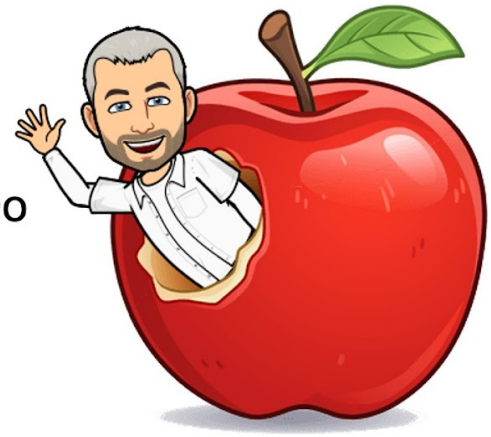
Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don’t rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words describing what a cycle is. Use examples from this article.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Directions: Draw diagrams of the Earth's Cycles

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To demonstrate that you understand the different cycles of the Earth.

Step 1. Drawing The Water Cycle

Draw and color a detailed picture of the water cycle.

Your picture must include evaporation, condensation, and precipitation, and must be in color. You can do this using crayons, colored pencils, or complete the drawing digitally.

Step 2. Drawing The Carbon Cycle

Draw and color a detailed picture of the carbon cycle. Your picture must include the atmosphere, the earth, and the biosphere.You can complete your drawing using crayons, colored pencils, or digitally.

Step 3. Drawing The Nitrogen Cycle

Draw and color a detailed picture of the Nitrogen Cycle. Your picture must include the atmosphere, the earth, plants, animals, and bacteria. You can complete your drawing using crayons, colored pencils, or digitally.

Final Questions:
Remember to write your answers using complete sentences.

1. What would happen if the water cycle stopped?

2. What would happen if too much carbon collected in one place, such as in the atmosphere?

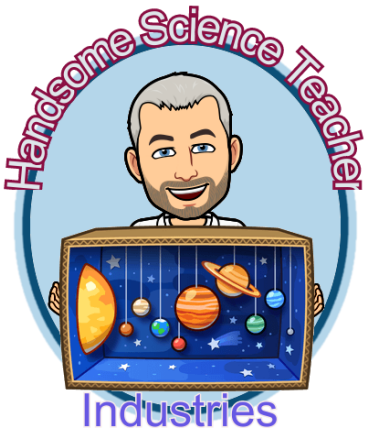
3. Why do you think it might be important for humans to balance their usage of renewable resources like water, carbon, and nitrogen?

4. What is a reservoir?

5. What is the biggest reservoir of water on Earth?

6. What is the biggest reservoir of carbon?

7. What is the biggest reservoir of nitrogen?



Congratulations! You Have Completed The Entire Mastery Badge
You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

Time To Evaluate Your Work
Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

My Self-Evaluation:
Based on the criteria listed above, I believe I have passed off this Mastery Badge because… (Be detailed ans specific)

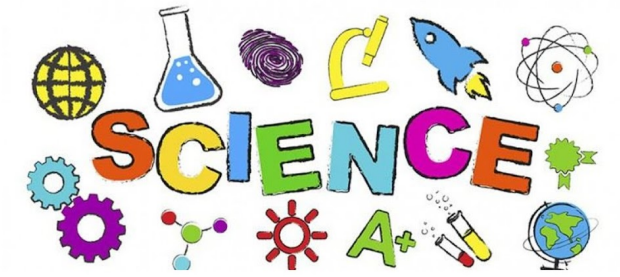
Mastery Badge Counselor Evaluation:
I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because… (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

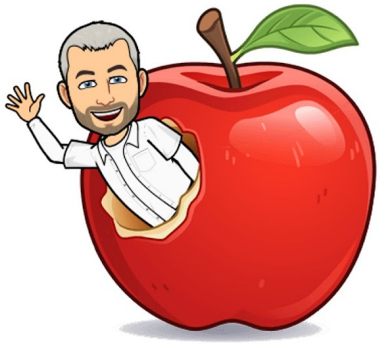
Student's Signature	Date	Signature of Mastery Badge Counselor	Date

Certificate For Your Homeschool Records

The following certificate which has been awarded through self-evaluation by the student, and also certified by a mastery badge counselor proves that the student listed thereon has completed all the work and has mastered all the concepts for the specified topic.

Keep this on file as evidence of your successful completion of this topic.
If audited by the State, these certificates stand as evidence that you have worked on and successfully completed a rigorous science curriculum.





Pollution

What I Will Be Learning In This Mastery Badge:
In this mastery badge we will learn about pollution, and its effects on the environment.

What This Packet Includes:
It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.

II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.

III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.

IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- What is pollution?
- Air pollution
- Water Pollution
- Soil Pollution
- Garbage
- How can we mitigate pollution?

Name:_____ Date:_____

Activity: Discovering Pollution

Directions: Follow the directions below to learn how pollution affects the Earth.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about how pollution affects different environments.

Part 1. Garbage And Debris

Let's find out how challenging it is to clean up garbage and debris. For this experiment, you need to create a small meadow.

- Place a large tortilla on the table, which will represent the ground.
- For fun, you can add little trees or animals around the meadow.
- Crumple up tiny pieces of paper and spread them out across the meadow.
- Now pick them up!

How hard was it to pick up the small pieces of garbage?

How hard do you think it would be to pick up actual garbage in a real meadow?

Kee your meadow, we will use it again later, but first…

Part 2. Water Pollution

Let's find out how challenging it is to clean up water pollution

- Fill a glass jar with clean fresh water.
- Add a few drops of food coloring to the jar to represent pollution.
- Observe what happens as the pollution spreads throughout the body of water.

What happens when a small amount of pollution is added to a large body of water?

How long does it take for the pollution to spread throughout the entire body of water?

How hard do you think it would be to get the pollution back out of the water?

Part 3. Soil Pollution

Let's find out how challenging it is to clean up soil pollution

- Take your polluted water back to the meadow that you created in part 1.
- Gently pour some of the polluted water onto the ground (tortilla) of your meadow.
- Observe what happens.
- Try to clean the pollution out of the tortilla without damaging it.

What happens when a small amount of pollution is added to the soil?

What happened when you tried to clean the pollution out of the tortilla?

How hard do you think it would be to get the pollution out of the soil?

Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let’s watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

Take Your Time, Pause And Rewind As needed

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don’t understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

When you finish this video, you should have a good understanding of the concepts that have been taught. If you find yourself confused, rewind, and rewatch.

The Video For This Mastery Badge Can Be Opened Using This QR Code

This Mastery Badge includes one video:

Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

Check Point

Let’s make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I watched the video carefully, and paused to look up anything I didn’t understand.

Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

Ten Things I Learned From This Video

A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

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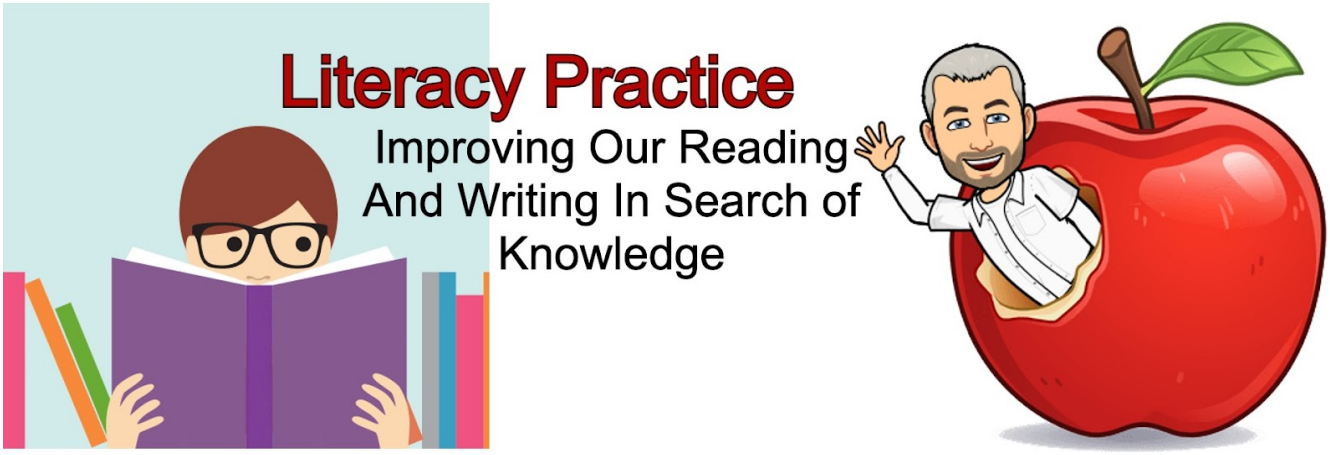
Now, Let’s Connect These New Concepts To Things You Already Knew

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



Activity: Reading And Writing About Lunar Phases

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

1. **Practice Reading For Understanding**
   Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it.**

2. **Practice Writing To Communicate**
   Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:

Read The Assigned Article Carefully For Understanding.

https://handsomescienceteacher.com/Online-science-classes-kids/pollution-and-mitigating-solutions/

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

Check Point

Let’s make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

Now Let’s Write To Communicate

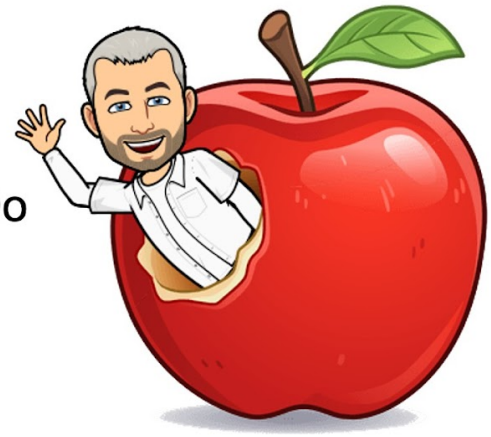
Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don’t rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words discussing the various types of pollution.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Directions: Solving The Pollution Problem

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To create a solution solving the pollution problem

Applying Pollution Through Engineering Solutions

A very important type of scientist is an engineer. Engineers use science to solve real-world problems. Which helps humankind continually improve. In this lab you are going to become an engineer. Your assignment as an engineer is to design a solution to help mitigate the problem of pollution.

Step 1. Select a form of pollution that you want to help reduce.

This can be any kind of pollution, such as water, air, soil, and trash. There are other types of pollution we did not talk about in this mastery badge which you can also select, such as noise pollution, light pollution, and so forth.

What type of pollution will you be trying to reduce? Why did you pick this type of pollution?

Step 2. Discuss the type of pollution you selected.

In your own words, describe the pollution type that you selected. How doe it impact the environment?

Step 3. Describe what you will do to help reduce this type of pollution.

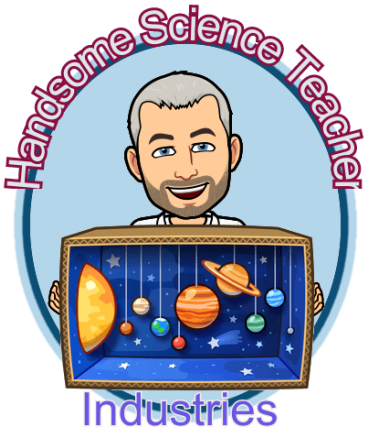
Note: It is tempting to think that all the best ideas are already taken. There are, after all, a lot of engineers working to solve these problems. However, the truth is that there are still many good ideas that no one has ever thought of. In fact, there are more good ideas that have not yet been thought of, than there are good ideas that have already been put into action by other engineers. Believe in yourself. You are smart enough to come up with a great idea.

What will you do to help reduce the type of pollution you selected?
Write a detailed explanation of your solution. It would also be helpful to include a diagram of your ideas.

Final Questions:

Remember to write your answers using complete sentences.

1. Which type of pollution do you think is the hardest to clean up? Why?
2. How does pollution harm the environment?
3. What can humans do to decrease pollution?
4. What can you personally do to decrease pollution?



Congratulations! You Have Completed The Entire Mastery Badge
You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

Time To Evaluate Your Work
Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

My Self-Evaluation:
Based on the criteria listed above, I believe I have passed off this Mastery Badge because… (Be detailed ans specific)

Mastery Badge Counselor Evaluation:
I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because… (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

Student's Signature	Date	Signature of Mastery Badge Counselor	Date

Certificate For Your Homeschool Records

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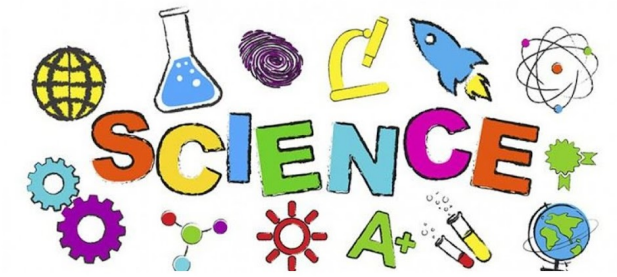
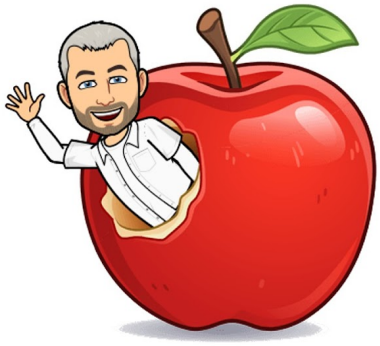




Filtering Water A STEM Lab

What I Will Be Learning In This Mastery Badge:
This is a STEM Mastery Badge. In this mastery badge we will work to solve problems surrounding water pollution.

What This Packet Includes:
It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.

II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.

III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.

IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- Solving the water pollution problem.
- How Mesh Size Affects Water Filtration
- Creating your own water pollution solution.
- What is the engineering process?

Name:_____ Date:_____

Activity: Discovering Pollution

Directions: You will follow the Engineering Design Process to create your own water filtration system.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: Create the best water filtration system in the entire universe.

Problem: A flood has polluted the local water supply. Other residents of the community have called on you to build a device to clean the water so that everyone can safely drink. You must build your filter using only supplies available to you around your home. Create the best possible water filtration system that you can.

Possible Supplies:

You are allowed to use anything that is already found around your home. Do not go buy something new for this lab. Possible supplies include the following items. But this is just a list to spark your imagination. You are allowed to use anything else that you might have laying around.

Water Bottle	Screen Window Material
Cotton Ball	Material From An Old Sheet
Muslin Square	Hay or Straw
Cotton Material Square	Charcol From A Fishtank Filter
Sand	Coffee Filter
Pea Gravel	Old Sock

Step 1: Ask

What types of materials might filter out both large and small particles found in water?

Do you think it matters what order you put these supplies in? Why or why not?

Step 2: Imagine

What are some ideas you can try as you design your water filter?

Step 3: Plan

Draw a picture of your design.

Step 4: Let’s Create Polluted Water

We need some dirty (but safe) water for this experiment. You will be drinking this water later, so don’t put anything in it that might be toxic. It is important to include things that are both large and also fine. Examples of large safe particles might include pepper, spices, rice, and so forth. Examples of fine particles might include cocoa powder, cool aide mix, and so forth. Make your water nice and polluted. Take time to stir it up super well, and give everything time to fully mix into the water.

Step 5: Build Your Filter

Now build an actual prototype based on the design you created earlier. To do this, take the supplies you planned to use, and assemble them into a water filter.

Step 6: Test Your Design

Test your design by pouring the polluted water you made earlier through your filter.

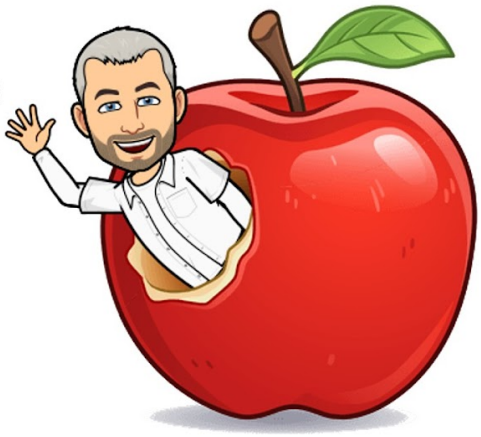
How long did it take for your water to pass through the filter?

Does your filtered water have any large particles in it?

How clear was your water?

Step 5: Improve By Using The Engineering Process

Engineers are always working to improve their designs. They are never satisfied with the way things are. Instead, they are constantly looking for little ways they can make their designs even better. Now that you have built and tested your water filter, what could you do to make it even better?



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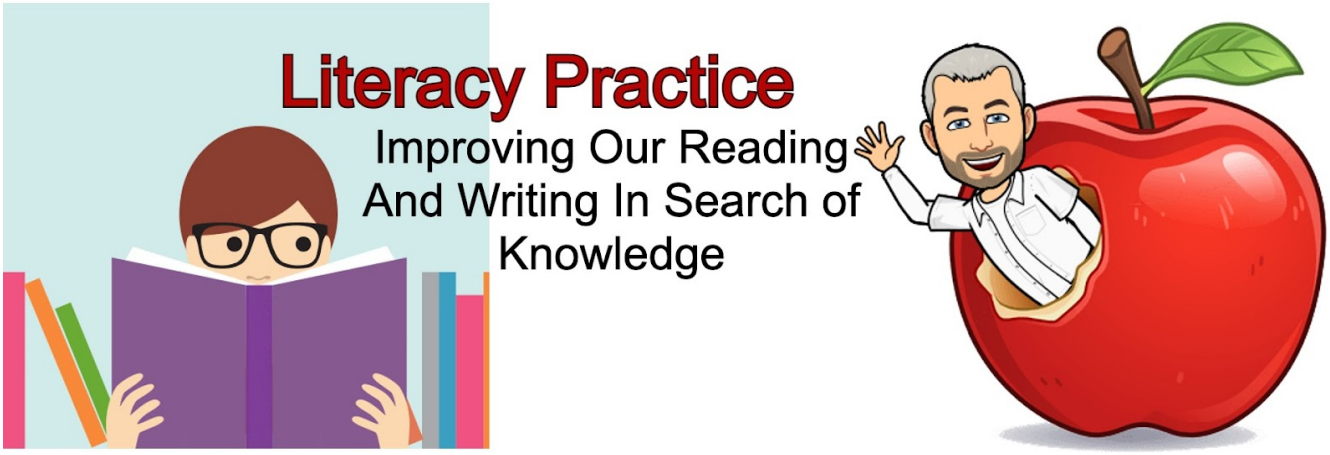

Activity: Reading And Writing

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

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Article:

Read The Assigned Article Carefully For Understanding.
https://handsomescienceteacher.com/Online-science-classes-kids/water-pollution-and-its-impact/

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Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

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Now Let’s Write To Communicate

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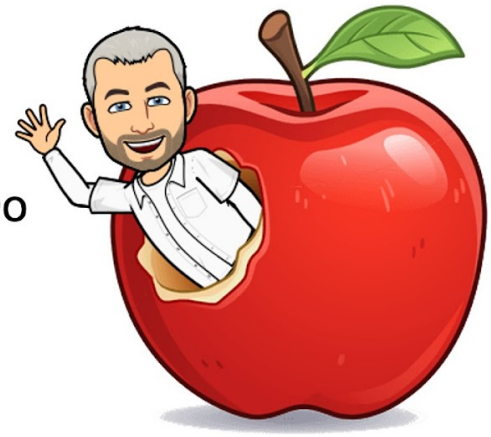
Writing Prompt: Write two paragraphs in your own words discussing water pollution and its causes.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Activity: Water Filter Part II

Directions: You will follow the Engineering Design Process to improve your water filter design.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: Create the best water filtration system in the entire universe.

Problem: In the last lab you created a water filter. Now we are going to make it even better. Remember, engineers are constantly working to improve their designs. Which is why technology is constantly advancing. In this lab you will work to improve your last design.

Possible Supplies:

You are allowed to use anything that is already found around your home. Do not go buy something new for this lab. Possible supplies include the following items. But this is just a list to spark your imagination. You are allowed to use anything else that you might have laying around.

Water Bottle	Screen Window Material
Cotton Ball	Material From An Old Sheet
Muslin Square	Hay or Straw
Cotton Material Square	Charcol From A Fishtank Filter
Sand	Coffee Filter
Pea Gravel	Old Sock

Step 1: Ask

What did you learn from your last design? What types of materials filter out both large and small particles found in water?

What did you learn in your last trial? How important was the order of the layers of supplies in successfully filtering the water?

Step 2: Imagine

How will you improve your design?

Step 3: Plan

Draw a picture of your design and insert it into the box.

Step 4: Create Polluted Water

We need some dirty (but safe) water for this experiment. You will be drinking this later, so don’t put anything in it that might be toxic. It is important to include things that are both large and also fine. Examples of large safe particles include pepper, spices, rice, and so forth. Examples of fine particles include cocoa powder, cool aide mix, and so forth.

Make your water nice and polluted. Take time to stir it up super well, and give everything time to fully mix with the water.

Step 5: Build Your New And Improved Filter

Build the prototype of your design following the improved plan you just created.

Step 6: Test Your Design

Test your design by pouring the polluted water you made earlier through your filter.How long did it take for your water to pass through the filter?

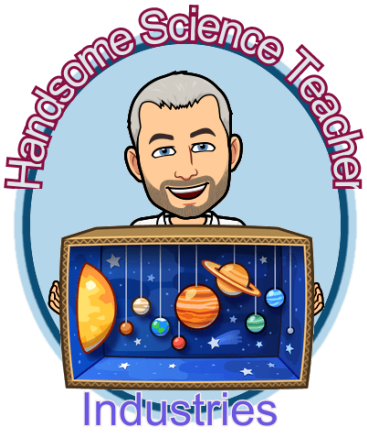
Does your filtered water have any large particles in it?

How clear was your water?

Describe your water sample:

Step 5: How did your second design compare to your first?

Our goal was to improve our design. Were you successful? Did your second design yield cleaner water than your first? Explain your results and how you achieved them.



Congratulations! You Have Completed The Entire Mastery Badge
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Time To Evaluate Your Work
Check each of the following to evaluate your work:

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2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

My Self-Evaluation:
Based on the criteria listed above, I believe I have passed off this Mastery Badge because… (Be detailed ans specific)

Mastery Badge Counselor Evaluation:
I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because… (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

Student's Signature	**Date**	**Signature of Mastery Badge Counselor**	**Date**

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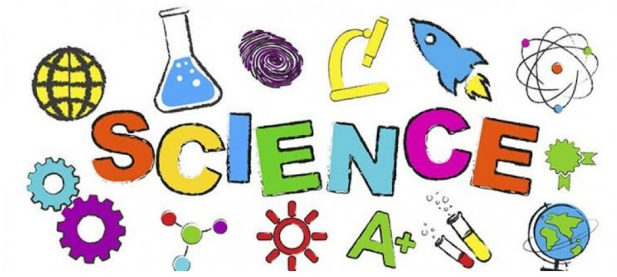
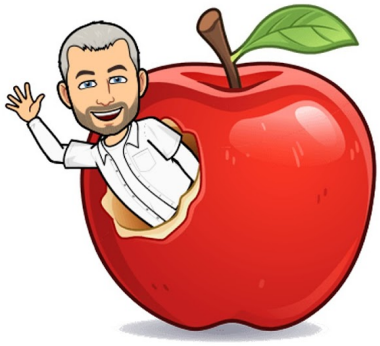




Soil Erosion A STEM Lab

What I Will Be Learning In This Mastery Badge:
In this mastery badge we will learn about soil erosion, including what it is, its causes, and how engineers are working to mitigate it.

What This Packet Includes:
It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.

II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.

III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.

IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- What is soil?
- How soil forms.
- How farmers select the perfect location for their farm.
- How farming affects the soil.
- What is soil erosion?
- How soil erosion affects the environment.
- What farmers and engineers are doing to mitigate soil erosion.

Name:_____ Date:_____

Activity: Discovering Soil Erosion.

Directions: Follow the instructions below to learn about soil erosion.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about soil erosion.

The solemn Farmer Sam. S. Sammerson The Second has been farming his stately estate for many seasons. Mr. Sammerson's father the saintly Samuel S. Sammerson Sr. started selling succulent salads many years ago. Sam S. Sammerson the Second is feeling sad and sick as he prepares to pass the stately estate on to his sophomoric son Sammy S. Sammerson The Second Second (also known as the third). Whew!

Anyway…

After generations of farming, their soil seems to be disappearing. As a result, their crops are not growing as well as they used to. The three of them have hired you to examine their field in order to determine what is happening to their soil.

Step 1. Building A Farm

Follow each step carefully to build a farm.

- Use a cookie sheet or other flat surface as a base for your farm. Turn the cookie sheet upside down so that water can easily drain off, without becoming trapped.
- Add a couple inches of soil on top of the cookie sheet. Spread the soil out so that its thickness is even. You can use potting soil from a local store, or collect soil from outside.

Step 2. Plant Crops In Your Soil

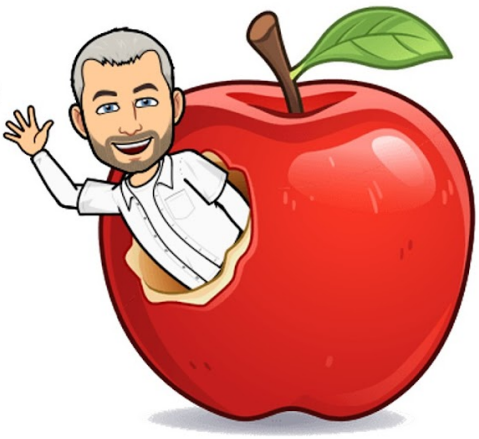
Use toothpicks to create little rows of corn. Place the toothpicks into your soil in even rows.

Step 3. Irrigate (Water) Your Crops
Be very careful as you complete this step. You don’t want to create a mess in your house. It is best to do this step outside. Fill a pitcher, kettle, or other container with water. Gently pour the water onto your farm and observe what happens.

Describe what happened when you watered your farm. Be very detailed. Pay close attention to what happens to the soil.

Final Questions:
Remember that your answers must ALWAYS be written in complete sentences.

1. Did any of your soil wash off of your farm (cookie sheet)?
2. Why do you think this happened?
3. How do you think this might relate to the real world? In other words, how do you think watering a farm might impact the soil on that farm?
4. Can you think of any reasons why soil on farms washes away, while the soil in natural habitats doesn’t?
5. Now that you have completed your study, write an explanation that you can share with the farmers explaining why their soil is disappearing.



Handsome Science Teacher One Take Videos

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Take Your Time, Pause And Rewind As needed

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On the next page, you will record your learning and connect it to things you already know.

Ten Things I Learned From This Video

A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

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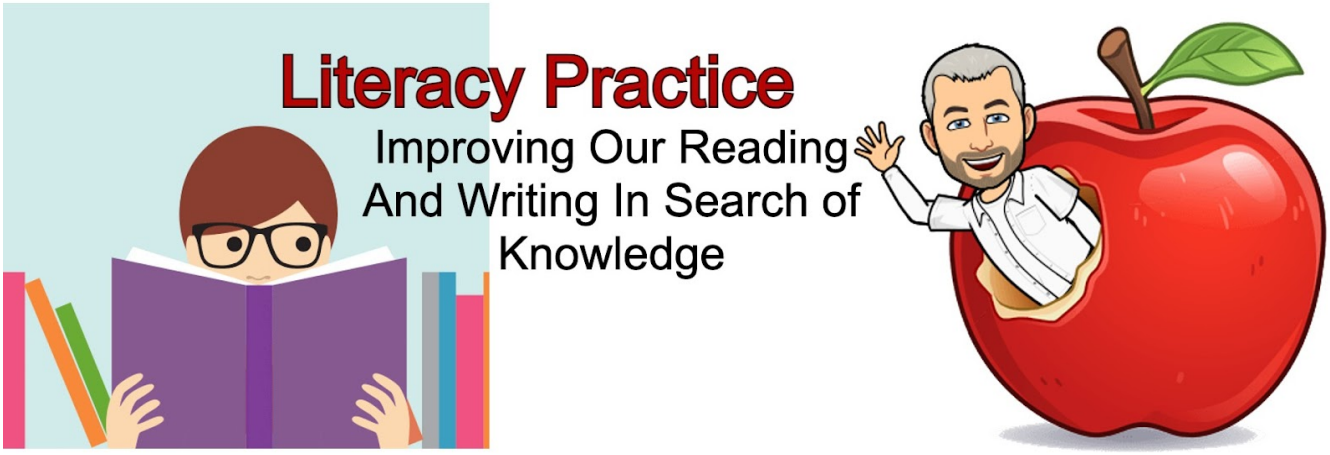
Now, Let’s Connect These New Concepts To Things You Already Knew

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



Activity: Reading And Writing

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

1. **Practice Reading For Understanding**
   Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it.**

2. **Practice Writing To Communicate**
   Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:

Read The Assigned Article Carefully For Understanding.
https://handsomescienceteacher.com/Online-science-classes-kids/soil-and-soil-formation/

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

Check Point

Let’s make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

Now Let’s Write To Communicate

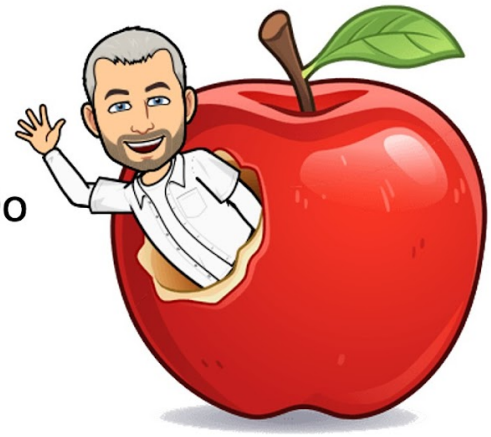
Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don’t rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words discussing the factors that influence the creation of soil.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Activity: Applying Soil Erosion

Directions: You will follow the Engineering Design Process to design a solution to protect the soil.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: Design a solution to reduce soil erosion.

Look at you! You are AMAZING! And because you're amazing, your reputation has spread throughout the county. Everyone is so impressed by how you solved the mystery of the Sammerson's disappearing soil. And now, all the other farmers have begun to notice that they too have soil issues.

They have all gotten together and hired you to come up with a solution to mitigate (reduce) their soil erosion troubles. In this lab, you will design and build a solution to reduce the amount of soil that disappears when these farmers water their crops.

Step 1. Building A Farm

Follow each step carefully to build a farm.

- Use a cookie sheet or other flat surface as a base for your farm. Turn the cookie sheet upside down so that water can easily drain off, without becoming trapped.
- Add a couple inches of soil on top of the cookie sheet. Spread the soil out so that its thickness is even. For soil you can use potting soil from a local store, or collect soil from outside.

Step 2. Plant Crops In Your Soil

Use toothpicks to create little rows of corn. Place the toothpicks into your soil in even rows.

Step 3. Design And Build A Solution

Scientists who design and build solutions are called engineers. These engineers are very important to society. They help society by coming up with new ideas, inventions, and solutions that improve our lives.

1. Before you build your solution, it is important to think about the problem and come with ideas for how you might address it. In the box below, describe the problem, and share some possible ideas for how you might solve this problem.

2. Before you build something, it is also important to sketch it out. Draw a diagram showing how you will reduce soil erosion around a farm.

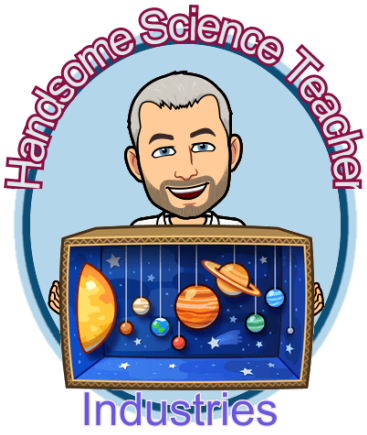
3. Now it is time to put your plan into action. Build your design. You can use any supplies that you have access to around your home. Once it is built, place it on, around, or in your farm.

Step 3. Irrigate (Water) Your Crops

Be very careful as you complete this step. You don’t want to create a mess in your house. It is best to do this step outside. Fill a pitcher, kettle, or other container with water. Gently pour the water onto your farm and observe what happens.

What happened this time? How does it compare to last time? Were you able to reduce the amount of soil that eroded away?

Engineers are always looking for ways to improve their designs. If you were to build another solution what would you change? What could you do to make your design even better?



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Time To Evaluate Your Work
Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
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My Self-Evaluation:
Based on the criteria listed above, I believe I have passed off this Mastery Badge because… (Be detailed ans specific)

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Student's Signature	**Date**	**Signature of Mastery Badge Counselor**	**Date**

Certificate For Your Homeschool Records

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Biotic & Abiotic Factors

What I Will Be Learning In This Mastery Badge:
In this mastery badge we will be learning about the biotic and abiotic factors that are found in an environment. We will also learn about the relationship between predators and prey, which is an example of a biotic factor.

What This Packet Includes:
It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.

II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.

III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.

IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- Biotic factors in an environment
- Abiotic factors in an environment
- Examples of each
- Predators and prey
- What happens when there are too many predators?
- What happens when there isn't enough prey?

Name:_____ Date:_____

Activity: Discovering Biotic And Abiotic Factors

Directions: Find ten things around your home or neighborhood and record them in the chart below. For each item list whether they are living, once living (dead), or nonliving, and explain how you know.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about the difference between living and nonliving things.

Complete the chart below based on your own observations of things around your home and neighborhood.

Object Name	Living, Once Living, or Nonliving	How do you know?
Fallen log	Once living	Because it was once alive, but after falling down, it died.
Rock	Nonliving	
Insect		

Thinking Questions

Scientists think about the world around them and do their best to explain their conclusions to others. As a scientist, you will need to learn to support any conclusions you draw with evidence. Answer each thinking question using complete sentences. Do your best to explain your thoughts so that your answers will make sense to someone else who reads them.

1. What do you think makes living things different from non-living things? Be detailed.

2. Do you think a dead thing is the same as, or different from a non-living thing? Explain your answer.

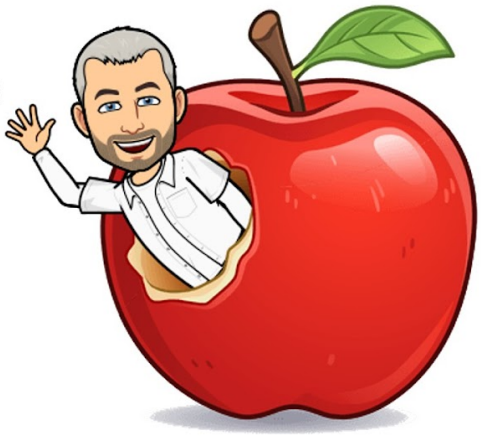
3. How can you tell if something is alive?

4. How can you tell if something is dead?

5. How can you tell if something is non-living?

6. As you completed the chart above, were any of the things you observed difficult to classify? Explain your answer.

7. Draw a picture of an environment showing at least three living things, three nonliving things, and three once-living things.



Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let’s watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

Take Your Time, Pause And Rewind As needed

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The Videos For This Mastery Badge Can Be Opened Using These QR Codes

This Mastery Badge includes two videos:

Watch The Assigned Science Videos

Scan These QR Codes To Open And Watch The Assigned Videos For This Mastery Badge

Check Point

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Recording Your Learning

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Ten Things I Learned From This Video

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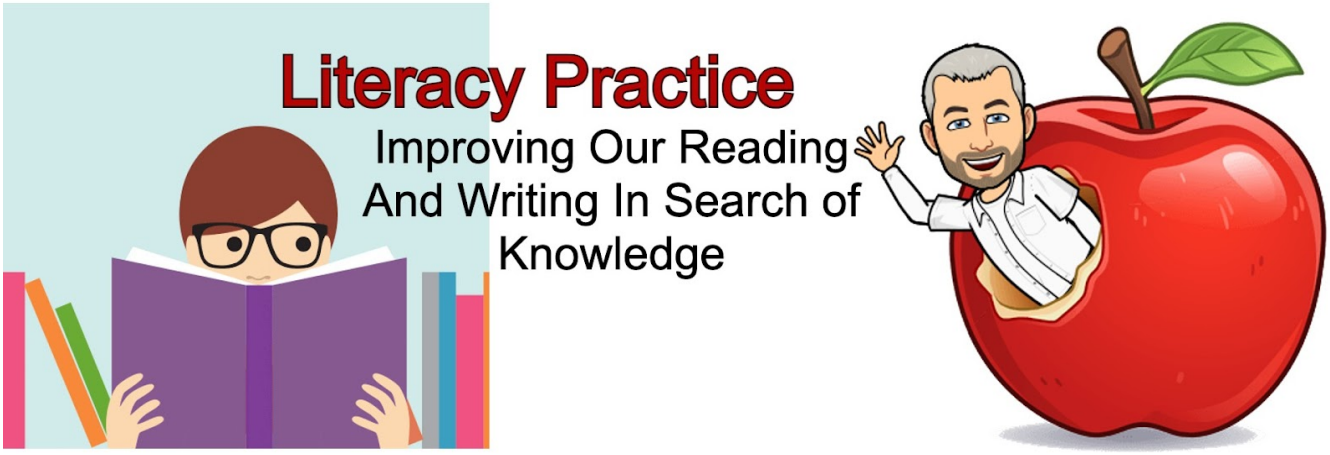

Activity: Reading And Writing Predators And Prey

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.

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Name:_____ Date:_____

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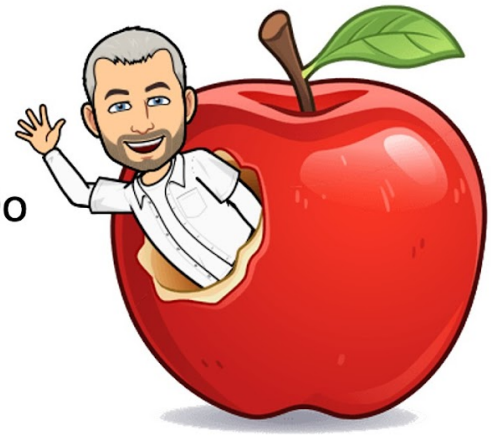
Proving That We Can Do It Ourselves



Activity: Applying Predator And Prey

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Goal: To learn as much as you can about the difference between living and nonliving things.

A local forest has seen a dramatic increase in the number of bunnies foraging through the forest floor. These bunnies are eating all of the natural vegetation that grows along the basin of the forest, and have begin to leave the forest in search of food. Which has resulted in these bunnies being spotted in the yards and gardens of local townspeople.

You have been appointed by the mayor to find out what is occurring and to propose a solution to the problem.

Observation Before Data:

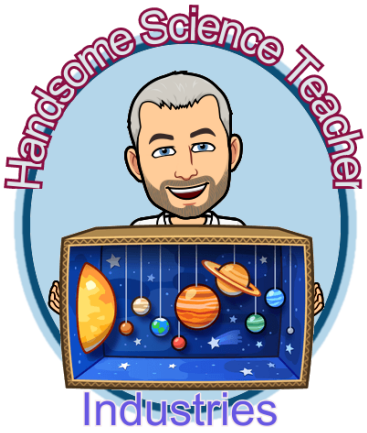
Scientists often make observations using their best judgment, based on what they perceive with their own senses, such as sight and sound. What are your initial observations? What do your senses tell you occurs in an environment when predators, prey, and plants interact with each other that might result in the problems being seen in this community? Be detailed and specific.

Supporting Your Observations With Data And Evidence:

Scientists must back up their conclusions using data and evidence to prove that they are right. Without evidence, your conclusions are just opinions. Using the Internet or books, do some research. Find evidence in the form of studies, simulations, or articles that support your earlier conclusions about why the rabbit population might be increasing. Then share at least two of the sources you found. Summarize each source below.

Final Conclusions:

Write a short explanation for why the population of rabbits is increasing in the forest, that could be submitted to the mayor. In your explanation share evidence from your research to help strengthen your arguments.



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Check each of the following to evaluate your work:

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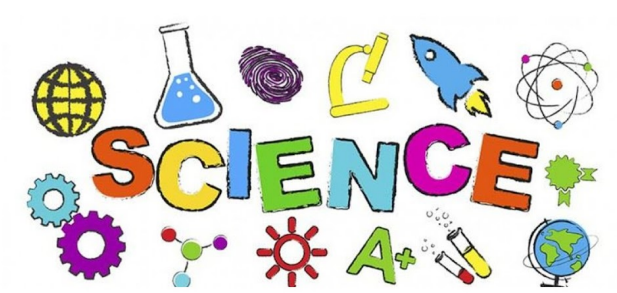

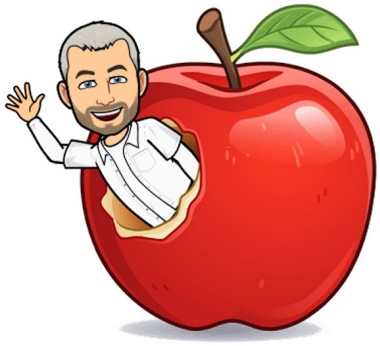

Food Webs

What I Will Be Learning In This Mastery Badge:
In this mastery badge we will learn how energy moves through an environment.

What This Packet Includes:
It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.

II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.

III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.

IV. **Applying Lab**
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Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- What are food chains?
- What are food webs?
- Producers
- Primary Consumers
- Secondary Consumers
- Autotrophs and heterotrophs
- Herbivores, Omnivores, Carnivores
- The 10% Rule

Name:_____ Date:_____

Activity: Discovering Food Webs

Directions: Follow the steps below to learn as much as you can about how animals get the energy they need to thrive in their environments. If you are unable to go outside, you can pick any animal that you want to complete this assignment. Make sure you record all of your answers using complete sentences.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about how energy moves through an ecosystem

Step 1: Go Outside (With Parental Permission). Select an animal to study. What animal did you pick?

Step 2: The animal you listed needs energy to survive. It gets this energy by eating. Observe your animal carefully. What do you think it eats? Name at least three things. Hint: It is okay to research this online if you get stuck.

a.

b.

c.

Step 3: As you discovered in the last step, the animal you are studying eats foods that have energy locked up inside them. Whether they eat plants or other animals. Where do you think these things got their energy from? Do they eat other things, or are they plants? If they are plants, where do these plants get their energy from? Explain how each of the foods you listed in the previous step gets its energy.

a.

b.

c.

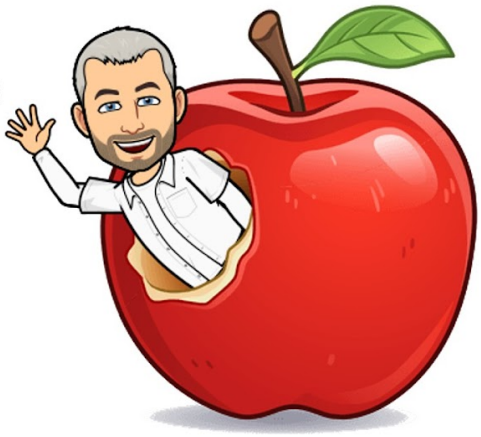
Step 4: Is your animal at the top of the food chain, or does something else potentially eat it? let's consider what happens above this animal in a food chain. Do any predators eat the animal you are studying? Explain your answer. Even if your animal is a top-level predator, it can't live forever. What happens to its body when it dies?

Step 5: Based on the answers that your earlier answers, explain how you think energy moves from one living thing to another in an environment.

Final Questions:

Remember to answer each final question using complete sentences.

1. Where do living things get their food or energy from?
2. What role do plants play in providing food to an ecosystem?
3. What role do animals have when it comes to food and energy in an ecosystem?



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The Video For This Mastery Badge Can Be Opened Using This QR Code

This Mastery Badge includes one video:

Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

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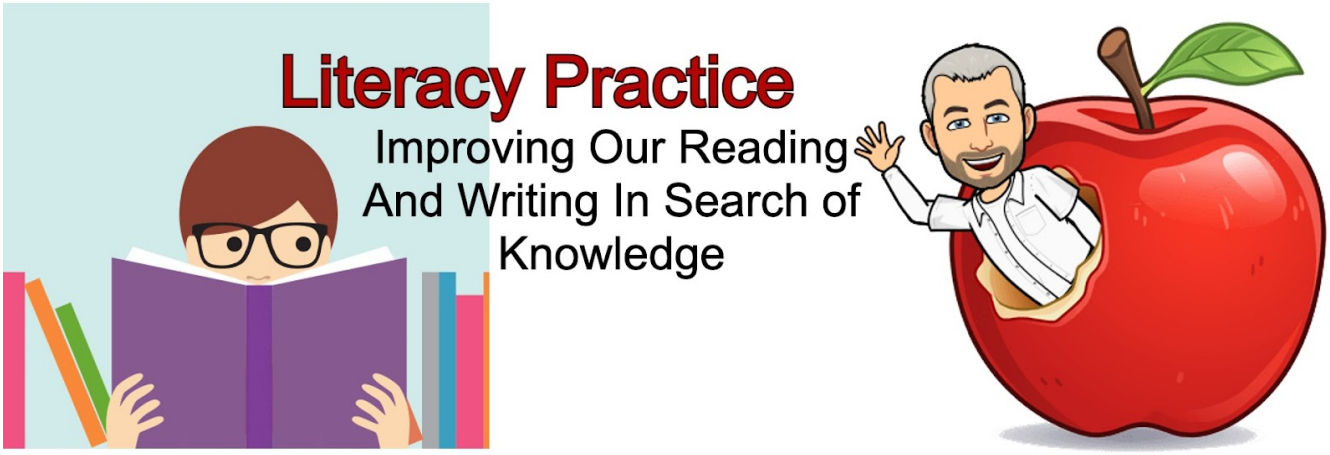

Activity: Reading And Writing About Food Webs

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

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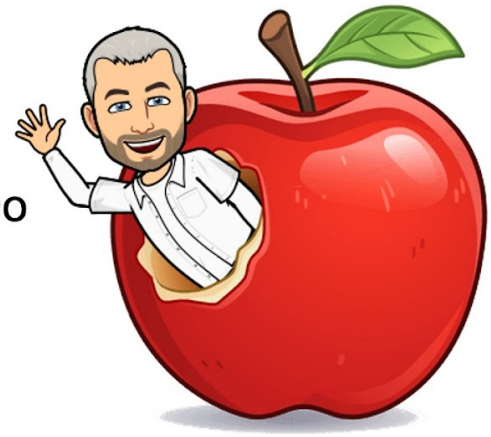
Writing Prompt: Write two paragraphs in your own words explaining how producers, consumers, and decomposers interact in an environment.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Activity: Applying Food Webs

Directions: You are going to create your own food web model. Your model can be a diagram or it can be 3d. Complete each step below to build your own model.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To create your own model of a food web

Step 1: Describe whether each of the following is a producer, consumer, or decomposer.

Item	Producer or Consumer
Sun	Neither
Grass	Producer
Zebra	Consumer
Mushroom	Decomposer
Lion	
Fungi	
Worm	
Tree	
Beatle	

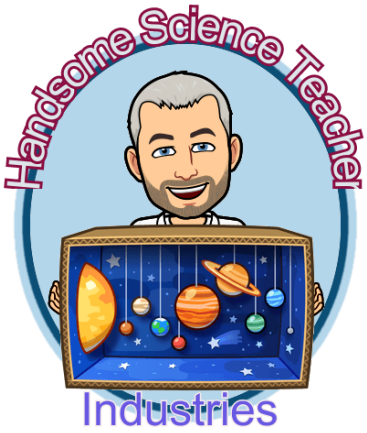
Step 2: Add two more consumers, two more producers, and two more decomposers of your own to this list.

Item	Producer or Consumer
	Consumer
	Consumer
	Producer
	Producer
	Decomposer
	Decomposer

Step 3: To pass off this Mastery Badge, you need to create a detailed model including **ALL** of the producers, consumers, and decomposers that you listed above. Your model can be a diagram, a drawing, or it can be 3d, such as made out of clay or foam.

Include each of the following:

1. Each item listed above.
2. Arrows showing how energy moves from the Sun, through producers, and from one consumer to another.
3. An explanation of the 10% Rule



Congratulations! You Have Completed The Entire Mastery Badge
You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

Time To Evaluate Your Work
Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

My Self-Evaluation:
Based on the criteria listed above, I believe I have passed off this Mastery Badge because… (Be detailed ans specific)

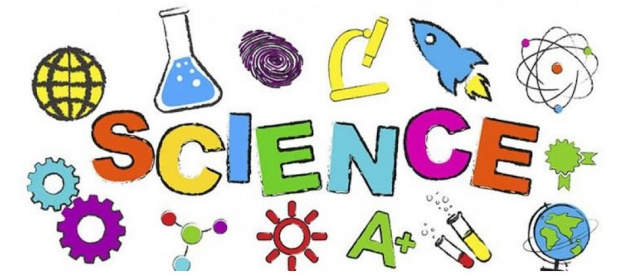
Mastery Badge Counselor Evaluation:
I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because… (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

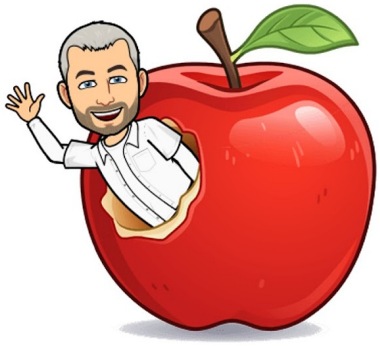
Student's Signature	Date	Signature of Mastery Badge Counselor	Date

Certificate For Your Homeschool Records

The following certificate which has been awarded through self-evaluation by the student, and also certified by a mastery badge counselor proves that the student listed thereon has completed all the work and has mastered all the concepts for the specified topic.

Keep this on file as evidence of your successful completion of this topic.
If audited by the State, these certificates stand as evidence that you have worked on and successfully completed a rigorous science curriculum.





Anatomy of Waves

What I Will Be Learning In This Mastery Badge:
This mastery badge is the first in a series of badges that we will be doing that explore the properties and uses of waves. In this first wave mastery badge our goal is simply to understand the anatomy of a wave, including what a wave is, what causes waves, and what are the basic parts of a wave.

What This Packet Includes:
It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.

II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.

III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.

IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- What are waves?
- How does energy move through substances, or through empty space?
- What is actually moving in a wave?
- Wavelength
- Frequency
- Wave Crest
- Wave Trough

Name:_____ Date:_____

Activity: Discovering Waves

Directions: Using a slinky or rope try to learn as much as you can about how waves work. You are the scientist! You are making your own discoveries!

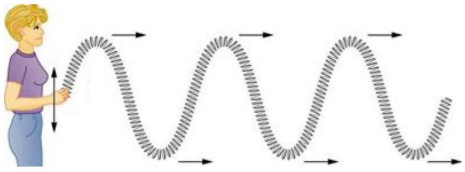
Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about how energy moves from one place to another in the form of waves.

Step 1: What do waves look like?

- **Step 1:** Get a slinky or a rope, and stretch it out about five feet between you and someone else. Don't stretch it too far or you will break it.
- **Step 2:** Carefully shake the slinky or rope back and forth to create waves.
- **Step 3:** Experiment with speed and energy. How does changing these factors affect what the waves look like?



Draw a picture of what your waves looked like when you moved the slinky or rope around.

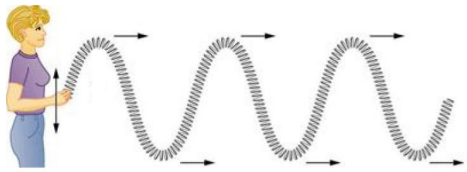
How did changing the amount of force or energy impact your waves? How did changing the speed of your movements impact your waves?

Pretend that you are describing the waves that you created to a friend over the phone. Remember that they cannot see your waves. How would you describe them? Be detailed.

Step 2: How do waves move?

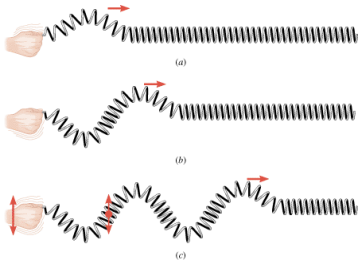
This step is very similar to what we just did. Except that this time we are trying to understand how waves move. Whereas in the last step we were trying to understand what they look like..

- **Step 1:** Get a slinky or a rope, and stretch it out about five feet between you and someone else. Don't stretch it too far or you will break it.
- **Step 2:** Carefully shake the slinky or rope back and forth to create waves.
- **Step 3:** Experiment with speed and energy. How does changing these factors affect how the waves move?



Draw a diagram showing how waves move from one end of a slinky or rope to the other.

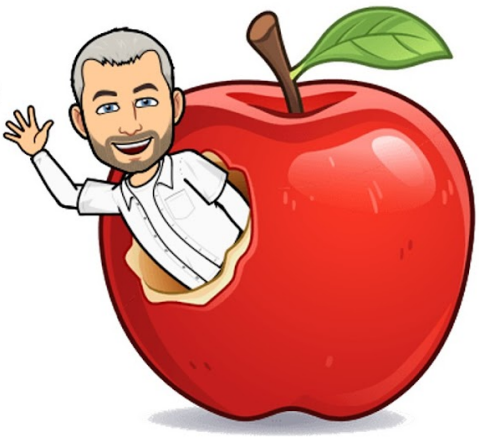
Step 3: How do waves change?



- **Step 1:** Get a slinky, and stretch it out about five feet between you and a partner. Don't stretch it too far or you will break it.
- **Step 2:** Carefully shake it back and forth to create waves.
- **Step 3:** Observe how the waves move.
- **Step 4:** Increase the amount of energy applied to the slinky.
- **Step 5:** Decrease the amount of energy being applied to the slinky.

Draw a diagram showing how waves look when **more** energy is added to them.

Draw a diagram showing how waves look when **less** energy is added to them.



Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

Take Your Time, Pause And Rewind As needed

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don't understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

When you finish this video, you should have a good understanding of the concepts that have been taught. If you find yourself confused, rewind, and rewatch.

The Videos For This Mastery Badge Can Be Opened Using These QR Codes

This Mastery Badge includes two videos:

Watch The Assigned Science Videos

Scan These QR Codes To Open And Watch The Assigned Videos For This Mastery Badge

Check Point

Let's make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I watched the video carefully, and paused to look up anything I didn't understand.

Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

Ten Things I Learned From This Video

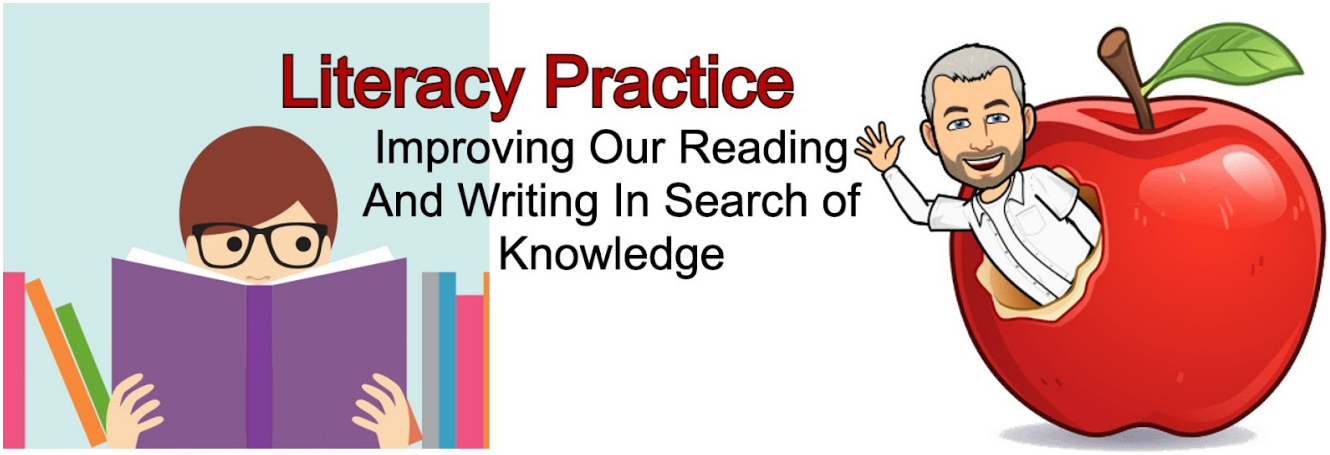
A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

Now, Let’s Connect These New Concepts To Things You Already Knew

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



Activity: Reading And Writing About Waves

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

1. **Practice Reading For Understanding**
   Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it.**

2. **Practice Writing To Communicate**
   Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:

Read The Assigned Article Carefully For Understanding.
https://handsomescienceteacher.com/Online-science-classes-kids/all-about-waves/

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

Check Point

Let’s make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

Now Let’s Write To Communicate

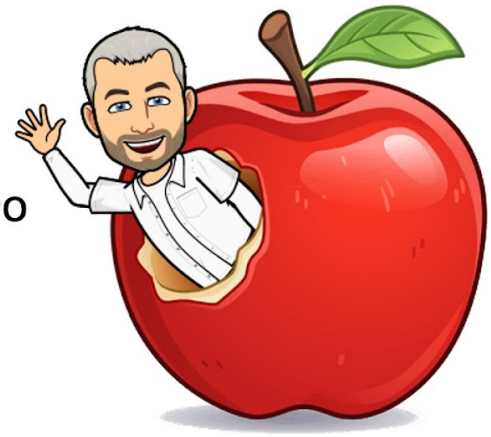
Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don’t rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words explaining the parts of a wave.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Activity: Applying Waves To Solve A Problem

Directions: Using what you know about waves, you are going to move a ball from one side of a sheet or blanket to the other. You will then create a model illustrating what you learned.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To create your own model of a wave

Problem: Get the ball to the other side of the blanket!

Hold a sheet or a blanket between your hands and the hands of another person. When you are both ready, try to get a small ball such as a tennis ball to move from your side of the blanket towards the other person's side without it bouncing more than a few inches high and without it falling off. Have them try to move the ball toward your side.

Set a timer for two minutes. When the timer goes off, the winner is the person who got the ball closest to the other person.

Round 1

Who won? Why did they win?

What kind of waves helped win? (big waves, small waves, fast waves, slow waves, etc)

Round 2

Who won? Why did they win?

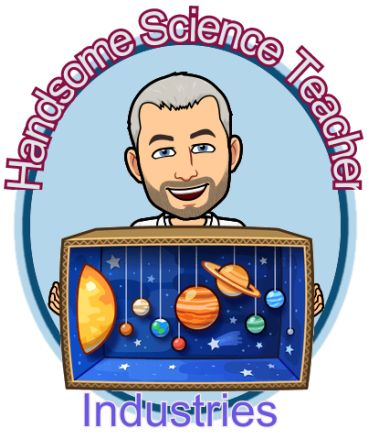
What is amplitude? How does increasing energy/amplitude affect who wins?

Round 3

Who won? Why did they win?

What is wavelength? How does wavelength affect who wins?

Model: Draw a diagram showing what happened on each of the three trials (rounds) above. Make sure your diagrams are labeled, showing crest, trough, wavelength, and amplitude.



Congratulations! You Have Completed The Entire Mastery Badge
You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

Time To Evaluate Your Work
Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

My Self-Evaluation:
Based on the criteria listed above, I believe I have passed off this Mastery Badge because… (Be detailed ans specific)

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Student's Signature	Date	Signature of Mastery Badge Counselor	Date

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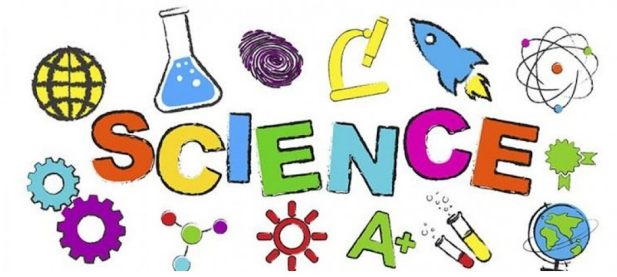

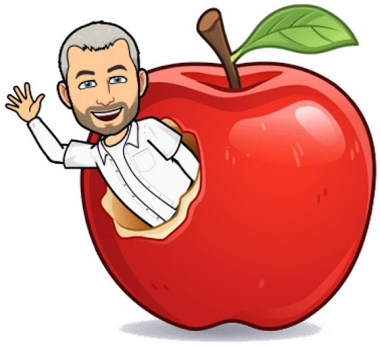

Frequency vs Amplitude of A Wave

What I Will Be Learning In This Mastery Badge:
This mastery badge builds on our knowledge and understanding of waves by looking at how energy alters the shape (amplitude) of a wave. By the time you complete this mastery badge you will have a good understanding of how increasing the energy of a wave changes it. We will also explore the difference between amplitude and frequency.

What This Packet Includes:
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Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.

IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- What does amplitude refer to?
- How does energy affect amplitude?
- What does frequency refer to?
- How does frequency affect a wave?
- Use basic math skills to analyze amplitude

Name:_____ Date:_____

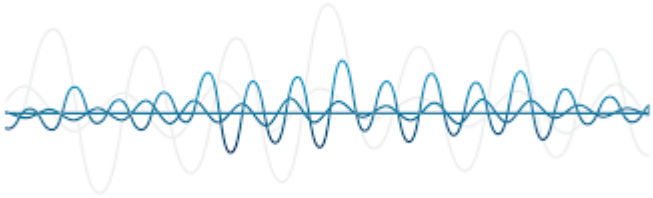
Activity: Discovering Amplitude

Directions: Follow the steps below, to learn about wave energy.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about how changes in energy impact waves.



A Note About This Lab:
For this lab, you will be making sounds and observing the waves that result. To do this, you will need to download an app that records your voice and then generates sound waves from it. It is impossible for us to recommend such an app without this book becoming dated since new apps are constantly being released. However, there are many good apps available with this functionality.

Part 1: Measuring Quiet Deep Sounds

Question: What do soft (quiet) low-pitch (deep voice) sound waves look like?
To find out, you will need to experiment, by making these sounds with your voice and looking at the waves that result.

Record The Sound Waves Below

Draw a picture of your sound waves below as best as you can. It doesn't have to be perfect, just close.

Use words to describe what low-pitched soft sound waves look like.

Part 2: Measuring Loud Deep Sounds

Question: What do loud, low-pitch (deep voice) sound waves look like?

To find out, you will need to experiment, by making these sounds with your voice and looking at the waves.

Record The Sound Waves Below

Draw a picture of your sound waves below as best as you can. It doesn't have to be perfect, just close.

Use words to describe how these waves look.

How is it different from your last sound wave?

Part 3: Measuring Soft High-Pitched Sounds

Question: What do soft (quiet) high pitch (high voice) sound waves look like?

To find out, you will need to experiment, by making these sounds with your voice and looking at the waves.

Record The Sound Waves Below

Draw a picture of your sound waves below as best as you can. It doesn't have to be perfect, just close.

Use words to describe how these waves look.

How is it different from your last sound wave?

Part 4: Measuring Loud High-Pitched Sounds

Question: What do loud high pitch (high voice) sound waves look like?

To find out, you will need to experiment, by making these sounds with your voice and looking at the waves.

Record The Sound Waves Below

Draw a picture of your sound waves below as best as you can. It doesn't have to be perfect, just close.

Use words to describe how these waves look.

How is it different from your last sound wave?

Final Questions:

Remember to answer your final questions using complete sentences.

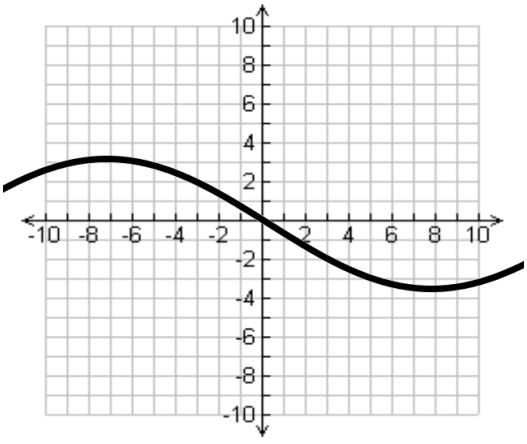
1. What is amplitude?

2. Based on your own observations what had a greater amplitude, quiet sounds or loud sounds?

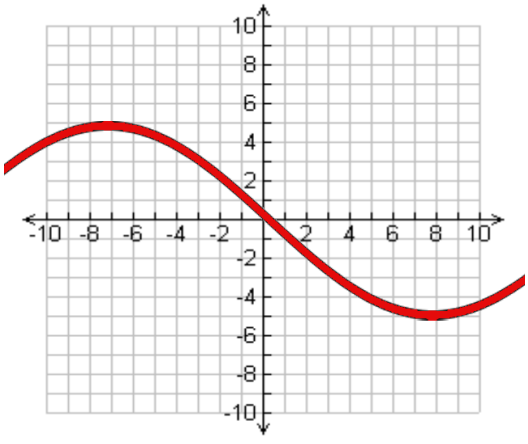
3. Based on your own observations what had a greater amplitude, low-pitched sounds or high-pitched sounds?

Using Math To Solve Amplitude Problems

1. What is the amplitude of this wave?



2. What is the amplitude of this wave?



3. Look at the waves from questions 1 and 2. Which has the highest amplitude?

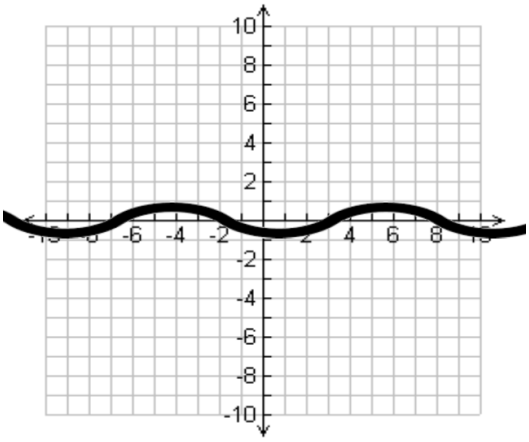
4. Look at the waves from questions 1 and 2. Calculate the difference between the two waves.

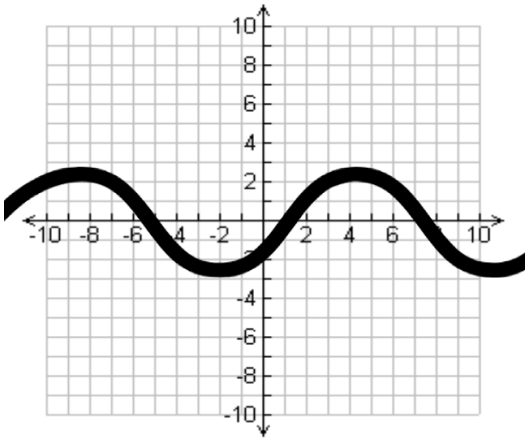
5. Look at the waves from questions 1 and 2. Which has the greatest amount of energy?

6. Look at question 2. Where is the crest? Where is the trough?

7. What is the amplitude of this wave?

8. What is the amplitude of this wave?



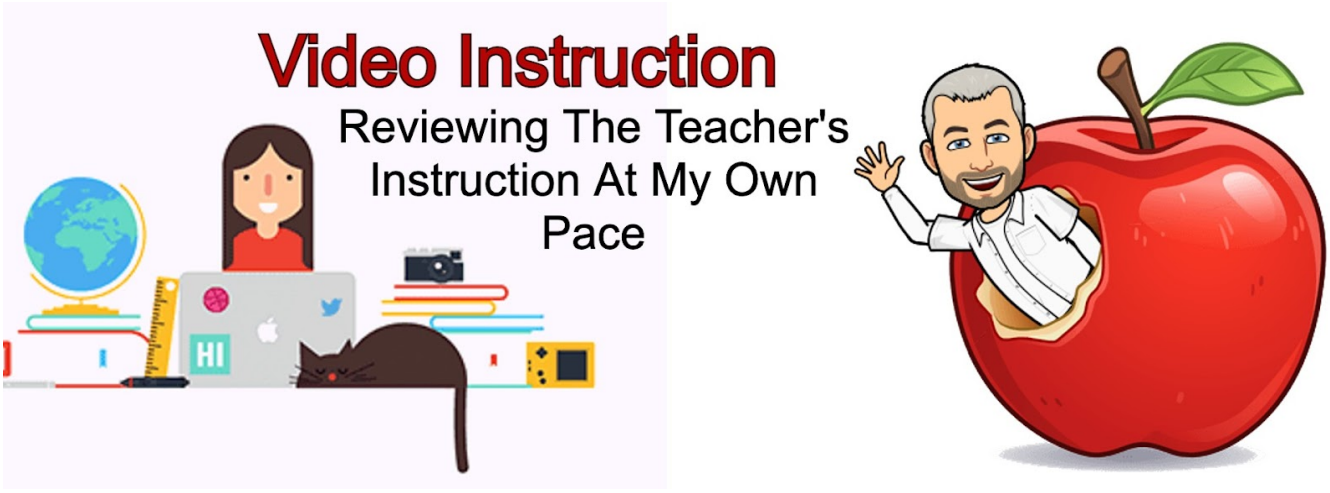


9. Look at the waves from questions 7 and 8. Which has the highest amplitude?

10. Look at the waves from questions 7 and 8. Calculate the difference between the two waves.

11. Look at the waves from questions 7 and 8. Which has the greatest amount of energy?

12. Look at question 8. Where is the crest? Where is the trough?



Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let’s watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

Take Your Time, Pause And Rewind As needed

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don’t understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

When you finish this video, you should have a good understanding of the concepts that have been taught. If you find yourself confused, rewind, and rewatch.

The Video For This Mastery Badge Can Be Opened Using This QR Code

This Mastery Badge includes one video:

Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

Check Point

Let’s make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I watched the video carefully, and paused to look up anything I didn’t understand.

Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

Ten Things I Learned From This Video

A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

1.
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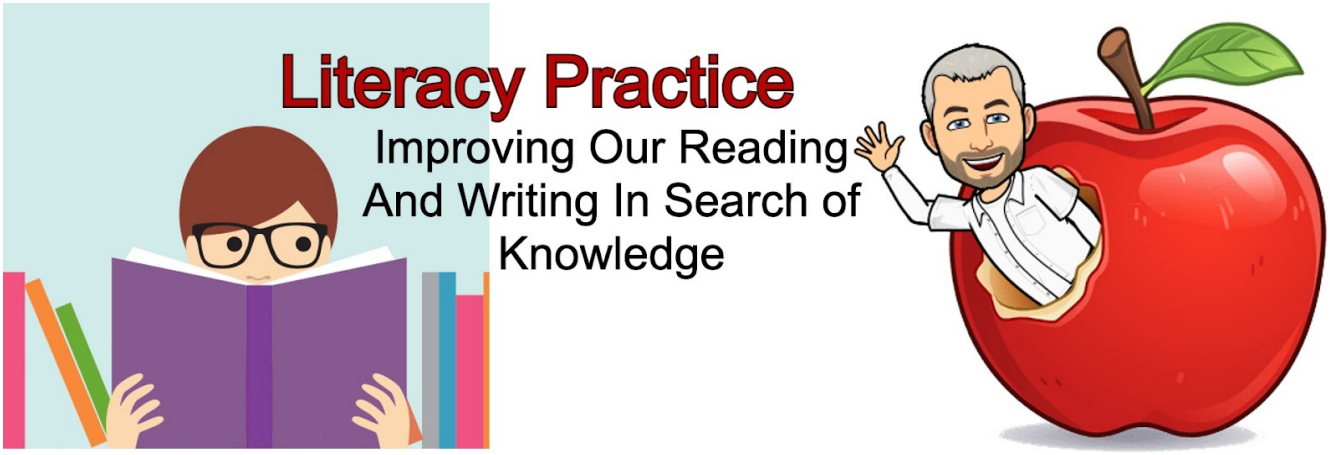
10.

Now, Let’s Connect These New Concepts To Things You Already Knew

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



Activity: Reading And Writing About Amplitude

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

1. **Practice Reading For Understanding**
   Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it.**

2. **Practice Writing To Communicate**
   Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:

Read The Assigned Article Carefully For Understanding.
https://handsomescienceteacher.com/Online-science-classes-kids/sound-waves/

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

Check Point

Let’s make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

Now Let’s Write To Communicate

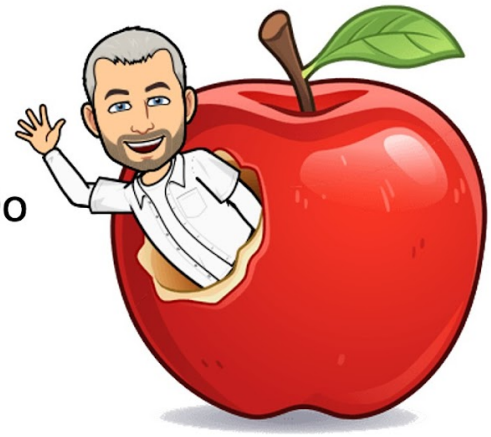
Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don’t rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words explaining what sound waves are and how they work.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Activity: Frequency Vs. Amplitude

Directions: In this lab you will use what you already know to change either the frequency or the amplitude of a sound wave.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To create and alter the frequency and amplitude of a wave.

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1. What does frequency refer to? In other words, write a definition for frequency in your own words.

2. How do you think frequency might affect sound? In other words, how do you think tones with higher frequencies might sound? How do you think tones with lower frequencies sound? You might need to use the app from your discovering lab to figure this out.

3. Using either your voice, or an instrument such as a piano or a guitar, create a tone that has a low frequency. Note: It is okay to download a piano app for this lab.

   Now create a tone that has a high frequency, **but has the exact same amplitude as the first wave**. Use your sound wave app to track your progress.

4. Draw these two waves below.

Low Frequency	High Frequency (Same Amplitude)

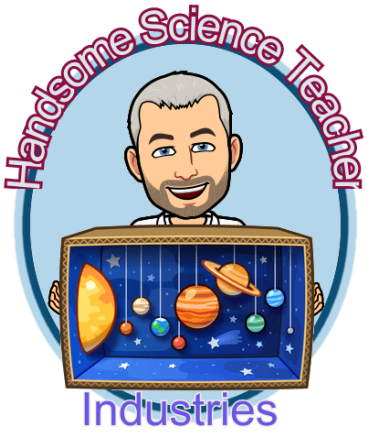
5. What does Amplitude refer to? In other words, write a definition for amplitude in your own words.

6. How do you think amplitude affects sound? In other words, how do you think tones with higher amplitudes sound? How do you think tones with lower amplitudes sound? You might need to use the app that you downloaded for the last lab to figure this out.

7. Using either your voice, or an instrument such as a piano or a guitar, create a tone that has a low amplitude. Then create a tone that has a high amplitude **but that has the exact same frequency as the first wave**. Draw these two waves below.

Low Amplitude	High Amplitude (Same Frequency)

8. How are amplitude and frequency different from one another? Be detailed.



Congratulations! You Have Completed The Entire Mastery Badge
You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

Time To Evaluate Your Work
Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

My Self-Evaluation:
Based on the criteria listed above, I believe I have passed off this Mastery Badge because… (Be detailed ans specific)

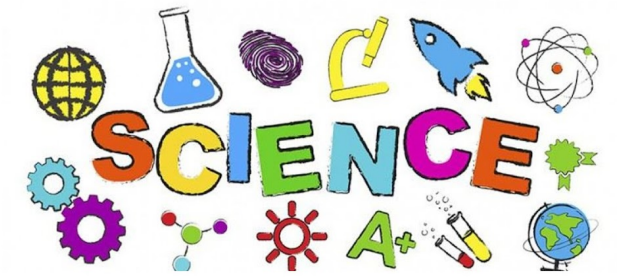
Mastery Badge Counselor Evaluation:
I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because… (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

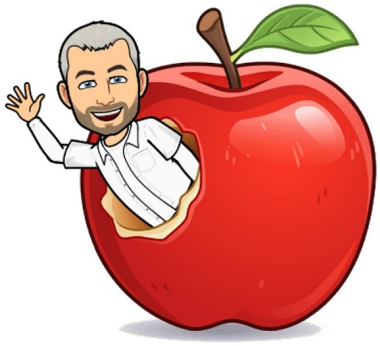
Student's Signature	**Date**	**Signature of Mastery Badge Counselor**	**Date**

Certificate For Your Homeschool Records

The following certificate which has been awarded through self-evaluation by the student, and also certified by a mastery badge counselor proves that the student listed thereon has completed all the work and has mastered all the concepts for the specified topic.

Keep this on file as evidence of your successful completion of this topic.
If audited by the State, these certificates stand as evidence that you have worked on and successfully completed a rigorous science curriculum.





How Waves Interact A STEM Lab

What I Will Be Learning In This Mastery Badge:
In this mastery badge you will be exploring how waves interact with their environment. You will discover that they are always either absorbed, transmitted, or reflected by other substances. You will also learn that the substances that waves travel through are either opaque, translucent, or transparent to the waves.

What This Packet Includes:
It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.

II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.

III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.

IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

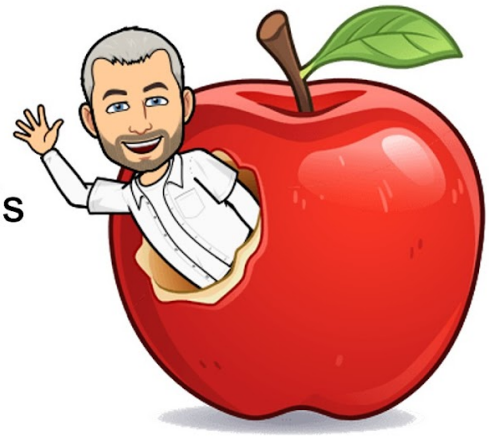
Some of the most important things we will learn in this mastery badge:

- How do waves interact with the environment?
- Waves are reflected, absorbed, or transmitted
- Objects are opaque, translucent, or transparent
- An object might be opaque to one type of wave, but transparent to another.

Name:_____ Date:_____

Discovering Lab

Learning Through Hands On Activities

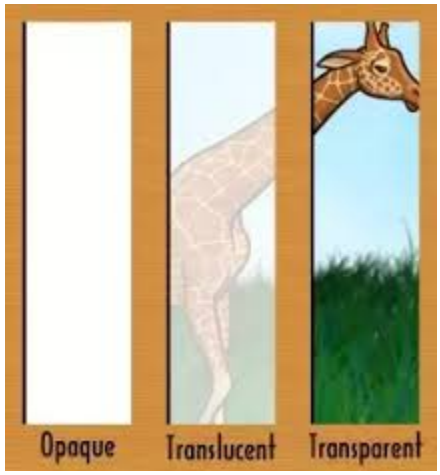


Activity: Discovering How Waves Interact With Their Environment

Directions: Follow the steps below, to learn about how waves interact with their environments

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment



Goal: To learn as much as you can about how waves interact with their environments.

For this lab, you will need a piece of clear plastic wrap, a sheet of foggy wax paper, and a sheet of solid black construction paper.

Transparent Message

1. Write a secret message on a piece of paper.
2. Have a parent, sibling, or partner hold the **transparent** (clear) piece of plastic up in front of their face. Once they have the clear plastic held in front of them, show them the message.
3. Have them read the message out loud.
4. Were they able to read the message correctly?

5. Why do you think they were or were not able to read it correctly?

6. In your own words, describe how transparent objects (like the sheet of clear plastic) interact with light waves. Are the light waves distorted as they pass through something that is transparent?

Translucent Message

1. Write another secret message on a piece of paper.
2. Have a parent, sibling, or partner hold the **translucent** (foggy) piece of wax paper up in front of their face. Once they have the wax paper held in front of them, show your partner the new message.
3. Have them try to read the message out loud. If they are unable to, have them try moving the wax paper closer to their face, or moving the wax paper closer to the message.

4. Were they able to read the message correctly?

5. Why do you think they were or were not able to read it correctly?

6. In your own words, describe how translucent objects (like a sheet of wax paper) interact with light waves. There are no wrong answers here. What were your own observations?

Opaque Message

1. Write another secret message on a piece of paper.
2. Have a parent, sibling, or partner hold the **opaque** (black) piece of construction paper up in front of their face. Once they have the construction paper held in front of them, show your partner the new message.
3. Have them try to read the message out loud. If they are unable to, have them try moving the construction paper closer to their face, or moving the construction paper closer to the message.

4. Were they able to read the message correctly?

5. Why do you think they were or were not able to read it correctly?

6. In your own words, describe how opaque objects (like the sheet of construction paper) interact with light waves. There are no wrong answers here. What were your own observations?

Final Questions

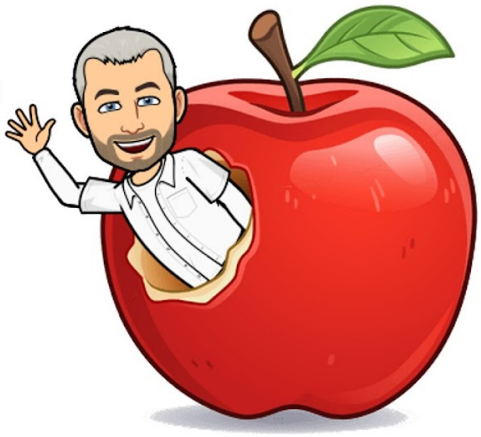
Remember to answer each question using complete sentences.

1. In the lab you discovered that light passes through transparent objects unaltered. Allowing for clear pictures to be seen. Look around your house for transparent objects and list at least five of them below. These can be anything that you can think of.

2. In the lab you discovered that light passes through translucent objects, but that the light is altered, making it look foggy. Look around your house for three things that make images look foggy. These can be anything that you can think of.

3. In the lab you discovered that light does not pass through opaque objects but is instead blocked. Look around your house for three objects that block light from passing through them. These can be anything that you can think of.

4. Write a paragraph explaining in your own words the difference between transparent, translucent, and opaque objects.



Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let’s watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

Take Your Time, Pause And Rewind As needed

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don’t understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

When you finish this video, you should have a good understanding of the concepts that have been taught. If you find yourself confused, rewind, and rewatch.

The Video For This Mastery Badge Can Be Opened Using This QR Code

This Mastery Badge includes one video:

Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

Check Point

Let’s make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I watched the video carefully, and paused to look up anything I didn’t understand.

Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

Ten Things I Learned From This Video

A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

1.
2.
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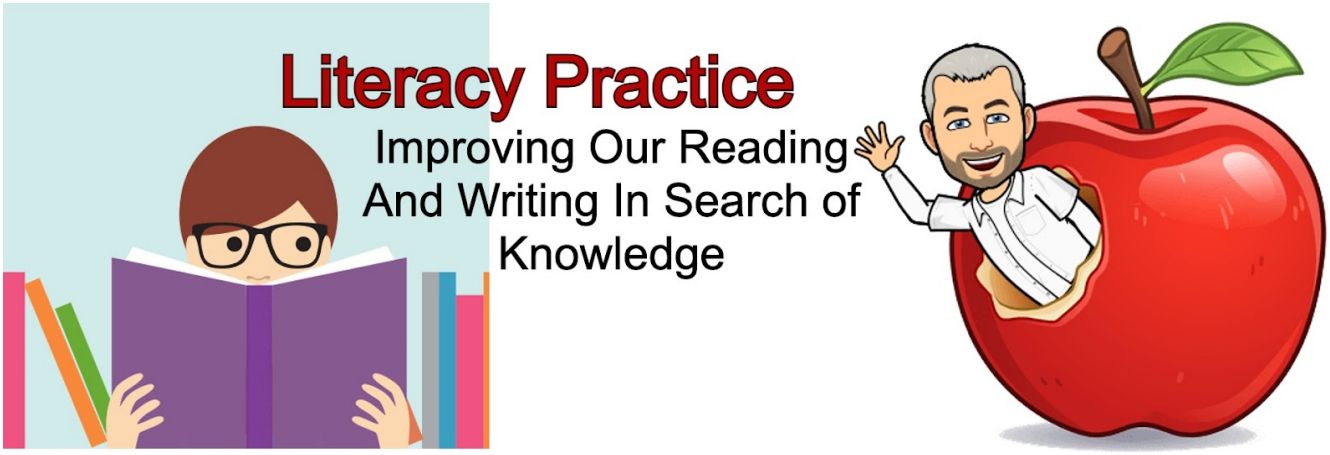
10.

Now, Let’s Connect These New Concepts To Things You Already Knew

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



Activity: Reading And Writing About Amplitude

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

1. **Practice Reading For Understanding**
   Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it.**

2. **Practice Writing To Communicate**
   Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:

Read The Assigned Article Carefully For Understanding.

https://handsomescienceteacher.com/Online-science-classes-kids/waves-interact-with-the-universe/

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

Check Point

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I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

Now Let’s Write To Communicate

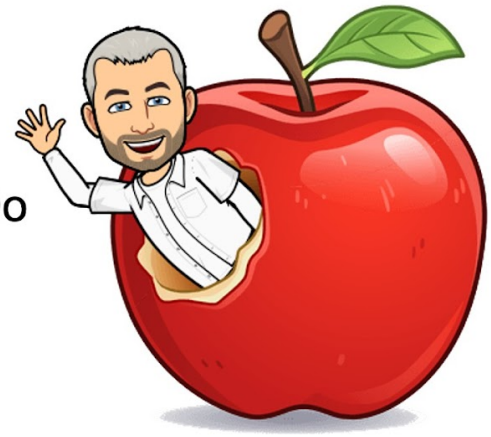
Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don’t rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words explaining the difference between transparent, translucent, and opaque objects.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Activity: Applying Transmission, Reflection, Absorption

Directions: You must use the objects available to you to invent your own kaleidoscope.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about the difference between opaque, translucent, and transparent objects.

Supplies you will need

For this lab, you will need three inexpensive mirrors, and random colorful tiny objects, such as beads, glitter, scraps of paper, fish tank rocks, and so forth.

Imagine

You have been hired by a toy company to create a new line of kaleidoscopes. How will you use your supplies to create your kaleidoscope?

You Are The Engineer

You will need to experiment and come up with your own design. See if you can figure out on your own how to create a kaleidoscope. It is okay to try different ideas and configurations of mirrors and colorful objects. It is also okay to do research online. However, I encourage you to experiment on your own for a while before looking up ideas online.

Create Shapes: Once you have a working Kaleidoscope, see if you can replicate each of the following shapes inside of it.

1. Explain what you had to do to create each of these shapes. Be detailed.
   - **Star**
     - To create the star I...
   - **Circle**
     - To create the circle I...
   - **Half Moon**
     - To create the moon I...
   - **Snowflake**
     - To create the snowflake I...
   - **Face**
     - To create the face I...
   - **Tree**
     - To create the tree I...
2. Describe your kaleidoscope. How many mirrors did you use? How did you hold them together? How were the mirrors positioned towards each other?
3. Did you try other mirror configurations? If so, which did you think was the best? Explain why.

Final Questions:

1. What is the difference between transparent and translucent objects?

2. What does an opaque object do to light?

3. What does transmission mean?

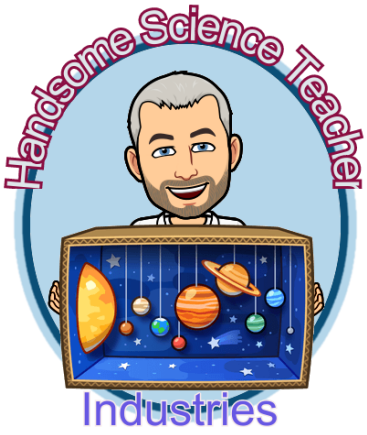
4. What does reflection mean?

5. What does absorption mean?

6. What does it look like when you look into the kaleidoscope that you created?

7. Explain why it looks this way.

8. Is this effect caused by absorption, reflection, or transmission? Explain your answer.



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Time To Evaluate Your Work
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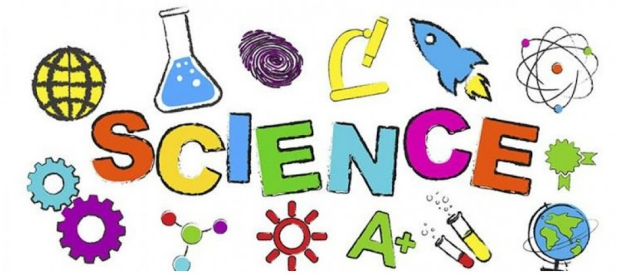

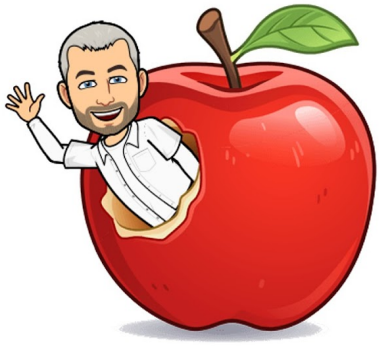

Waves & Communication

What I Will Be Learning In This Mastery Badge:
In this mastery badge we will look at how waves are used by people to communicate ideas. Including sound waves, light waves, and radio waves. We will examine the pros and cons of using each type of wave, and attempt to communicate information ourselves using each.

What This Packet Includes:
It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.

II. **Video Instruction**
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IV. **Applying Lab**
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Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- How mankind uses waves to communicate
- How we use sound waves
- How we use light waves
- How we use radio waves
- Advantages and disadvantages of each type of wave
- Waves and technology

Name:_____ Date:_____

Activity: Discovering How Waves Are Used For Communication

Directions: Work with a partner to complete each of partbelow. Then record your observations in the space provided.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about how waves are used to communicate.

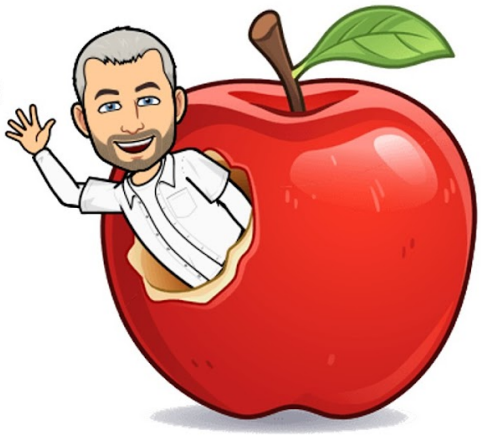
Part 1: Sound Waves Vs Light Waves

For this experiment you will need a pot, and something to bang on it, such as a hammer, or a spoon. Be careful not to damage the pot!

- **Step 1:** Stand outside as far from your partner as you can (at least 200 ft apart). When you're ready signal for your partner to bang on their pot several times.
- **Observe Carefully:** Notice what arrives first, sound waves, or light waves.
  Do you see your partner's hand hit the pot first, or do you hear the sound?

1. What did you observe? What travels faster, sound waves or light waves?

2. How might this difference in speed affect how these waves are used to communicate?



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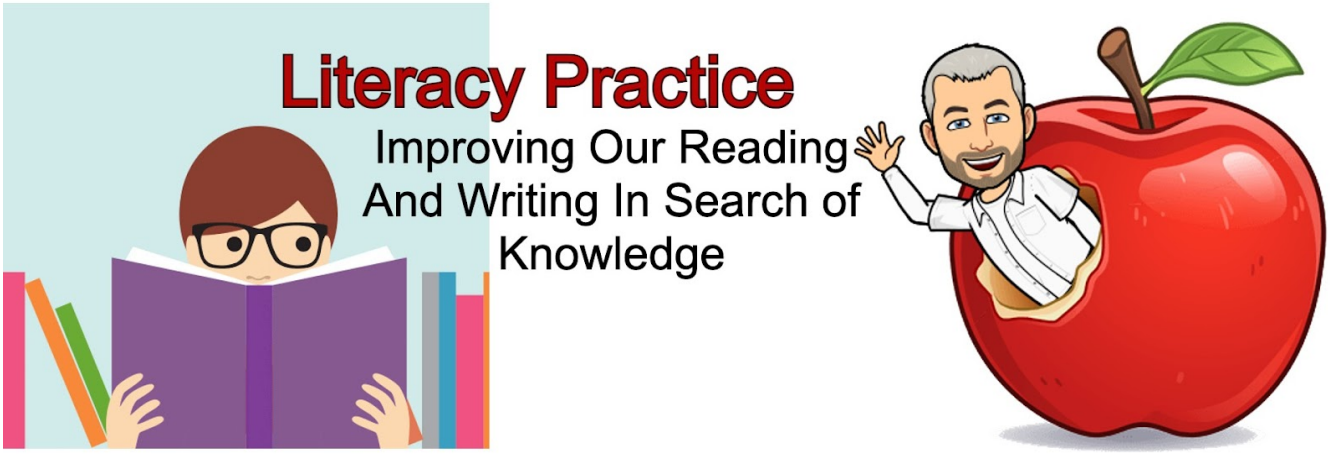

Activity: Reading And Writing About Amplitude

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1. **Practice Reading For Understanding**
   Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it.**

2. **Practice Writing To Communicate**
   Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:

Read The Assigned Article Carefully For Understanding.
https://handsomescienceteacher.com/Online-science-classes-kids/analog-versus-digital-signals/

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I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

Now Let’s Write To Communicate

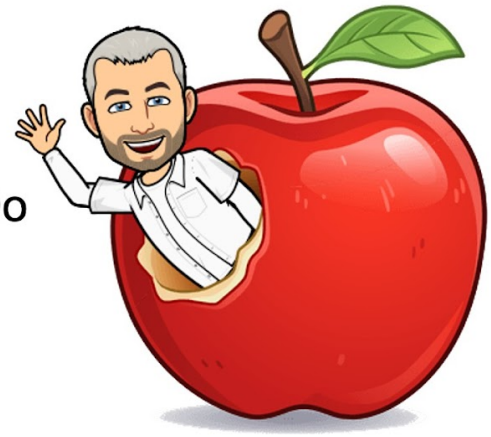
Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don’t rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words explaining the difference between digital and analog signals.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Directions: Working with a partner complete each of the parts below. Record your observations in the space provided.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about how waves are used to communicate.

Part 1: Using Three Kinds of Waves To Communicate

For this lab, you will need paper and a marker, your voice, and a cell phone. You will be communicating secret messages to a partner using sound waves, light waves, and radio waves.

1. Write a secret message that you would like to send to your partner in the space below.

2. Have your partner stand a short distance away from you in the same room. How will you communicate your secret message to them? Your options are your voice (sound waves) marker and paper (light waves) or your cellphone (radio waves). Explain why you think the option you picked is the most effective.

3. After sending your message, record the results. How effective was the method you selected?

4. Write another secret message that you would like to send to your partner in the space below.

5. Have your partner stand where they can see you, but not hear you. Such as on the other side of a window. How will you communicate your secret message to them? Your options are your voice (sound waves) marker and paper (light waves) or the cellphone (radio waves). Explain why you think the option you picked is the most effective.

6. After sending your message, record the results. How effective was the method you selected?

7. Write another secret message that you would like to send to your partner in the space below.

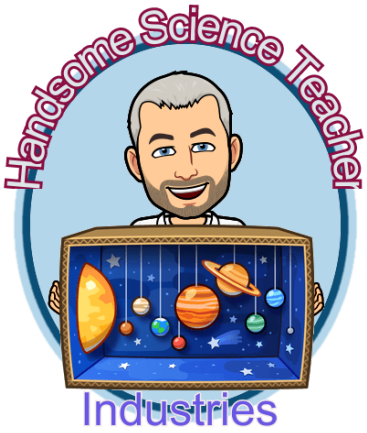
8. Have your partner stand where they can't see or hear you. How will you communicate your secret message to them? Your options are your voice (sound waves) marker and paper (light waves) or the cellphone (radio waves). Describe what happened.

Final Questions:

1. Why do we sometimes use sound waves for communication? When is sound most effective?

2. Why do we sometimes use light waves for communication? When is light most effective?

3. Why do we sometimes use radio waves for communication? When is radio most effective?



Congratulations! You Have Completed The Entire Mastery Badge
You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

Time To Evaluate Your Work
Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

My Self-Evaluation:
Based on the criteria listed above, I believe I have passed off this Mastery Badge because… (Be detailed ans specific)

Mastery Badge Counselor Evaluation:
I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because… (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

Student's Signature	Date	Signature of Mastery Badge Counselor	Date

Certificate For Your Homeschool Records

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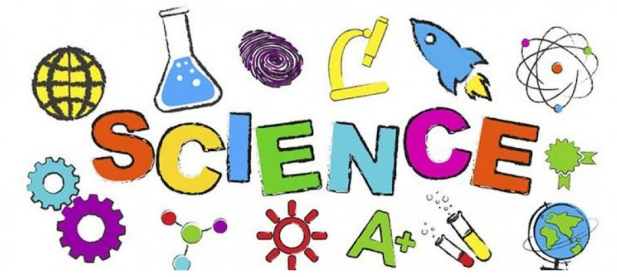
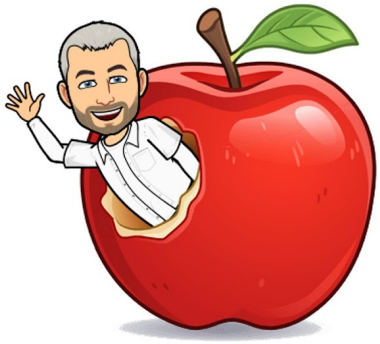




Eclipses

What I Will Be Learning In This Mastery Badge:
In this mastery badge we will learn about lunar and solar eclipses. Including what causes them and how they can be predicted.

What This Packet Includes:
It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.

II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.

III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.

IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- What is a lunar eclipse?
- What is a solar eclipse?
- Why do eclipses occur?
- Total Eclipse Vs Partial Eclipse

Name:_____ Date:_____

Activity: Discovering Eclipses

Directions: For this lab you will use a ball and a lightbulb to discover and record your own results about how eclipses occur.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about how eclipses occur.

Step 1. Creating A Solar Eclipse

Hold a ball out in front of you. Use it to block the light coming from a light source, such as a lightbulb. (do not use the Sun as it will harm your eyes). Bring the ball closer to your face, and then further away. Notice how it changes the amount of light that you can see from the light source.

1. What happens to the light you can see when the ball gets closer to the source, and you get further away from the ball?

2. What happens to the light when the ball gets closer to your eyes, and further away from the light source?

3. A solar eclipse occurs when the moon gets between the Earth and the Sun. How does this compare to the experiment that you did?

Step 2. Creating A Lunar Eclipse

Hold a ball so that you are between the ball and a light source. Your goal is to use your body to cast a shadow across the ball.

1. What happens to the light on your ball as you move it through your shadow?

2. Move the ball through your entire shadow slowly. Notice how it changes as it enters and leaves your shadow. What did you observe?

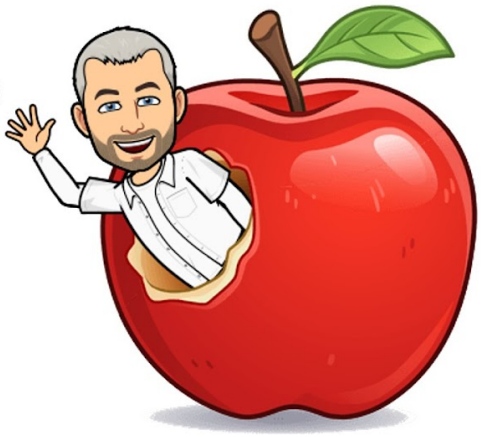
3. A lunar eclipse occurs when the moon passes through the Earth's shadow. How does this compare to the experiment that you did?

Final Questions:

Remember to always use complete sentences.

1. Relate your experiment to a solar eclipse and try to explain how solar eclipses might occur. There are no wrong answers. Later we will learn what causes solar eclipses. Right now, we are just trying to use our own observations to guess what causes them.

2. Relate your experiment to a lunar eclipse and try to explain how lunar eclipses might occur. There are no wrong answers. Later we will learn what causes lunar eclipses. Right now, we are just trying to use our own observations to guess what causes them.



Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let’s watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

Take Your Time, Pause And Rewind As needed

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don’t understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

When you finish this video, you should have a good understanding of the concepts that have been taught. If you find yourself confused, rewind, and rewatch.

The Video For This Mastery Badge Can Be Opened Using This QR Code

This Mastery Badge includes one video:

Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

Check Point

Let’s make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I watched the video carefully, and paused to look up anything I didn’t understand.

Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

Ten Things I Learned From This Video

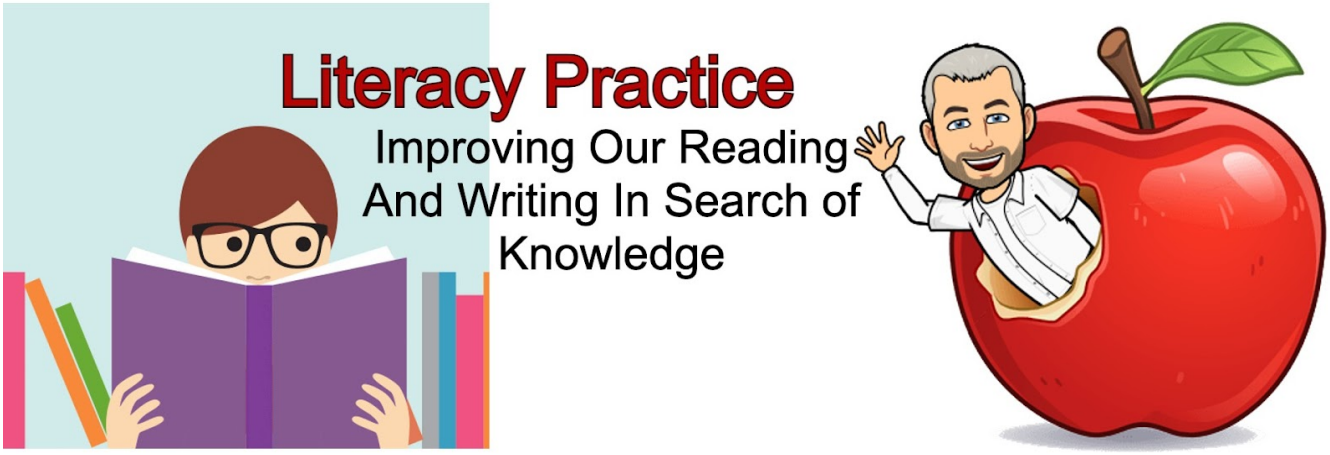
A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

Now, Let’s Connect These New Concepts To Things You Already Knew

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



Activity: Reading And Writing About Lunar Phases

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

1. **Practice Reading For Understanding**
   Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it.**

2. **Practice Writing To Communicate**
   Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:

Read The Assigned Article Carefully For Understanding.
https://handsomescienceteacher.com/Online-science-classes-kids/eclipses/

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

Check Point

Let’s make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

Now Let’s Write To Communicate

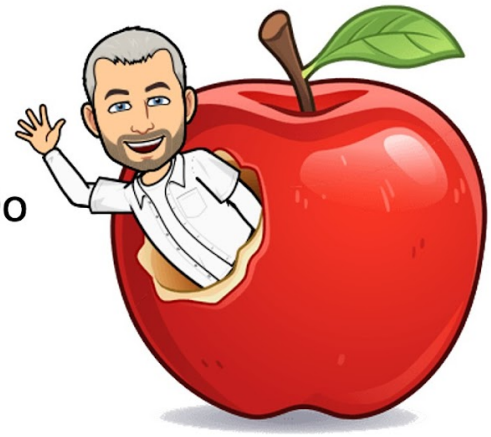
Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don’t rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words explaining how solar and lunar eclipses occur.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Directions: Complete each of the parts below. Record your observations in the space provided.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To create your own model of A Solar And Lunar Eclipse

Part 1. Create a model of a Solar Eclipse

- Using a piece of paper and colored pencils or crayons, create a model (drawing) of a solar eclipse. Show where the Sun, Earth, and Moon are, and label them. Also, draw the light, showing how it is blocked during an eclipse.

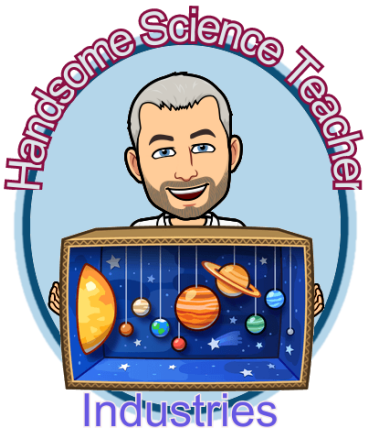
Part 2. Create a model of a Lunar Eclipse

Using a piece of paper and colored pencils or crayons, create a model (drawing) of a lunar eclipse. Show where the Sun, Earth, and Moon are, and label them. Also, draw the light, showing how it is blocked during an eclipse.

Final Questions:
Remember to use complete sentences.

1. Where are the Sun, Moon, and Earth during a solar eclipse?

2. Where are the Sun, Moon, and Earth during a lunar eclipse?



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The Moon

What I Will Be Learning In This Mastery Badge:
In this mastery badge we will investigate the Earth's moon. Including its formation, its effects on the Earth, and its features.

What This Packet Includes:
It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.

II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.

III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.

IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- What are moons?
- How the Earth's moon is different from most other moons.
- How the Moon formed.
- How the Moon impacts the Earth.
    - Tides
    - Helps protect us.
- Phases and Eclipses
- Facts about the Moon
    - Size, Distance, Dark And Light Areas, Craters

Name:_____ Date:_____

Activity: Discovering The Moon With My Own Eyes

Directions: Follow the steps below to learn as much as you can about the Earth's moon . If you are unable to go outside, you can complete this assignment by doing online research. Make sure you record all of your answers using complete sentences.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about the Earth's moon.

Problem:
The President just spoke to the nation regarding a giant white orb that he saw floating in the sky last night. He isn't certain what the giant white orb is, but he promised the country that he wouldn't rest until he got to the bottom of it. As soon as he concluded his televised address, the President promptly turned to you and ordered you to find out what was going on.

You tried explaining to him that it what he saw was just the Moon, but he just looked at you like you were crazy and said "Listen, bub, I don't know what this moon thing is you are talking about, and I don't care! What I want to know is what is the giant white orb in the sky that I saw last night!" The President then turned and walked away.

Your job is to investigate the Moon, and create a report that you can submit to the President.

Making Observations

In science, one of the first things we do when we don't understand something is to observe it and record our observations. We can then use these observations to identify patterns or to provide evidence for theories that we might formulate later on.

Whenever we make observations it is important to keep very detailed notes, as it is difficult to know what may or may not be important later on.

Observing The Moon

Step 1: With a parent's permission, go outside and observe the Moon. Describe what the moon looks like on three different nights. Be detailed.

Night # 1. Date:_____ Time:_____
My observations of the Moon:

Night # 2. Date:_____ Time:_____
My observations of the Moon:

Night # 3. Date:_____ Time:_____
My observations of the Moon:

Improving Our Observations

Often, when we first start a new scientific inquiry, we don't always know the best tools and processes to use. However, as our work continues and we become more familiar with the subject we are examining, we are able to improve our efforts by refining our processes and improving our tools.

How can you improve your observations of the moon?

There are no wrong answers. YOU are the chief scientist here, and this is your study of the Moon. As chief scientist, you are the one in charge. What will you do to get better observations? Examples might include using binoculars, observing the moon at different times of the night to see if there are any changes, Observing the Moon at different times of the month, and so forth.

Create a plan for getting better observations and describe it below.

With parental permission, put your plan into action. Describe your new observations based on the plan that you created.

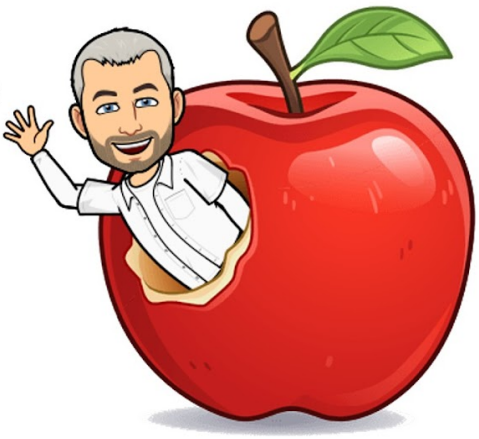
Night # 4. Date:_____ Time:_____
My observations of the Moon:

Night # 5. Date:_____ Time:_____
My observations of the Moon:

Night # 6. Date:_____ Time:_____
My observations of the Moon:

Create Your Report For The President

Now that you have collected six nights' worth of observations, write a report for the President. Base your report on your own observations.



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Now that you have completed the Discovering Lab let’s watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

Take Your Time, Pause And Rewind As needed

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The Videos For This Mastery Badge Can Be Opened Using These QR Codes

This Mastery Badge includes two videos:

Watch The Assigned Science Videos

Scan These QR Codes To Open And Watch The Assigned Videos For This Mastery Badge

Check Point

Let’s make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

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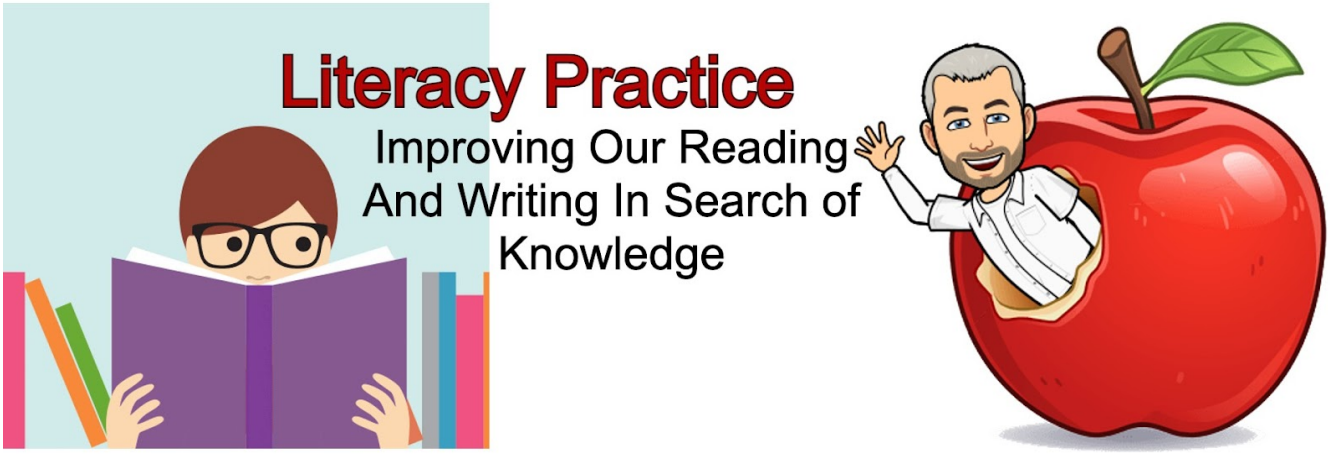

Activity: Reading And Writing About Biomes

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

1. **Practice Reading For Understanding**
   Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it.**

2. **Practice Writing To Communicate**
   Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:

Read The Assigned Article Carefully For Understanding.
https://handsomescienceteacher.com/Online-science-classes-kids/the-moon/

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Check Point

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I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

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Now Let’s Write To Communicate

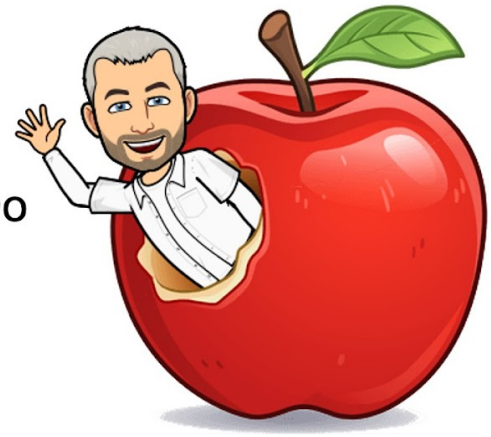
Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don’t rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words explaining what a moon is, and how they affect their planets.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Activity: Applying Our Moon

Directions: You are going to write an article sharing your discoveries about the moon with the rest of the scientific community.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To write an article sharing your discoveries about the moon with others.

Step 1: During the discovering lab you created and carried out your own inquiry where you observed the moon. This means that you made your own discoveries. You then wrote a short explanation sharing your discoveries with the President. Scientists also always share their discoveries with others by writing them down in articles that get published in scientific journals. Use your observations to create a detailed article sharing what you observed during your scientific inquiry. Your article should include the following:

1. A description of what you did each of the six nights that you observed the moon.
2. An explanation of what you observed each night.
3. At least one drawing or sketch of what you observed.
4. A conclusion you made based on your observations.
5. At least two outside sources, such as online articles or books that support your conclusions.

Remember:
You are every bit as capable as anyone else is of doing real science and of making real discoveries. Having a degree isn't what makes you a scientist. Following good scientific practices is. In this lab, you have done real science, and as a result, you have worked as a real scientist.

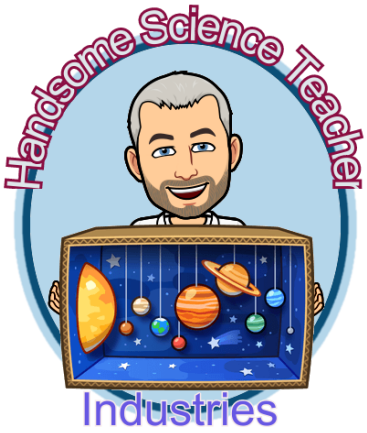
Write your article with the confidence of someone who knows that they are a real scientist.
Explain your discoveries and observations with authority and confidence.

My Journal Article About The Moon

Final Questions:

Always answer final questions using complete sentences.

1. Why is the Moon’s size, as compared to that of the Earth unique or significant?
2. How do scientists think the moon probably formed?
3. Why do some scientists consider the Earth and Moon to be a binary planet?
4. How do craters form on the moon?
5. What are maria?
6. List at least two ways that the moon affects the Earth.



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Student's Signature	Date	Signature of Mastery Badge Counselor	Date

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Lunar Phases

What I Will Be Learning In This Mastery Badge:
In this mastery badge we will learn about the phases of the moon. Including what causes them, what their names are, and how often they occur.

What This Packet Includes:
It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.

II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.

III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.

IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- What are lunar phases?
- What causes lunar phases?
- Predicting Lunar Phases
- Learning To Identify Each Phase By Its Name
    - New Moon
    - Waxing Crescent
    - First Quarter
    - Waxing Gibbous
    - Full Moon
    - Waning Gibbous
    - Third Quarter
    - Waning Crescent

Name:_____ Date:_____

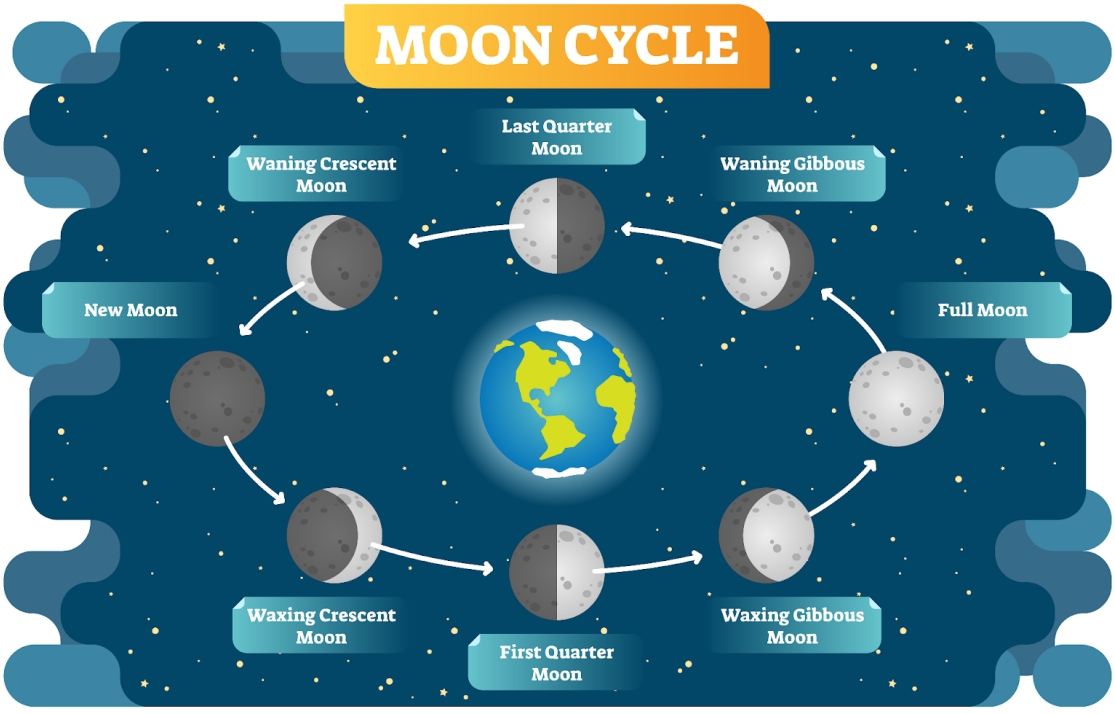
Activity: Discovering Phases of The Moon

Directions: For this lab you will use a flashlight and a ball to recreate phases of the moon.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about the phases of the Moon.



Part 1: Full Moon

1. Look at the chart. Describe what a full moon looks like. Be detailed.

2. Have you ever seen a full moon? Describe what a full moon looks like to an observer on the ground.

3. Using a ball and flashlight try to recreate a full moon. What did you have to do to get the effect of a full moon on your ball? Be detailed. Describe the angle that you had to hold your ball and flashlight at.

4. What do you think the flashlight represents?

Part 2: Quarter Moon

5. Look at the chart above. Describe what a quarter moon looks like. Be detailed.

6. Have you ever seen a quarter moon? Describe what it looks like to an observer on the ground.

7. Using a ball and flashlight recreate a quarter moon. What did you have to do to get the effect of a quarter moon on your ball? Be detailed. Describe the angle that you had to hold your ball and flashlight at.

8. Let's try to apply this to the actual Moon. This might be a bit challenging, but that is okay. You are smart enough to give a thoughtful answer. We are not yet concerned with whether or not your answer is correct. At this point what we care about is that you were thoughtful and that you based your answer on your own observations.

   Based on your observations, what do you think is occurring with the Sun and the Moon whenever we see a quarter moon from the ground on Earth?

Part 3: Crescent Moon

9. Look at the chart above. Describe what a Crescent moon looks like. Be detailed.

10. Have you ever seen a Crescent moon? Describe what it looks like to an observer on the ground.

11. Using a ball and the flashlight recreate a crescent moon. What did you have to do to get the effect of a crescent moon on your ball? Be detailed. Describe the angle that you had to hold your ball and flashlight.

12. Where do you think that the Sun, Earth, and Moon would have to be in order for you to see a crescent moon on the ground? Explain Why.

Part 4: New Moon

13. Look at the chart above. Describe what a new moon looks like. Be detailed.

14. Have you ever seen a new moon? Describe what it looks like to an observer on the ground.

15. Using a ball and the flashlight recreate a new moon. What did you have to do to get the effect of a new moon on your ball? Be detailed. Describe the angle that you had to hold your ball and flashlight.

16. Where do you think that the Sun, Earth, and Moon would have to be in order for you to see a new moon on the ground? Explain Why.

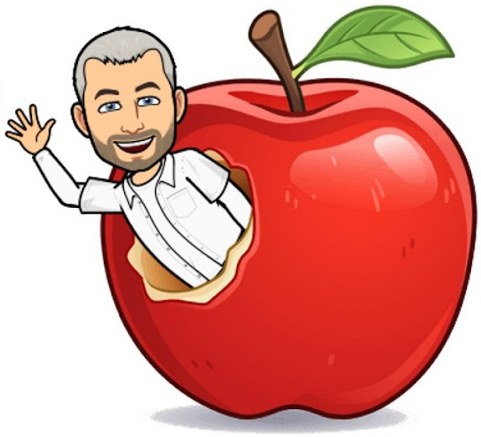
Final Questions:
Remember to answer each question using complete sentences.

1. Which lunar phase do you think is the brightest, and would result in the brightest nights? Why?

2. Which lunar phase do you think would be the darkest and result in the darkest nights? Why?

3. Why do you think the phases of the moon change throughout the month? What could be causing these changes?

   It's okay if you do not know the correct answer. Just try your best. Right now we are just trying to come up with theories based on our observations. Later on, we will learn what is really happening.



Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let’s watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

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The Video For This Mastery Badge Can Be Opened Using This QR Code

This Mastery Badge includes one video:

Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

Check Point

Let’s make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I watched the video carefully, and paused to look up anything I didn’t understand.

Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

Ten Things I Learned From This Video

A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

1.
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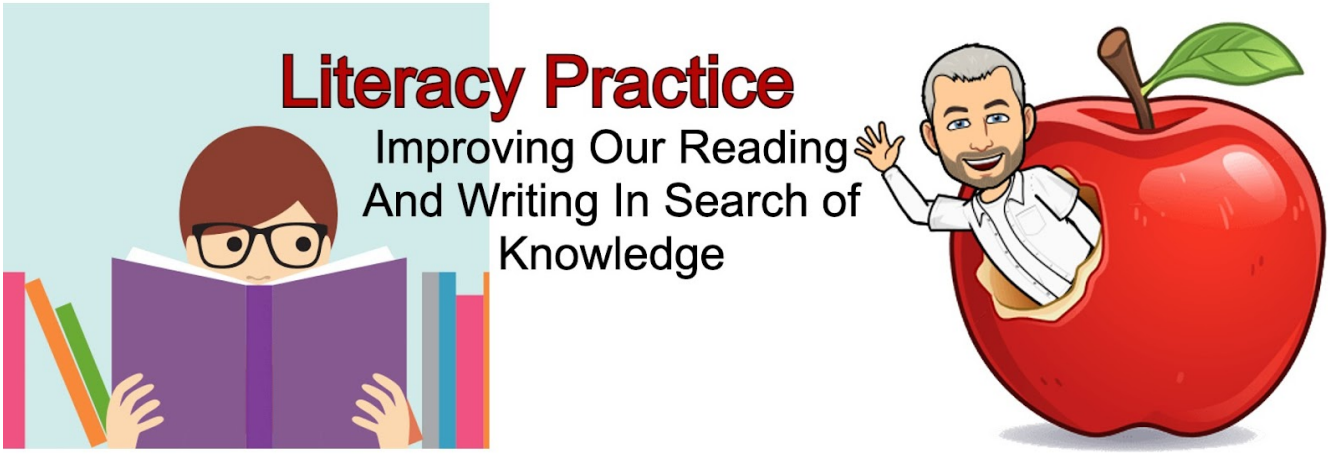
Now, Let’s Connect These New Concepts To Things You Already Knew

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



Activity: Reading And Writing About Lunar Phases

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

1. **Practice Reading For Understanding**
   Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it.**

2. **Practice Writing To Communicate**
   Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:

Read The Assigned Article Carefully For Understanding.
https://handsomescienceteacher.com/Online-science-classes-kids/the-phases-of-the-moon/

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

Check Point

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I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

Now Let’s Write To Communicate

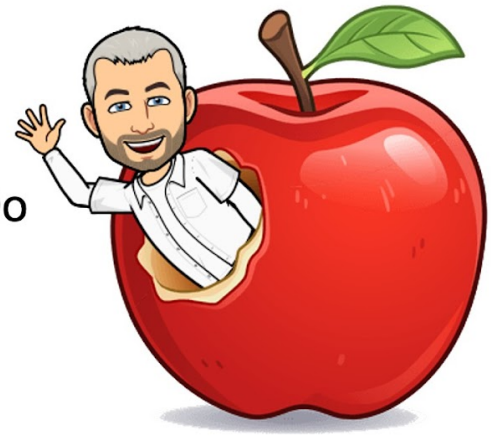
Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don’t rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words explaining what causes the phases of the Moon.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Directions: Complete each of the parts below. Record your observations in the space provided.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

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Goal: To create your own model of the phases of the moon

Create a model of the phases of the moon using Oreo cookies. Your model must include the following:

- New moon, waxing crescent, first quarter, waxing gibbous, full moon, waning gibbous, third quarter, and waning crescent.
- Earth in the center of the phases.
- Which direction the Sunlight is coming from.
- Label Each Phase

Final Questions:

Answer each final question using complete sentences.

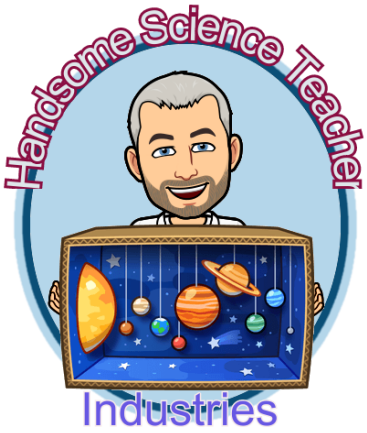
1. Where are the Sun, Earth, and Moon during a full moon?

2. Where are the Sun, Earth, and Moon during a new moon?

3. Where are the Sun, Earth, and Moon during a quarter moon?

4. Where are the Sun, Earth, and Moon during a crescent moon?

5. Where are the Sun, Earth, and Moon during a gibbous moon?



Congratulations! You Have Completed The Entire Mastery Badge
You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

Time To Evaluate Your Work
Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

My Self-Evaluation:
Based on the criteria listed above, I believe I have passed off this Mastery Badge because… (Be detailed ans specific)

Mastery Badge Counselor Evaluation:
I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because… (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

Student's Signature	Date	Signature of Mastery Badge Counselor	Date

Certificate For Your Homeschool Records

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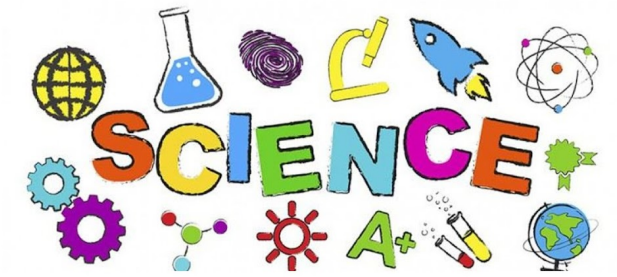
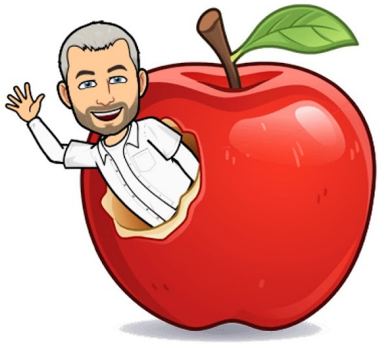




Tides

What I Will Be Learning In This Mastery Badge:
In this mastery badge we will learn how the Moon tugs on the Earth's oceans, creating tides.

What This Packet Includes:
It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.

II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.

III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.

IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- The Sun and the Moon have gravity.
- How does this gravity affect the Earth's oceans?
- What are tides?
- What causes tides?
- Why are there two high tides and two low tides each day?
- What is a spring tide?
- What is a neap tide?

Name:_____ Date:_____

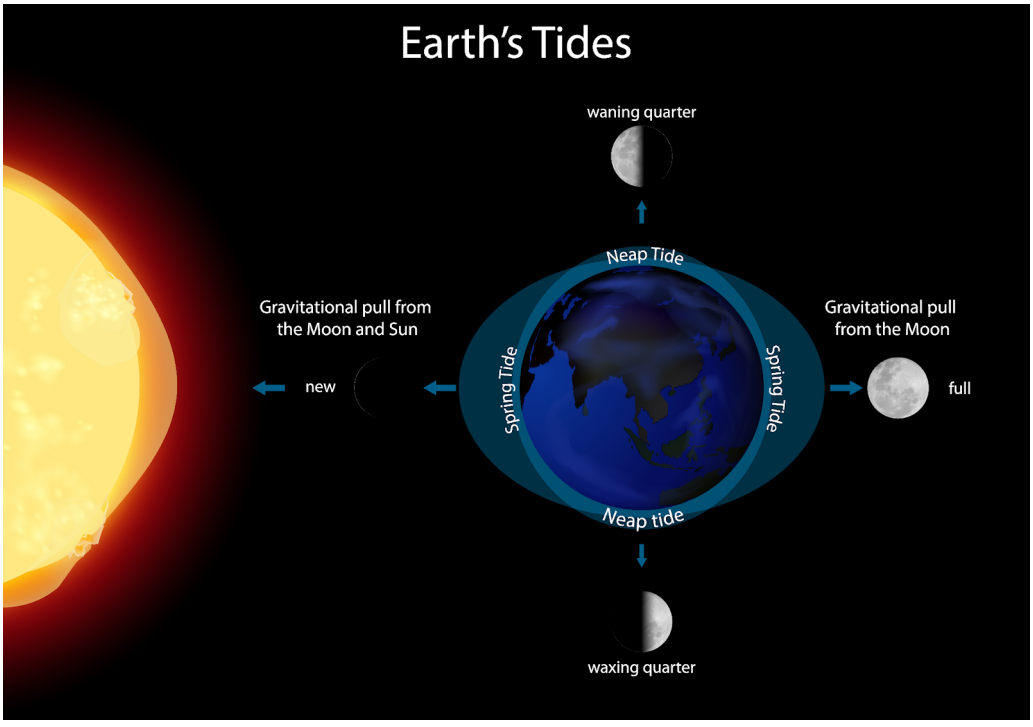
Activity: Discovering The Tides

Directions: For the instructions below to learn about tides.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about tides.



Collecting Data About The Tides

Scientists collect and analyze data in order to better understand the world around us. In this lab, you will be collecting and analyzing data about tides.

Select any beach anywhere in the world to study. Then find a tide table showing tide information for that area over the next few weeks. To find a tide table, you will have to search online.

Complete the following chart by filling in the data from the beach or area you selected.

Date	High Tide Time	Height	Low Tide Time	Height	High Tide Time	Height	Low Tide Time	Height	Moon Phase

Analyzing Data About The Tides

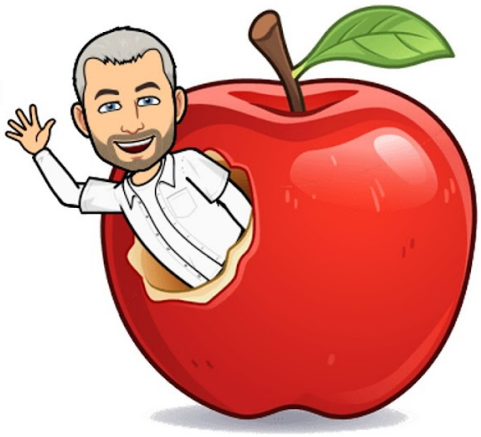
Now that you have collected your data, it is time to analyze it. There are no wrong answers. What matters is only that your conclusions match the data that you collected.

What patterns do you see in your data about when high tides occur?

According to your data, are there any patterns between the tides and the phases of the moon? Explain your answer.

Based on your data, what conclusions can you draw about the possible causes of the tides? Remember, at this point, we are less concerned about getting the right answers and more concerned about being thoughtful and about using our own observations to draw conclusions. The theories that scientists formulate aren’t always right on their first try and that is okay. What matters is that we are moving toward the correct answer.

What do you think?
What is your best guess for what might be causing tides?



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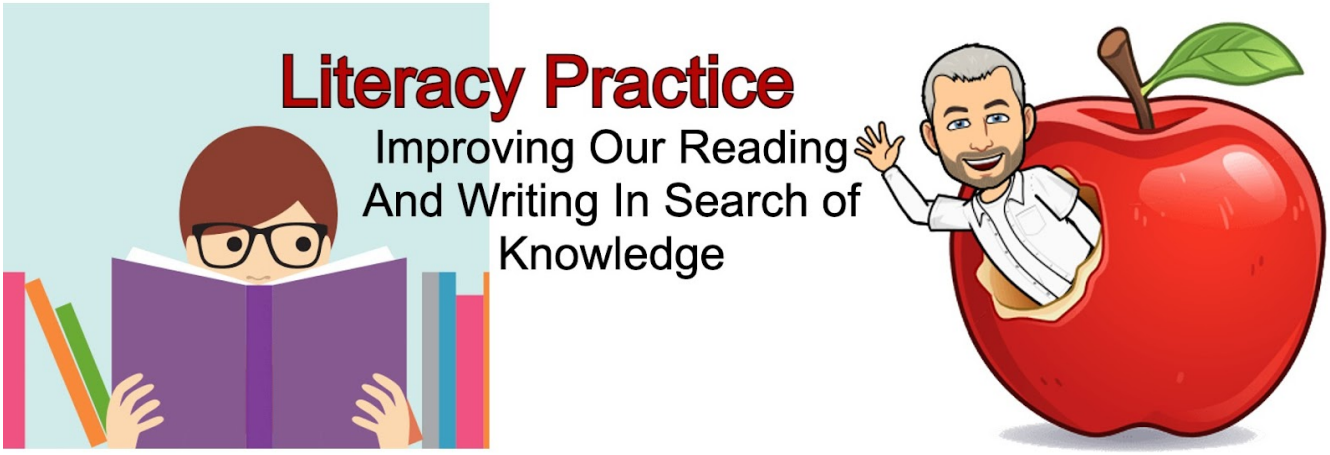

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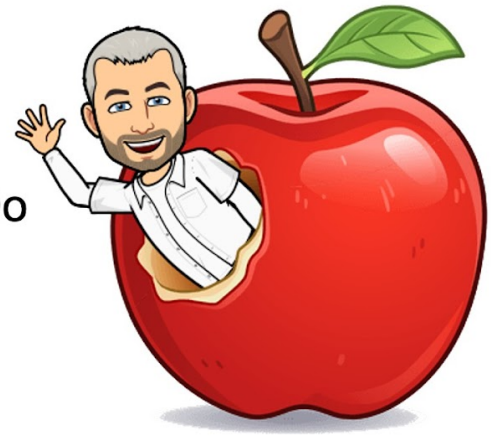
Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



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Goal: To create your own model of the phases of the moon

The Big Kahuna Surfing Challenge is coming to your community! (I hope you have beaches where you live, or it is going to be awkward!) The Mayor has assigned you a very important task. She needs you to schedule the dates of the surfing competition based on when the tide will be highest so that surfers can enjoy the best waves.

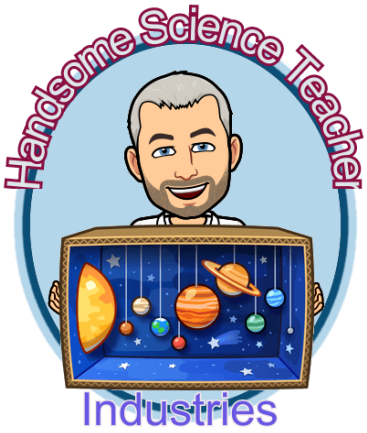
You must schedule this event far enough out so that all the competitors can book hotel rooms and plan their trips. At a minimum select a date six months from today when the tides will be at their peak.

For this lab, you are not allowed to use an online tide table.
How will you forecast high and low tides without access to tide tables? How do the people who create the tide tables know when high tide is going to be?

Hint: It is okay to use a chart showing lunar phases to select your competition dates.

Create a Competition Flyer
Once you have selected the dates for your surfing event, create a flyer that could be posted around your town. On this flyer explain that the event is being held during high tide. Discuss how you calculated the high tides for your community.

Note: If you live in an area where there are no beaches then you get extra credit for actually posting the flyers out around town, thus confusing local residents… okay, not really. Just pretend you have beaches.



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3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

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Mastery Badge Counselor Evaluation:
I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because… (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

Student's Signature	Date	Signature of Mastery Badge Counselor	Date

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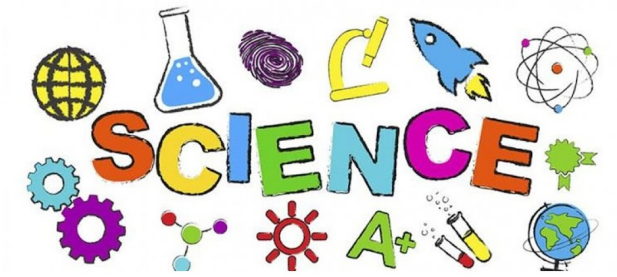
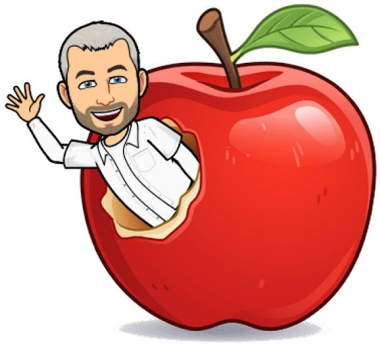




The Oceans

What I Will Be Learning In This Mastery Badge:
In this mastery badge we will learn about the oceans. Including their names, their major characteristics, how they support life, and the important role they play in the Earth's ecosystems.

What This Packet Includes:
It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.

II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.

III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.

IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- How many oceans are there?
- What are their names?
- What is a thermocline?
- Why do colder oceans have more life than warmer oceans?
- What are upwellings?
- Oceanic Currents
- Photic versus Aphotic Zones

Name:_____ Date:_____

Activity: Discovering Ocean Salinity

Directions: Follow the directions below to recreate saltwater and observe its density.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about how salt affects ocean water.

Creating Salt Water

In this lab, you will be completing two different experiments that use salt water. Before we can do those experiments though, you will need to create a supply of salt water.

Step 1. Fill a pot or saucepan with 1 gallon of fresh tap water.
Step 2. Add 1/2 cup of salt.
Step 3. Stir the water until the salt dissolves. This will take several minutes. You will know you are done when the water is no longer cloudy and there is no salt left on the bottom.

Good Job! You now have seawater for your experiments!

Experiment 1: Seawater Density

Place an unopened can of Diet Coke into your seawater. Observe and explain what happens.

Now place the same can of unopened Diet Coke into another saucepan filled with fresh water. Observe and explain what happened.

Why do you think you got a different result in freshwater than you did in seawater?

Note: If you got the exact same result try adding more salt to your salty water. Also, make sure you are using diet coke. This experiment will not work with a can or regular (non-diet) coke.

Experiment 2: Freezing Seawater

Place a cup of seawater into your freezer for several hours. Observe and record what happens.

Now place a cup of fresh water into your freezer for several hours. Observe and record what happens.

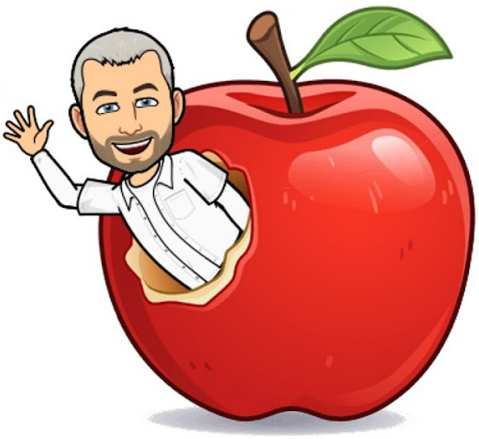
Why do you think you got a different result freezing freshwater than you did freezing seawater?

Final Questions:

1. How are saltwater and freshwater alike?

2. How are they different?

3. How do you think these differences might affect living things? Do you think freshwater fish could survive in the ocean? Do you think saltwater fish could survive in a freshwater lake? Why or why not?



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Check Point

Let’s make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I watched the video carefully, and paused to look up anything I didn’t understand.

Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

Ten Things I Learned From This Video

A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

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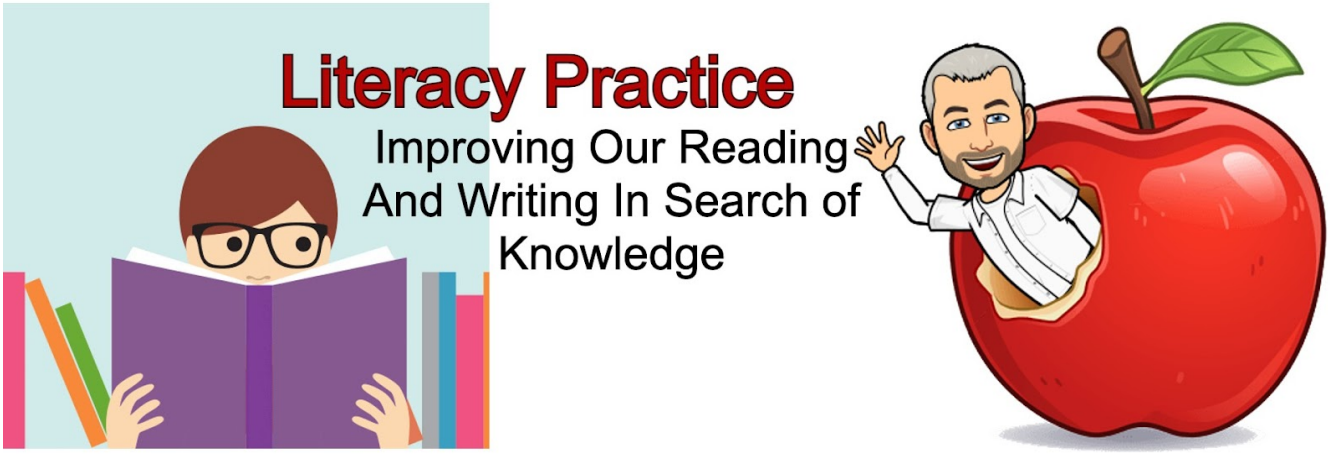
Now, Let’s Connect These New Concepts To Things You Already Knew

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



Activity: Reading And Writing About Lunar Phases

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

1. **Practice Reading For Understanding**
   Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it.**

2. **Practice Writing To Communicate**
   Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:

Read The Assigned Article Carefully For Understanding.
https://handsomescienceteacher.com/Online-science-classes-kids/the-earths-oceans/

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

Check Point

Let’s make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

Now Let’s Write To Communicate

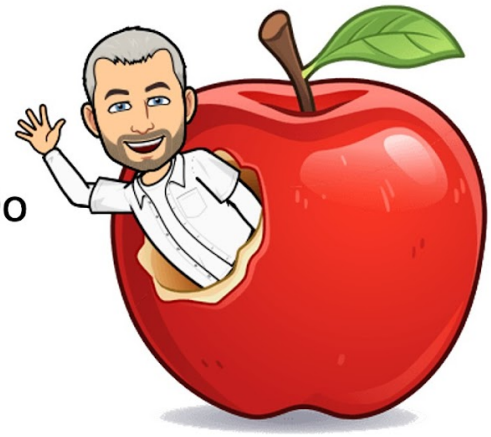
Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don’t rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write three paragraphs in your own words about the oceans, including the names of the five oceans, and some of their key features.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Directions: Write a one page article about life in the oceans.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment
Goal: To explain where living things are found in the Earth's oceans.

Imagine that you have been hired by an important magazine to write an article about life in the oceans. Your article should be detailed and specific. Pretend that you are writing your article to people who are younger than you. Try to help them understand where living things are found in the oceans.

Make sure to mention each of the following in your article:

- Thermoclines
- Upwellings
- Oceanic life in cool regions, & oceanic life in warm regions
- Photic and Aphotic zones.

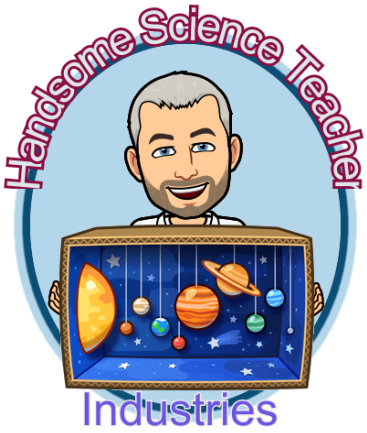
Final Questions:

1. How does the thermocline impact living things in the ocean?

2. How does light impact living things in the ocean?

3. Which ocean is the largest and deepest?

4. Which ocean is the shallowest?



Congratulations! You Have Completed The Entire Mastery Badge
You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

Time To Evaluate Your Work
Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

My Self-Evaluation:
Based on the criteria listed above, I believe I have passed off this Mastery Badge because… (Be detailed ans specific)

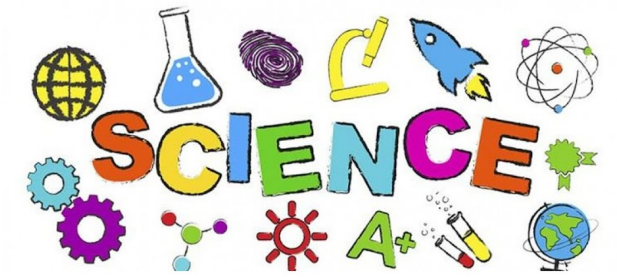
Mastery Badge Counselor Evaluation:
I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because… (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

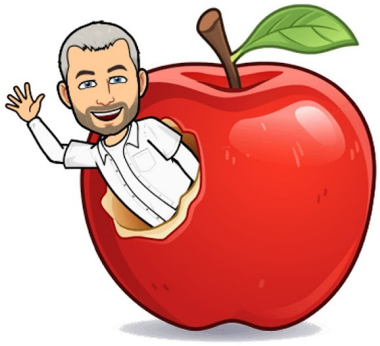
Student's Signature	Date	Signature of Mastery Badge Counselor	Date

Certificate For Your Homeschool Records

The following certificate which has been awarded through self-evaluation by the student, and also certified by a mastery badge counselor proves that the student listed thereon has completed all the work and has mastered all the concepts for the specified topic.

Keep this on file as evidence of your successful completion of this topic.
If audited by the State, these certificates stand as evidence that you have worked on and successfully completed a rigorous science curriculum.





Physical & Chemical Changes

What I Will Be Learning In This Mastery Badge:
In this mastery badge we will learn to distinguish between physical changes and chemical changes.

What This Packet Includes:
It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

I. **Discovering Lab**
A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.

II. **Video Instruction**
You will watch a video presented by Mr. Bertoch, and answer questions about it.

III. **Literacy Practice**
Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.

IV. **Applying Lab**
An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- Substances can be changed
- Some changes are only physical. The substances remain the same.
- Other changes are chemical. New substances are created.
- How to distinguish between physical and chemical changes.

Name:_____ Date:_____

Activity: Discovering Chemical & Physical Changes

Directions: Follow the directions below.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about chemical and physical changes.

Experiment 1: Changing Substances To Create Carbon Dioxide Gas

A chemical reaction occurs whenever two or more substances are combined to form a new substance.

For this experiment, you will mix two substances to make a new substance (Carbon Dioxide Gas).

- Fill a soda bottle with a small amount of vinegar.
- Using a funnel add two or three spoonfuls of baking soda to the inside of a balloon.
- Place the balloon over the mouth of the bottle, being careful not to spill out the baking soda.
- Once the balloon covers the entire mouth of the bottle, lift up the end of the balloon so that all of the baking soda spills out into the vinegar.
- Observe and record what happens.

What happened to the baking soda and vinegar when you mixed them together?

What happened to the balloon?

Your balloon should fill up with carbon dioxide gas.
When you put the balloon over the top of your bottle, there was no (or very little) carbon dioxide inside the bottle. Now there is a lot of it. Where did this gas come from?

Experiment 2: Observing A Physical Change
A physical change occurs when a substance changes its shape, texture, size, or state of matter, without changing the substance itself (without changing the molecules).
For this experiment, you will be changing the shape and state of matter of water.

- Fill a glass with water.
- Place the water into the freezer.
- Check on your water after several hours.
- Observe how it has changed.
- Leave the glass (of ice) on the counter for several hours.
- Once again, observe how it changes.

What happened to the water after being in the freezer for several hours?

What happened to the ice after being left on the counter for several hours?

At any point did the water ever stop being water?

Remember: A chemical change occurs when we change substances into new substances. Such as when we combine baking soda and vinegar to create carbon dioxide. Carbon dioxide is a new substance. A physical change occurs when we alter the shape, size, color, or other

physical attributes, but we do not change the substance itself. Such as when we freeze water and the water continues t remain as water.

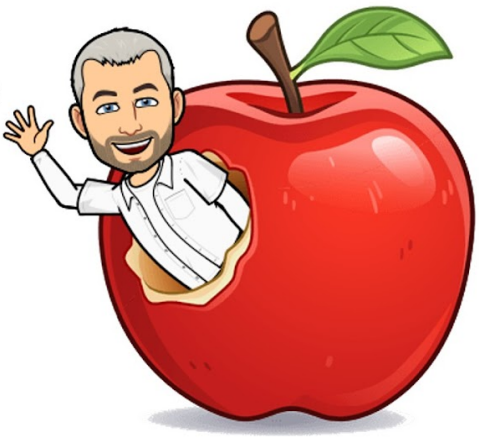
Final Questions:
Answer these questions using complete sentences.

1. In your own words explain what a chemical change is.

2. In your own words, explain what a physical change is.

3. Is chopping up wood into smaller pieces a chemical change or a physical change? Explain why you selected the answer that you did.

4. Do you think burning wood in a fire would be a chemical change or a physical change?
This is a tough one, and it is okay if you get the wrong answer. Later on, we will talk more about fire. For now, just do the best you can. Give a thoughtful answer based on your understanding of chemical and physical changes. Explain why you picked the answer that you did.



Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let’s watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

Take Your Time, Pause And Rewind As needed

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don’t understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

When you finish this video, you should have a good understanding of the concepts that have been taught. If you find yourself confused, rewind, and rewatch.

The Video For This Mastery Badge Can Be Opened Using This QR Code

This Mastery Badge includes one video:

Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

Check Point

Let’s make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I watched the video carefully, and paused to look up anything I didn’t understand.

Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

Ten Things I Learned From This Video

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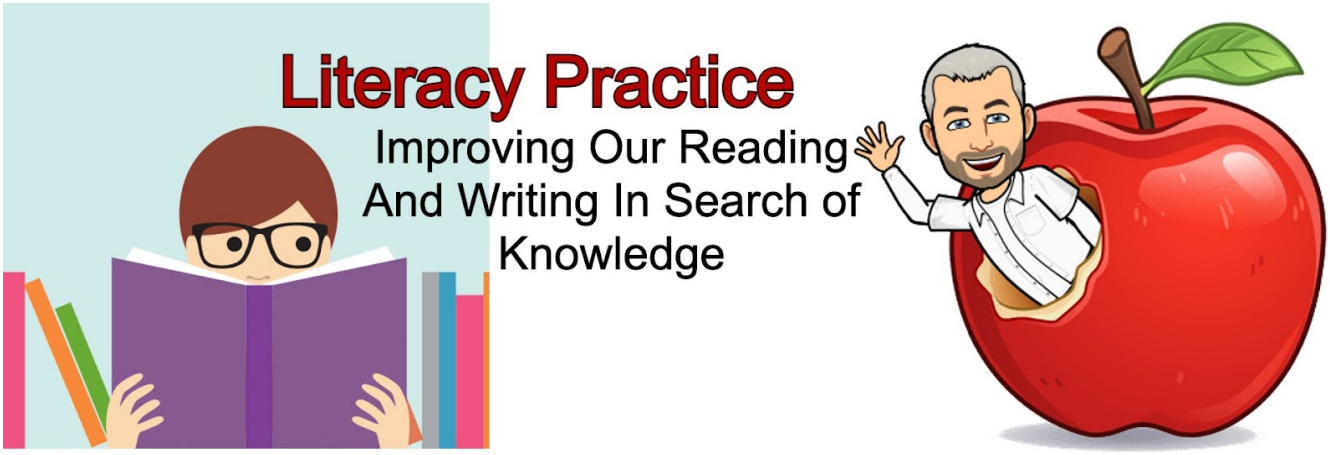
Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



Activity: Reading And Writing About Atoms

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.

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1. **Practice Reading For Understanding**
   Read the article below **for understanding**. Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it.**

2. **Practice Writing To Communicate**
   Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

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Read The Assigned Article Carefully For Understanding.
https://handsomescienceteacher.com/Online-science-classes-kids/physical-and-chemical-changes/

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Writing Prompt:

Check Point

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I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

Now Let’s Write To Communicate

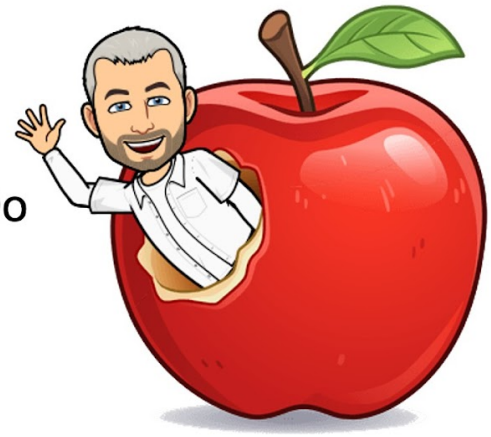
Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don’t rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs describing the difference between chemical and physical changes.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Activity: Identifying Chemical And Physical Changes Around Me

Directions: Follow the instructions below to identify chemical and physical changes in your neighborhood.

Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To distinguish between chemical and physical changes.

Chemical & Physical Changes Are Happening All Around Me

There are changes occurring all around you every single day. Some of them are physical and some of them are chemical. For example, your food is changed when it is cooked. A piece of paper is changed when you crumple it up and throw it away. The leaves on a tree change when they turn from green to brown. Look around your home and neighborhood. Find ten physical changes and ten chemical changes. Record them on the chart below.

Continued on the next page

Type of Change	What Happened?	Explain why this change is either chemical or physical.
Physical Change		
Physical Change		
Physical Change		
Physical Change		
Physical Change		
Physical Change		
Physical Change		
Physical Change		
Physical Change		
Physical Change		
Chemical Change		
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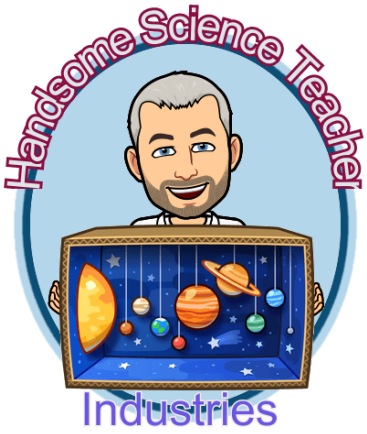

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My Self-Evaluation:
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Student's Signature	**Date**	**Signature of Mastery Badge Counselor**	**Date**

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Seventh Grade Is Up Next

Congratulations On Finishing Sixth Grade!
Next Stop! Seventh Grade!! In seventh grade we will study physics, and geology.

Visit HandsomeScienceTeacher.com to download a digital copy of the seventh grade textbook for free. If you would like a physical copy, they can also be purchased on HandsomeScienceTeacher.com.