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HOMESCHOOLING

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Eighth Grade Edition

Eighth Grade Science
Welcome to the final chapter of your exciting science journey in middle school! 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 final 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 eighth 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 Eighth Grade

During your time in eighth 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

- Animal Cells
- Plant Cells
- Tissues & The Structure of Living Things
- Organs & Organ Systems
- Evolution
- Natural Selection
- Artificial Selection
- Classification of Living Things
- The Animal Kingdom
- The Plant Kingdom
- The Fungi Kingdom & Single-Celled Kingdoms
- Mitosis
- DNA Transcription & RNA
- Translation & Proteins
- Osmosis, diffusion, Active/Passive Transport
- Middle School Science Capstone Project

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 the final chapter of 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!

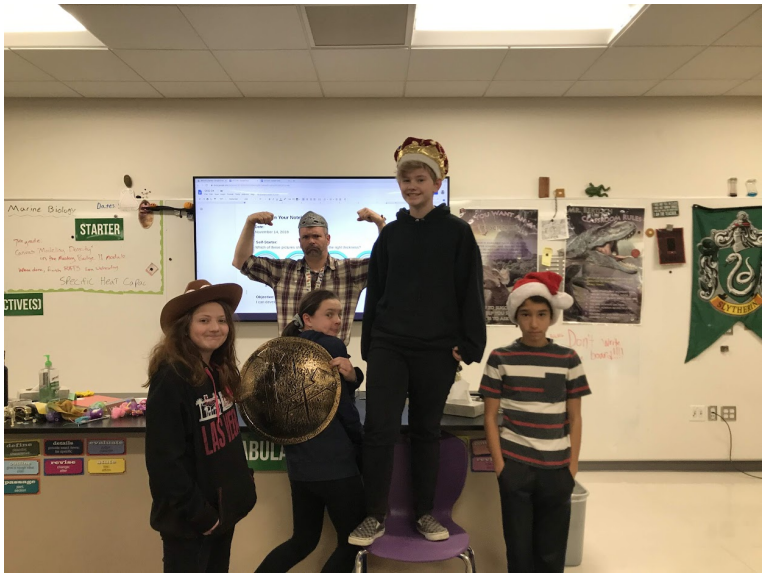
I loved building and working at The KidsKnowIt Network. It gave me some amazing opportunities. I got to meet and work with some impressive individuals. Including governments all over the world, in order to develop their science standards and curriculums. As well as top executives for companies like Microsoft, 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.

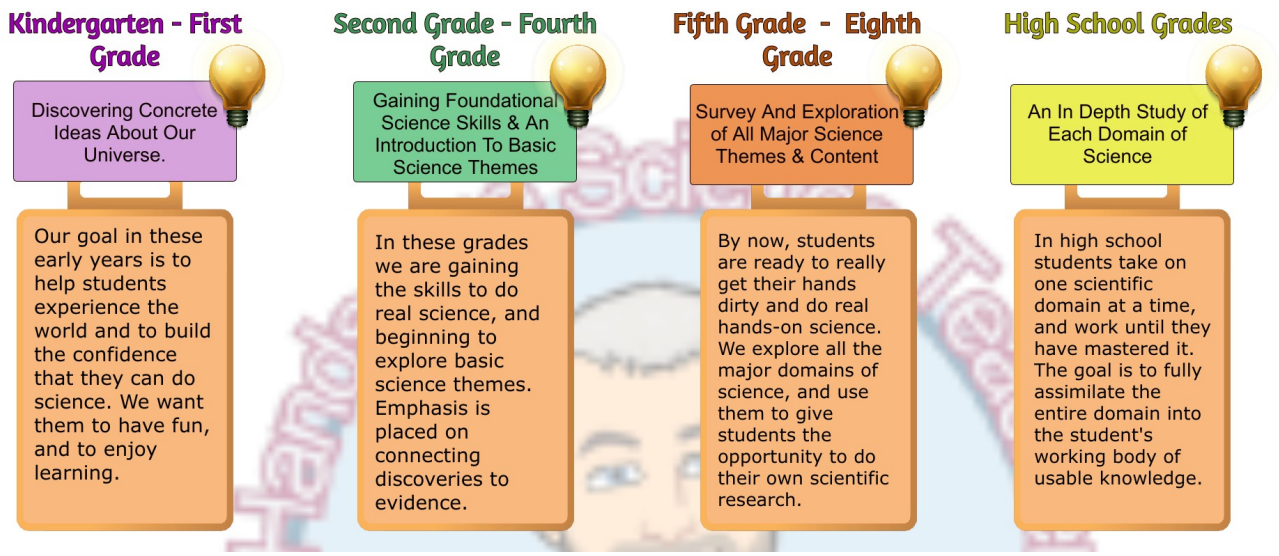
At no point in this curriculum do I tell them what they have to believe. Rather, I empower them to find truth on their own. It is not my job to impart my own agenda to them. Rather, it is my job to teach them to be skeptical of me as the teacher and to do their own research.

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.**

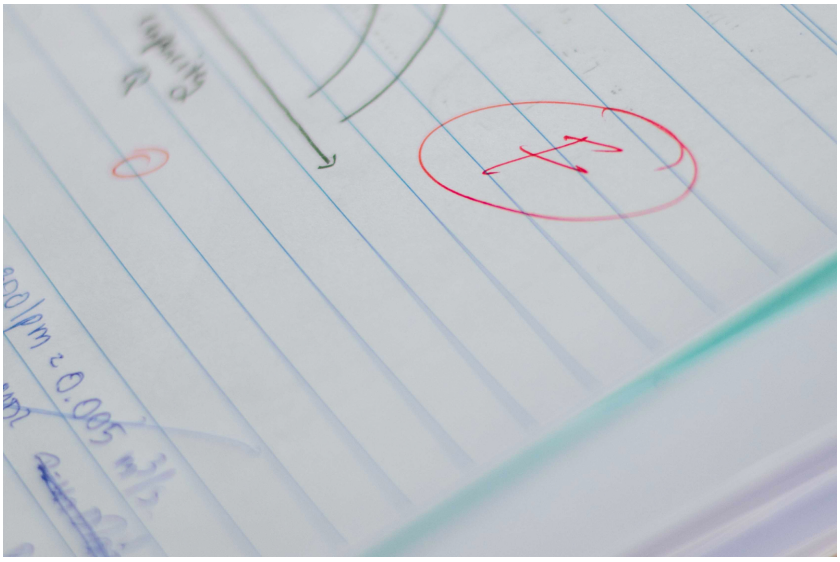
What they do not show though is how the grades of one teachers stack up against those of another. Johnny may earn an "A" in one class, but perhaps the same amount of work would have only earned him a "C" in another class down the hall.

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.

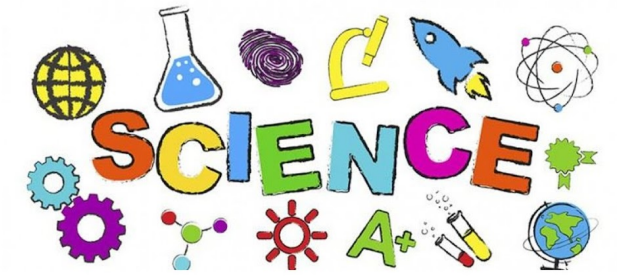
A project like this usually is overseen by a vast team. Just look at the credits page of a typical textbook! I do not have a team to help me. For me, this has been a labor of love. That I have funded out of my own pocket, and that I am giving away freely once it is completed. When it is done it will 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.

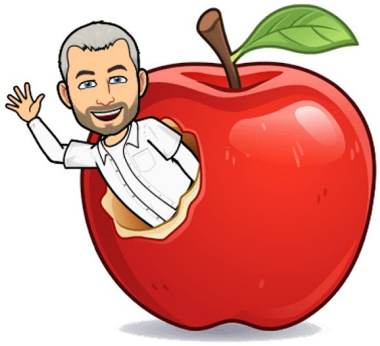
A project this massively immense would take an education publishing firm 5-10 years to produce and would be overseen by a team of hundreds of people working full-time. The books would go through editors and proofreaders.

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.





Animal Cells

What I Will Be Learning In This Mastery Badge:
In this master badge you will learn about the basic unit of life that all living things are made out of. You will learn the basic parts of a cell, and memorize the cell theory.

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 Cell Theory
- The Smallest Unit of Life
- Parts of A Cell
    - Cell Membrane
    - Cytoplasm
    - Nucleus
    - Endoplasmic Reticulum
    - Ribosomes
    - "The Mighty" Mitochondria
    - Vacuole
    - Golgi Aparatus

Name:_____ Date:_____

Activity: Discovering The Basic Unit of LIfe

Directions: Search online for pictures of cells, and diagram them 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 cells

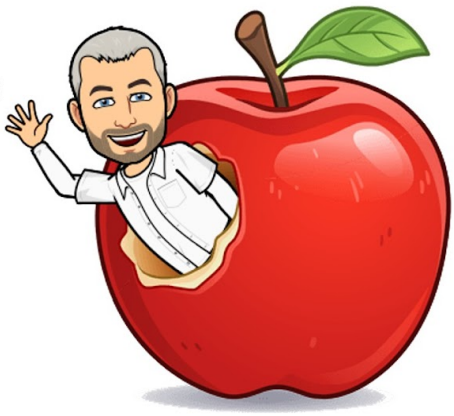
All Living Things Are Made of Cells

We are going to be using a microscope for this lab. If you do not have a microscope available, you can purchase an inexpensive one or rent a high-end microscope on HandsomeScienceTeacher.com. An alternative to using a microscope would be to use google images to pull up pictures of what slides would look like under a microscope.

Draw a Picture of Each Example of Cells From Your Microscope.
Look at six different examples of animal cells under your microscope. You can create your own by collecting cheek cells from your mouth, by picking a scab and collecting a small amount of blood, by looking at a fly wing, by examining a piece of dead skin, or by using pre-prepared slides.

Note: Make sure that your microscope is in proper focus. Otherwise, it will be difficult to see anything.

Analyze Your Observations:
Now that you have completed your observations look at your drawings. What patterns do you notice? There are no wrong answers. What matters is only that your answers are supported by your observations.



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 This QR Codes

This Mastery Badge includes two video:

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

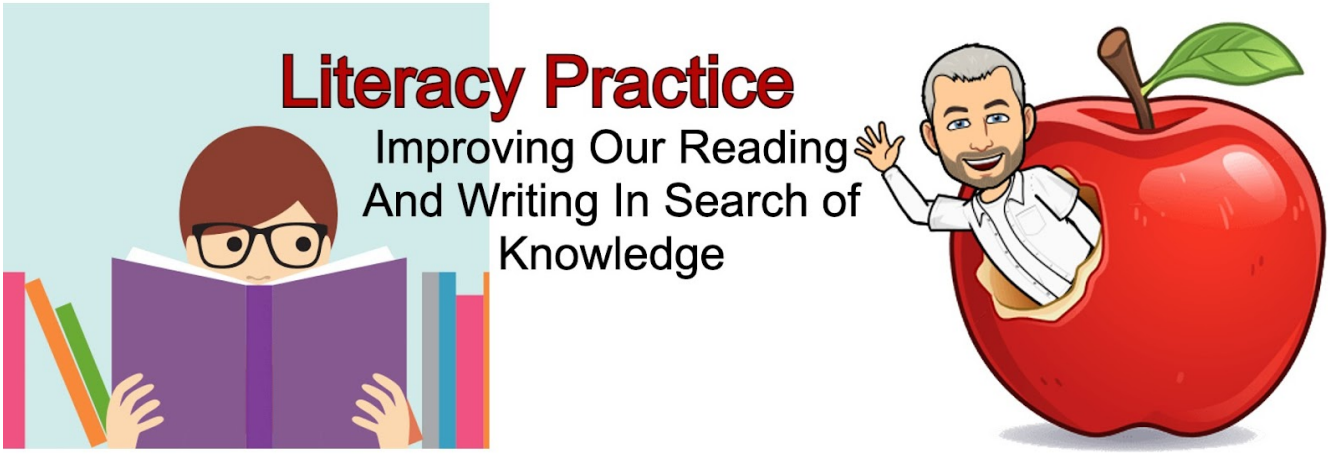
A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed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

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/cells-are-the-basic-unit-of-life/

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

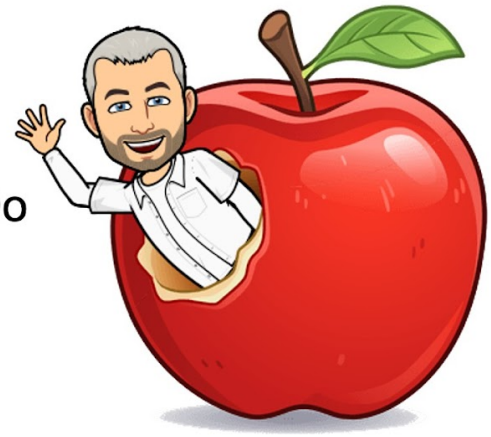
Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don’t rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words explaining what a cell is. Discuss at least two of the parts of a cell and how these parts help the cell to stay alive.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Activity: Modeling Animal Cells

Directions: Scientists make models of things to help them better understand them. In this lab, you are going to demonstrate your understanding of cells by creating a 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 demonstrate your understanding of animal cells, by creating a model.

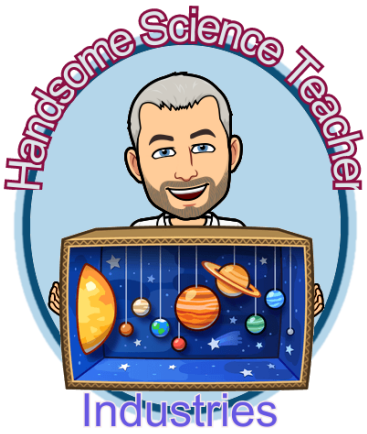
Your model must include the following:

- Cell Membrane
- Nucleus
- Cytoplasm
- Ribosomes
- Endoplasmic Reticulum
- Mighty Mitochondria
- Vacules
- Golgi Apparatus

Also, please make sure that everything is labeled, and includes a brief description.

Suggestion: You can make your model out of anything you want. Cardboard, clay, styrofoam, etc all work well.

However, in my opinion, the best models are **models that are delicious!** Because then you can eat them when you are done! Cookies and candy work really great for cell models. You can use frosting to hold it all together and different types of candy for each cell part. This is just a suggestion. All models are allowed, even the ones that are not delicious! :)



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)

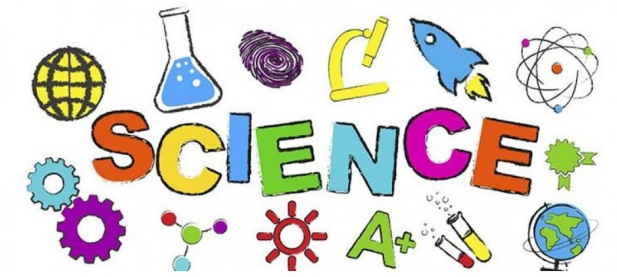
Mastery Badge Counselor Evaluation:
I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because… (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring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

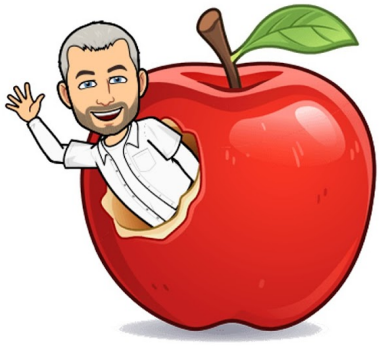
Student's Signature	Date	Signature of Mastery Badge Counselor	Date

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.





Plant Cells

What I Will Be Learning In This Mastery Badge:
In this master badge we will extend our understanding of cells by looking at plant cells. We will also learn new organelles and how to distinguish between plant and animal cells.

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:

- Cell Review
- How are plants and animals different?
- How these differences extend down to the cellular level.
- More Parts of Cells
    - Cell Wall
    - Chloroplasts - Why plants are green
- How plant vacuoles are different from animal vacuoles.

Name:_____ Date:_____

Activity: Discovering How Plants Are Different From Animals

Directions: You will be studying living things to learn how they are alike, and how they are different.

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 plant and animal cells are different.

All Living Things Are Made of Cells But Not All Cells Are Alike

Last week we learned that all living things are made up of cells. However, not all cells are alike. In this lab you will examine the differences between plants and animals.

Part I: Discovering Plants And Animals

Go outside (with adult permission) and observe four animals and four plant samples. Your animal samples can include family members (humans are a type of animal), pets, worms, birds, and insects.

Specimen 1: What type of animal or plant did you observe?	Describe what you observed. Include details about how it moves, how it feels, and so forth.

Specimen 2: What type of animal or plant did you observe?	Describe what you observed. Include details about how it moves, how it feels, and so forth.
Specimen 3: What type of animal or plant did you observe?	Describe what you observed. Include details about how it moves, how it feels, and so forth.
Specimen 4: What type of animal or plant did you observe?	Describe what you observed. Include details about how it moves, how it feels, and so forth.
Specimen 5: What type of animal or plant did you observe?	Describe what you observed. Include details about how it moves, how it feels, and so forth.
Specimen 6: What type of animal or plant did you observe?	Describe what you observed. Include details about how it moves, how it feels, and so forth.
Specimen 7: What type of animal or plant did you observe?	Describe what you observed. Include details about how it moves, how it feels, and so forth.
Specimen 8: What type of animal or plant did you observe?	Describe what you observed. Include details about how it moves, how it feels, and so forth.

Part II: How Are Plants And Animals Alike? How Are They Different?

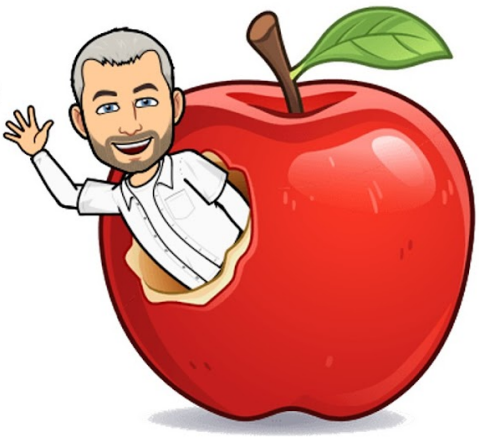
Look over your observations. Share some of your discoveries about how all plants and animals are alike.

Now look for things that make a plant different from an animal. You know right away when you see a plant or an animal what it is. How do you tell the difference? How is a plant different than an animal?

Final Questions:

1. Review: What are the three parts of the cell theory?
   a.
   b.
   c.

2. Why do you think plants are green? Later we will learn the actual reason. But based on what you already know, what is your best guess?



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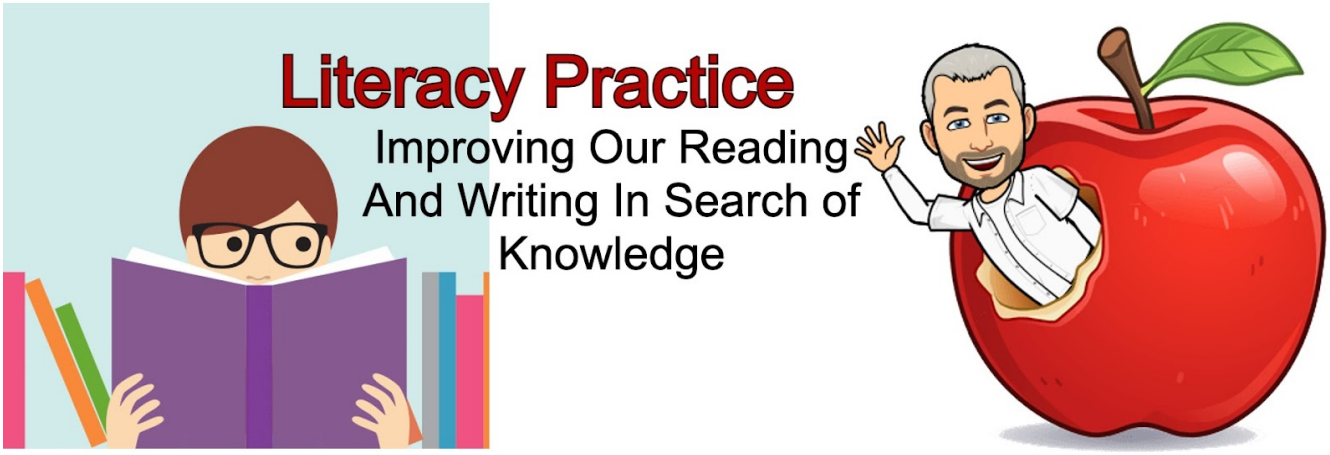
Now, Let’s Connect These New Concepts To Things You Already Knew

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 This Topic

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.**

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Article:

Read The Assigned Article Carefully For Understanding.
https://handsomescienceteacher.com/Online-science-classes-kids/the-discovery-of-cells-2/

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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?

%

Now Let’s Write To Communicate

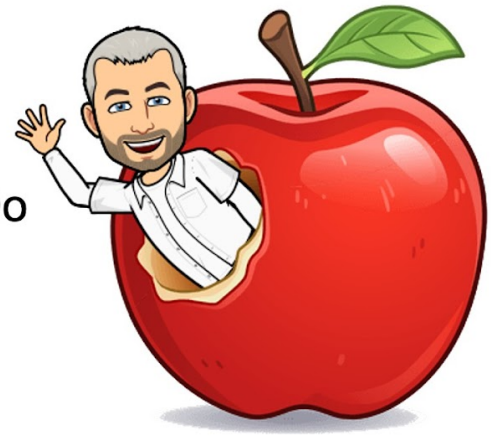
Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don’t rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words explaining how cells were first discovered.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Activity: Drawing Plant & Animal Cells

Directions: Scientists make models of things to help them better understand them. In this lab, you are going to demonstrate your understanding of plant and animal cells by creating a diagram illustrating the differences.

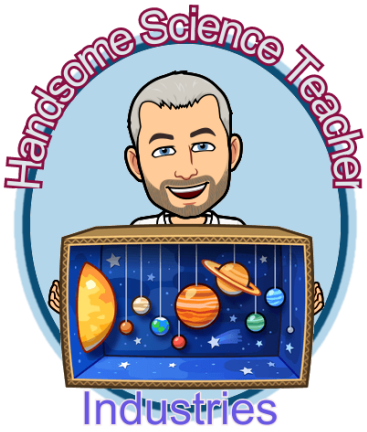
Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

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

Goal: To demonstrate your understanding of how plant cells are different than animal cells by creating a model.

Your model must include the following:

- One animal cell
  - Cell Membrane
  - Nucleus
  - Cytoplasm
  - Ribosomes
  - Endoplasmic Reticulum
  - Mighty Mitochondria
  - Vacules
  - Golgi Apparatus
- One plant cell
  - Cell Wall
  - Cell Membrane
  - Nucleus
  - Cytoplasm
  - Ribosomes
  - Endoplasmic Reticulum
  - Mighty Mitochondria
  - Chloroplast
  - Large Central Vacuole
  - Golgi Apparatus
- Must be labeled
- Must be in color
- Must include a description explaining how plant cells are different than animal cells.



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.

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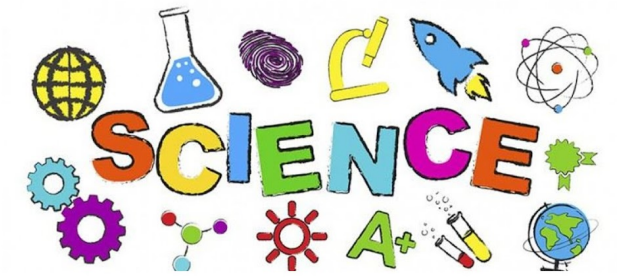
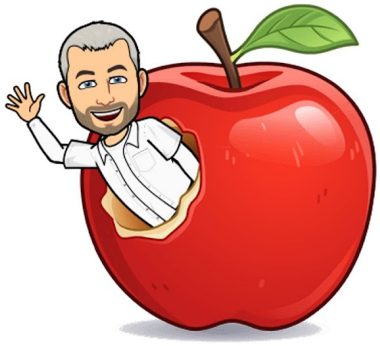




Cells Combine To Form Tissues

What I Will Be Learning In This Mastery Badge:
In this master badge, we will learn how cells combine to form tissues. We will also learn about each of the four types of tissues found in animals.

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:

- Two or more cells combine to form tissues.
- What is a tissue?
- The four types of tissues.
    - Epithelial Tissue
    - Nervous Tissue
    - Muscle Tissue
    - Connective Tissue

Name:_____ Date:_____

Activity: Discovering Tissues With A Virtual Microscope

Directions: Follow the directions below to discover how living things are organized into tissues.

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 cells combine to form tissues.

Cells combine to form tissues.

Living things are made of cells. In multicellular lifeforms, these cells usually combine to form tissues. In this lab, we will use a microscope to observe plant tissue.

Note: For this lab, you will need a microscope. If you do not have one available, you can purchase an inexpensive one, or rent a more high-end one from HandsomeScienceTeacher.com. An alternative would be to search Google to find images of what onion cells look like under a microscope.

Step 1: Create A Slide

We are going to be looking at onion cells under a microscope. To do this, we will need to first create an onion cell slide.

1. With adult supervision, carefully cut a raw onion and examine a single layer. Notice that you can peel off a very think membrane from either side of the onion layer. However, the inside (curved inward side) is usually best.

2. Peel the thin membrane off of the onion and place it onto a microscope slide. Try to lay the onion membrane as flat as possible. Folds will make it much harder for you to focus your microscope later.

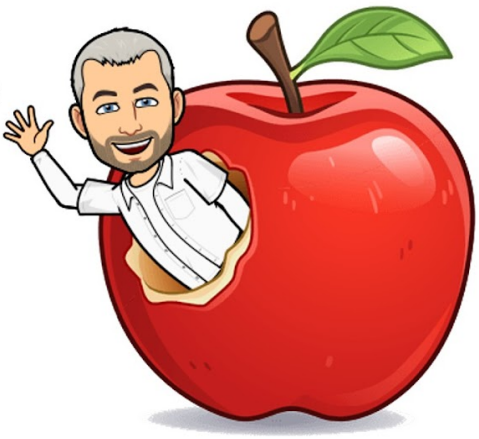
3. You can add a few drops of iodine onto your onion membrane if you have any. Which makes the cells easier to see, but is not necessary.

4. Place a slide cover over the top of your onion membrane.

Step 2: Observe The Slide
The membrane is made up of a layer of cells that have combined to form a tissue. Notice how the cells are connected to each other. The entire sample is made completely out of cells.

Draw a picture of what your slide looks like under the microscope.

Describe what you saw. What do the cells look like?



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Check Point

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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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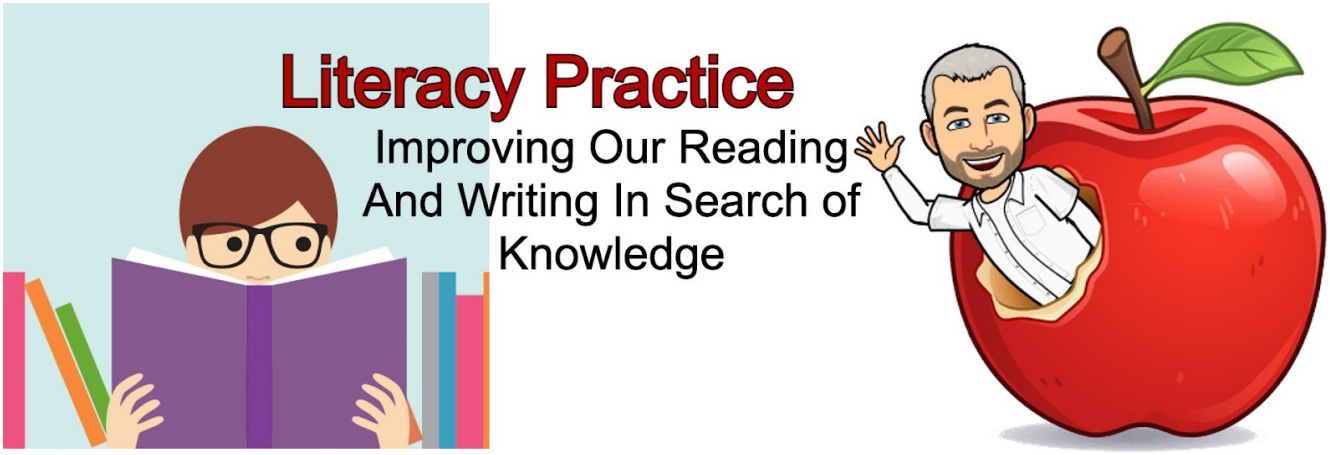

Activity: Reading And Writing About This Topic

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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   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.**

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   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/tissues/

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

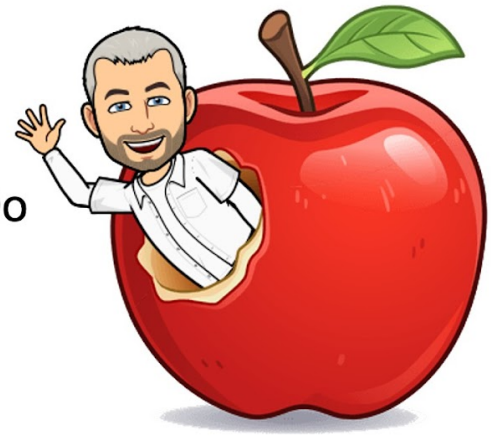
Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don’t rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words discussing the four types of tissues and their functions.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Activity: Creating A Comic Strip

Directions: In this lab, you will have to be creative! You are going to create a comic strip that discusses the four types of tissues. If you would like, your characters can be cells, or you can have them be people who discuss the types of tissues in their conversation bubbles.

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

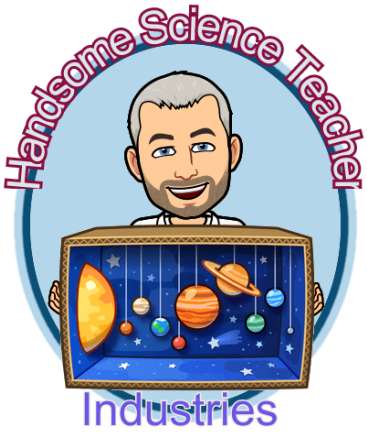
Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To demonstrate your understanding of the four main types of tissues that form in animals.

Your comic strip must include the following:

- Must discuss each of the four types of tissues, including their functions.
- Must be in color
- Must be at least eight frames long. A frame is a box or scene in your story.

If you need more space, you can create your own boxes on a separate piece of paper.



Congratulations! You Have Completed The Entire Mastery Badge
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Time To Evaluate Your Work
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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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Organs & Organ Systems

What I Will Be Learning In This Mastery Badge:
In this master badge you will learn how tissues combine to form organs, and how organs combine to form organ systems.

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:

- Two or more tissues combine to form an organ.
- Organs do specific jobs to keep the organism alive and healthy.
    - Heart, Lungs, Stomach, Brain, Kidneys, Intestines (large and small), and Liver.
- Organs combine to form organ systems.
    - Nervous System
    - Skeletal
    - Muscular System
    - Circulatory System
    - Resperitory System
    - Digestive System

Name:_____ Date:_____

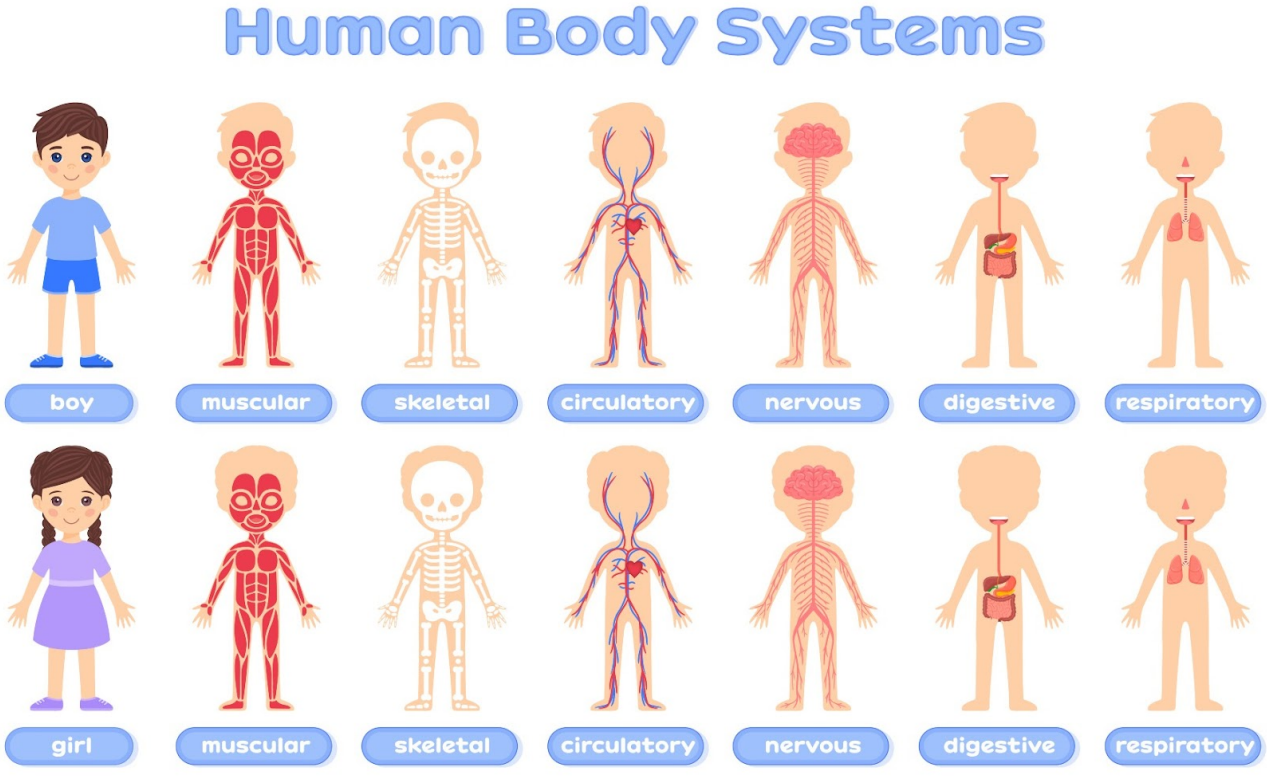
Activity: Discovering Organ Systems

Directions: Follow the directions below to discover how tissues combine to form various organs and organ systems.

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 tissues combine to form organs and organ systems.



1. What is an organ?

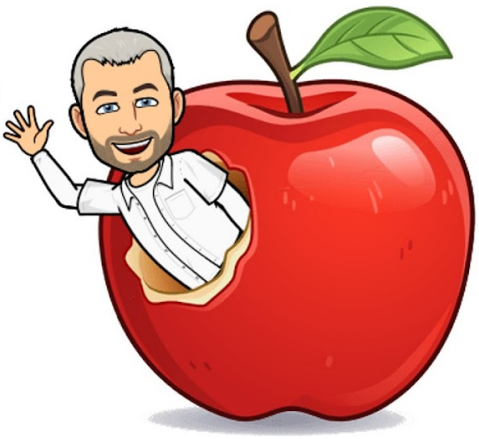
2. Give an example of an organ and explain its function.

3. What kinds of tissues are found in the organ you gave in the last question? What does each type of tissue do?

4. What is an organ system?

Complete this chart, explaining the job of each organ system, and the organs that make them up.

Organ System	**Function/Job**	**Organs Found In this Organ System**
Nervous System		
Circulatory System		
Respiratory System		
Skeletal System		
Muscular System		
Digestive System		
Urinary System		
Integumentary System		



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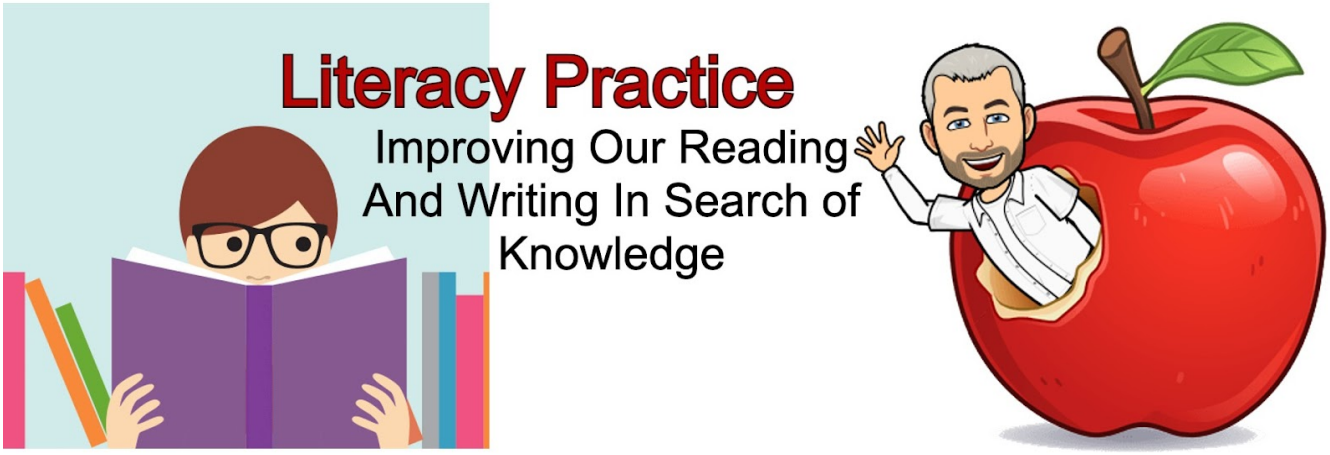

Activity: Reading And Writing About This Topic

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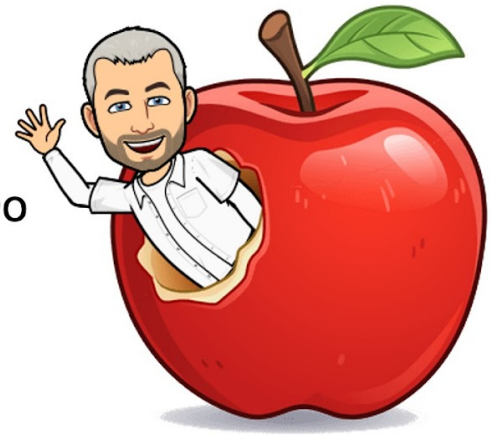
Applying Lab

Proving That We Can Do It Ourselves



Activity: Frog Dissection

Directions: In this lab, you are going to either dissect an actual living frog, or alternatively you can dissect a virtual frog. There are many virtual frog dissection simulations available online.

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 your understanding of organs and organ systems

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Frog Dissection Video

Mr. Bertoch walks you through the process of dissecting your frog in this video.

Supplies

To complete this lab, at a minimum you will need a frog, a pair of scissors, a paper towel, and a marker. You can purchase a frog online at HandsomeScienceTeacher.com.

Safety Note

Be very careful when working with scissors. Also, wear safety glasses throughout the dissection process.

The Video And Labsheet Are Designed To Work Together

Scan the QR code above to start the video. It goes along with the rest of the labsheet. The video will tell you when to pause so that you can write your observations down here on the labsheet.

Start The Video Now

Part I: The Outside of The Frog (The Integumentary System)
When the video instructs you to do so, examine the outside of the frog and answer each of the questions listed below.

1. What does the skin look and feel like? Be detailed.

2. How do you think the frog’s skin might protect it?

3. Draw a picture of the outside of your frog.

Continue The Video
Return to the video and continue watching it.

Remove The Skin
Remove the skin of the frog following the directions shown in the frog dissection video.

4. Describe what it felt like to remove the skin. How hard was it to tear?

Continue The Video
Return to the video and continue watching it.

Part II: The Muscular System
When the video instructs you to do so, examine the muscular system of the frog and answer each of the questions listed below.

5. What do the muscles look and feel like? Be detailed.

6. Bend and stretch the frogs arms and legs. Observe and describe how the muscles move.

7. Draw a detailed picture of the muscular system of your frog.

Continue The Video
Return to the video and continue watching it.

Part III: Inside Your Frog (Organs And Organ Systems)
When the video instructs you to do so, remove the organs and organ systems from the frog. Place them on a paper towel and label them. Then complete the tabel below, answering questions about each organ and organ system.

Organ	What it looked like	What does this organ do?
Liver		
Stomach		
Small Intestine		
Large Intestine		
Heart		
Lungs		
Kidneys		
Spleen		
Gall Bladder		

8. What did you find most interesting? What did you learn? Be detailed.

Continue The Video
Return to the video and continue watching it.

Part IV: The Skeletal System
When instructed to do so by the video, carefully remove all the muscle and remaining organs from your frog. Leaving only the skeletal system. Then answer each of the questions below.

9. What do the bones look and feel like? Be detailed.

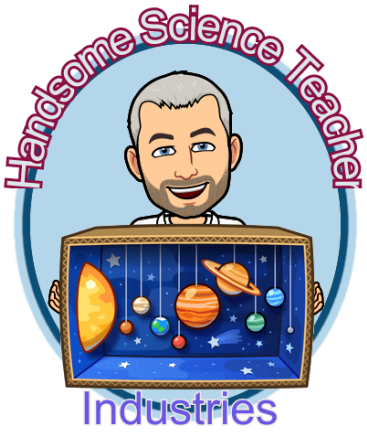
10. Bend and stretch the frogs arms and legs. Observe and describe how the bones move.

11. Draw a picture of the skeletal system of your frog.

Final Questions:
Answer each question using complete sentences.

1. Describe how cells combine to form tissues, organs, and organ systems.

2. Select an organ system of your choice and describe the function that it performs and the organs that make it up.



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

1. Did you do every assignment?
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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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Keep this on file as evidence of your successful completion of this topic.
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Evolution And Creationism

Supporting Our Views With Evidence While Remaining Objective

What I Will Be Learning In This Mastery Badge:
In this master badge you will learn about the theory of evolution. You will then compare the principle parts of this theory to creationism. Finally, you will choose a side on the evolution vs. creationism debate, and support your opinion using evidence.

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 importance of supporting our views and opinions with evidence.
- The importance of not allowing our biases to interfere with the conclusions we draw.
- Science is about allowing the facts to lead us toward the truth, and not about supporting our biases.
- The theory of evolution.
    - Charles Darwin
    - Natural Selection
    - Genetic Mutations
    - Evidence that both support and counter-support this theory
    - Vesitial Organs & DNA Code
    - Divergent And Convergent Evolution
    - The Tree of Life
- Taking Sides On This Debate & Supporting Our Views With Evidence

Name:_____ Date:_____

Activity: Preparing To Take A Side

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 think about the importance of remaining unbiased when doing science.

Evolution & Creationism - A Hotly Debated Topic

Few topics engender more discord both within and without science than the debate surrounding the topic of evolution. Feelings surrounding this topic can often be very strongly held, on both sides. As a result, there are very few who truly look at the issue with an open mind.

This includes scientists. Who very often utterly refuse to consider any possibility of there being a creator. It can also include creationists who dismiss evidence that may support evolution. In this lab, we are going to consider the importance of remaining unbiased, and of supporting our positions with evidence.

As you complete these assignments, try to remain neutral in your perspective. Do your best to truly think about the topics being discussed and allow the data to lead you, rather than looking to confirm what you already believe.

A Note To Parents: Evolution is an emotionally and politically charged topic. The purpose of this mastery badge is not to convince or promote any agenda. Rather it is to encourage everyone to remain neutral. Intelligent people look at the data thoughtfully. Nothing illustrates mankind's inability to do this more than this topic. Before you allow your student to complete this mastery badge please feel free to look over the material and watch the included video.

You Will Be Taking A Position On This Debate

Later you will take a position on this debate. You will argue on behalf of those who advocate for creationism, those who advocate for evolution, or those who advocate for both. First, though we need to prepare our minds so that we can approach this with a fair and unbiased approach.

Read each scenario and then answer the questions.

Scenario 1
Bill works in a company that sells SuperGreat Soda. He has spent the past 17 years as a sales rep, telling everyone how delicious SuperGreat is. Every time Bill makes a sale, he is awarded with a bonus check by his employer.

1. If you were to ask Bill which soda is the most delicious what do you think he would tell you? Explain your answer.

2. Do you think Bill is a trustworthy source when it comes to determining which soda is really the best? Explain your answer.

Scenario 2
Mandy absolutely does not believe in UFOs or aliens. She has written online social media posts making fun of people who do believe in aliens and once told you that there is absolutely nothing that anyone could show her that would ever convince her that aliens are real.

3. While walking home from school you find the body of an animal that you do not recognize. You wonder if it might be alien. What would Mandy tell you if you asked her for her opinion? Explain your answer.

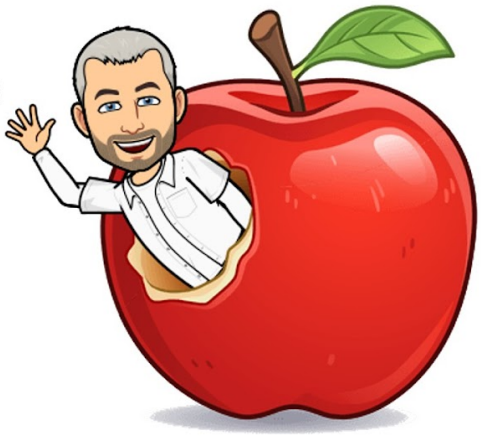
4. Who could you ask that might give you a more fair and unbiased opinion? Explain your answer.

Being Thoughtful About Managing Biases

Scientists try to maintain an unbiased approach to their research. This means that they do not allow their biases to interfere with the conclusions that they might draw about how the Universe operates.

5. Why do you think it is important for scientists to be unbiased in their research? Explain your answer.

6. If a scientist allows their conclusions to be biased by their own beliefs how valid do you think their conclusions are? Explain your answer.



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Watch The Assigned Science Video

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

Check Point

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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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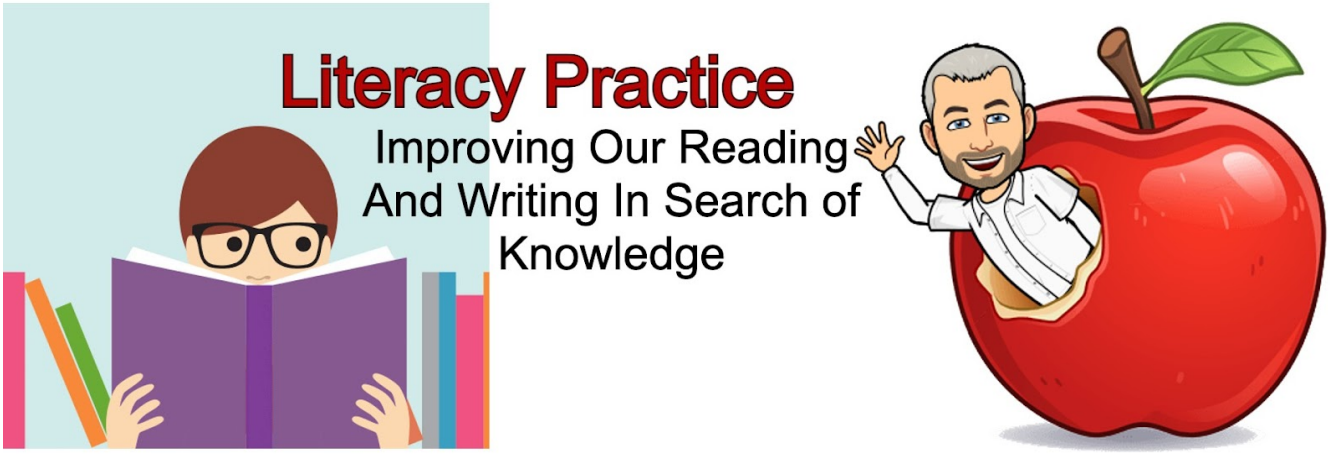
10.

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 This Topic

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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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/evolution/

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

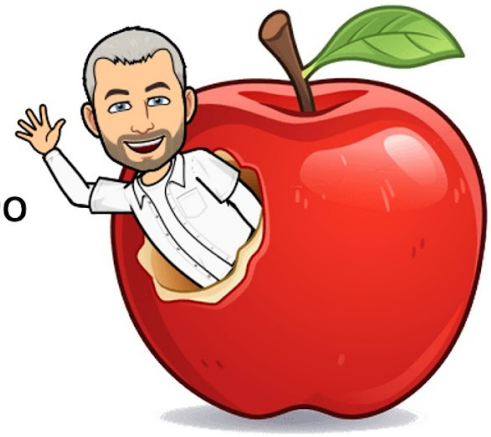
Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don’t rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words explaining how scientists believe that evolution occurs.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Activity: Evolution Essay

Directions: In this lab, you are going to write an essay supporting why you either do or do not believe in the theory of evolution.

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 your understanding of the theory of evolution.

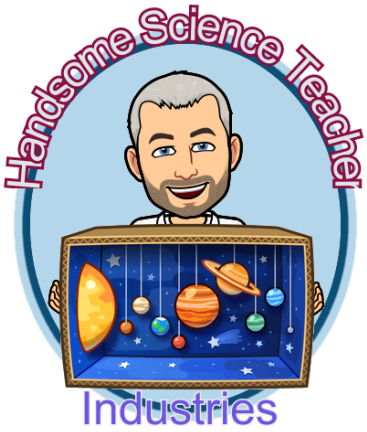
Support Your Position With Evidence

You have now completed an exhaustive study of evolution. Including the theory, as well as the evidence both supporting this theory and the evidence that stands against it. It is time for you to make your own judgment call.

What do you think about the theory of evolution?

Write a five-paragraph (minimum) essay stating your views on evolution versus creationism. There are no wrong answers. However, make sure to support the positions you take with strong evidence. This is especially important on a topic like this, where there are a lot of different strongly held views.

- Make your arguments as strong as you can, so that they will withstand examination by others.
- Discuss the theory of evolution in detail, including natural selection, gene mutation, punctuated equilibrium, and divergent and convergent evolution.
- Share evidence for why you either do or do not believe in the theory of evolution.



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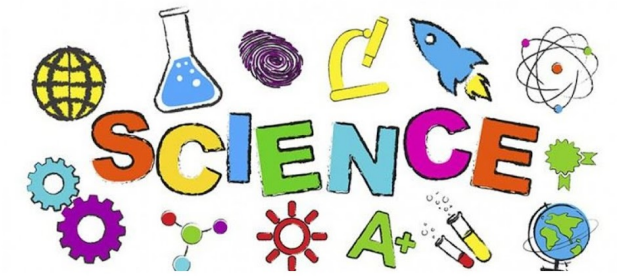

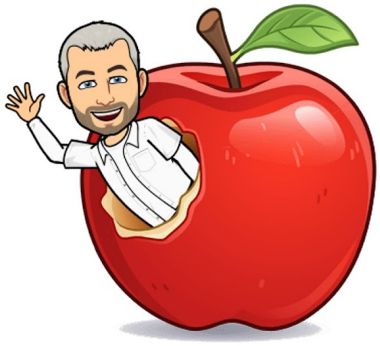

Natural Selection

What I Will Be Learning In This Mastery Badge:
In this mastery badge you will learn about natural selection.

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.

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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:

- Evolution is driven by natural selection.
- Natural selection was first suggested by Charles Darwin.
- What is natural selection?
- How do gene mutations affect natural selection?
- What is sexual selection?

Name:_____ Date:_____

Activity: Discovering Natural Selection

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 natural selection.

Following In The Footsteps of An Animal

We are going to follow the evolutionary history of an animal of your choice and consider thoughtfully how it may have evolved.

Select any animal that is currently still alive. Do not pick an extinct animal.
Which animal will you be studying?

Why did you select this animal?

Creating A Phylogenetic Chain

A phylogenetic chain shows the connections or links from one species to another back through time.

They show the species that modern animals evolved from. These chains are not always easy to construct. It can be difficult to find some of the links between different species. To construct this chain, you will have to do some research, and you may have to do some guessing.

The Next Link
The final link in your chain is the animal you selected. It is the modern version of your animal. Using the Internet and books, try finding the next link in the chain. For example, if you selected horse as your animal, the next link would be pilohippus, since the modern horse’s most recent ancestor species is believed to have been pilohippus.

Which species did the animal you selected most recently evolve from?

How is your animal different from that animal?

The Next Link
What is the next link in the chain? What species proceeded the one you listed above?

How did the species evolve? How is it like the last one? How is it different?

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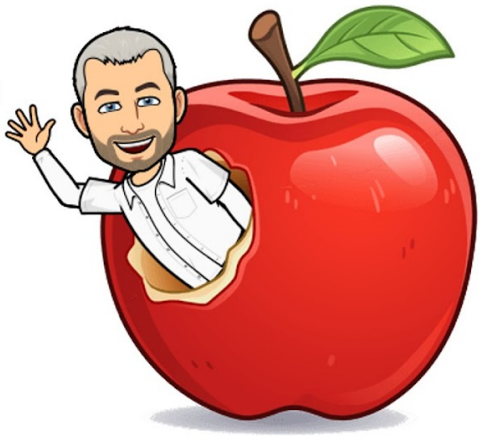
Let’s Consider The Future

On the last page, you identified several different species that have existed over time. You showed how the ancestors of the animal you selected have changed throughout time.

Do you think your animal is done evolving? Will its offspring remain the same forever, or is evolution an ongoing process? Explain your answer.

What forces affect how an animal might evolve in the future?

Draw a picture showing what the descendants of your animal might look like 20 million years from now. There is no way to know for certain but make an educated guess.



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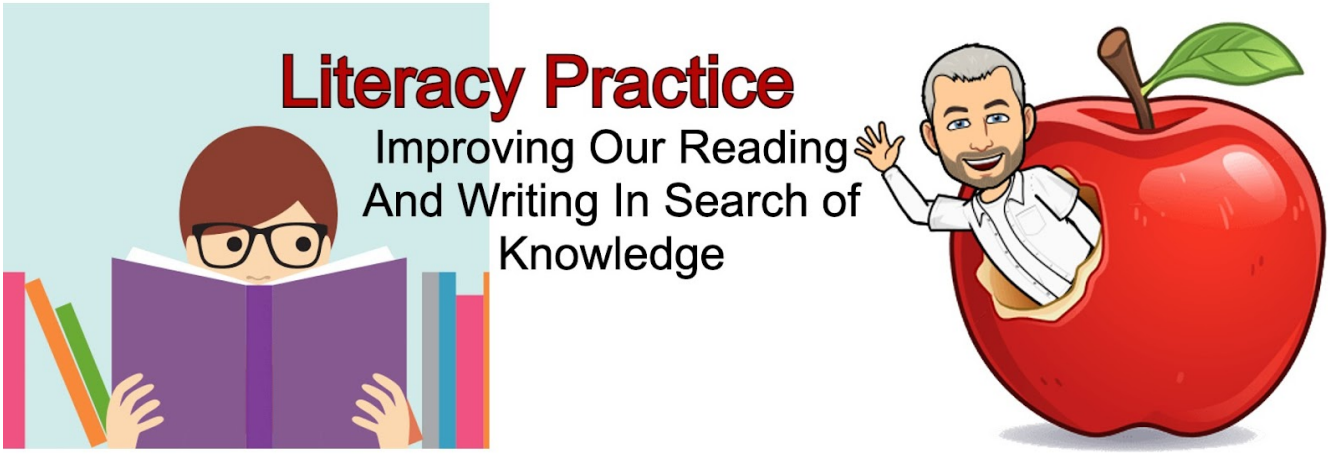

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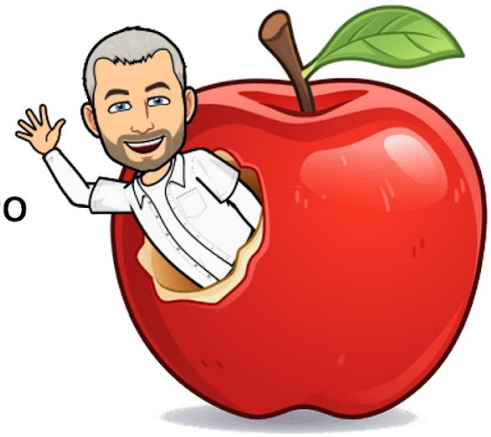
Writing Prompt: Write two paragraphs in your own words explaining how scientists believe life on Earth began.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Activity: Creating A Textbook Diagram

Directions: In this lab, you are going to create a textbook diagram, demonstrating your understanding of natural selection.

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 your understanding of natural selection.

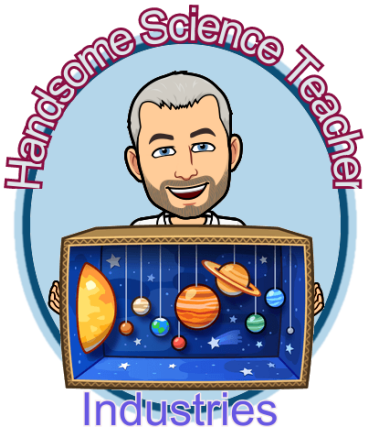
Natural Selection Diagram

Congratulations! The management of Acme Textbook Corp. has assigned you the task of creating a diagram for their 8th Grade Science Texbook. What? You don't work for Acme! Oh, well that is even better! If you don't work for us, we won't have to pay you! Now then, on to your assignment:

Create A Detailed Illustration Showing How Genes Mutate And How This Leads To Natural Selection

Create a detailed textbook illustration showing how genes mutate and how these mutations can sometimes lead to evolution through natural selection. Include all of the items listed below.

- Show how DNA is copied when cells divide.
- Show how sometimes this DNA is copied incorrectly.
- Show how this leads to mutations.
- Show why some mutations are passed on to future generations.
- Label your illustlration.
- Make sure your illustration is in color, and that it is drawn to your best ability.



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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**

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.

Natural Selection

What I Will Be Learning In This Mastery Badge:
In this mastery badge you will learn about artificial selection.

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

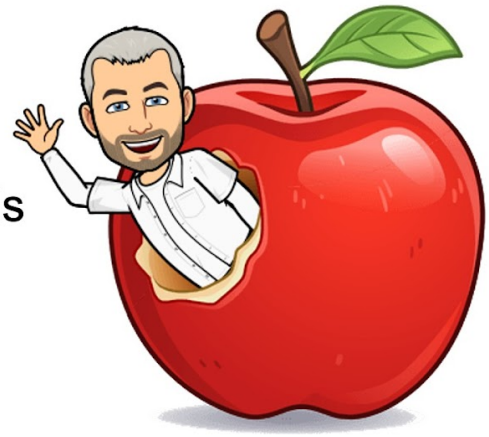
Some of the most important things we will learn in this mastery badge:

- Evolution is driven by natural selection.
- Natural selection was first suggested by Charles Darwin.
- Natural selection promotes traits that benefit the species.
- Artificial selection promotes traits that benefit human beings.
- Examples of artificial selection through selective breeding.

Name:_____ Date:_____

Discovering Lab

Learning Through Hands On Activities



Activity: Discovering Artificial Selection

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 artificial selection.

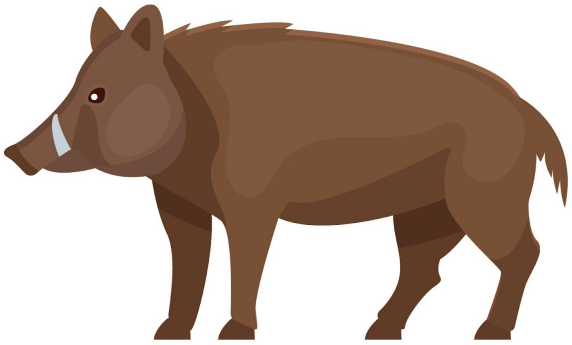
Comparing Natural Selection To Artificial Selection

Humans have domesticated numerous plants and animals. In this lab, you are going to be exploring domesticated plants and animals, and comparing them to their original wild (natural) forms.

Part I: Domesticated Animals

For each animal listed draw the missing Form. You may have to do some research to determine what the missing form looks like.

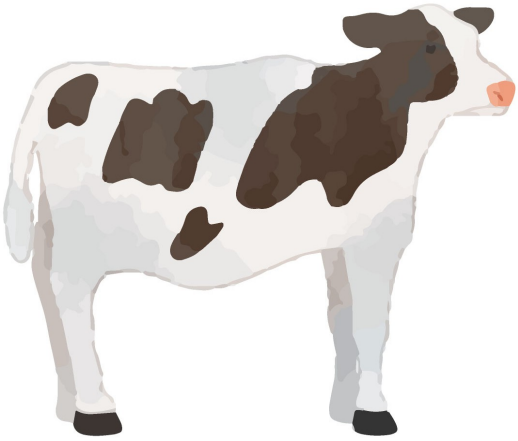
Wild Pig



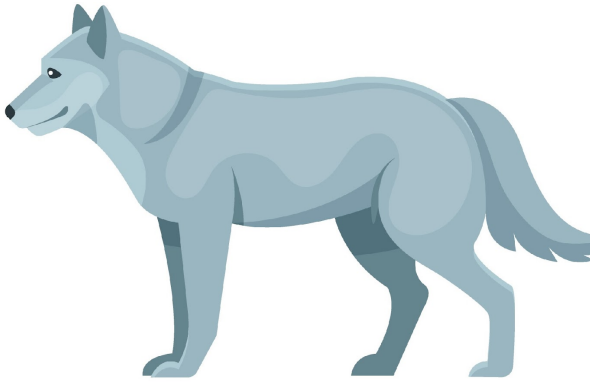
Draw A Domesticated Pig

Draw A Wild Cow (Bison, Buffalo, Ox, Etc)

Domesticated Cow



Wild Dog (Wolf)



Draw A Domesticated Dog

Draw A Wild Cat

Domesticated Cat

Part II: Domesticated Plants

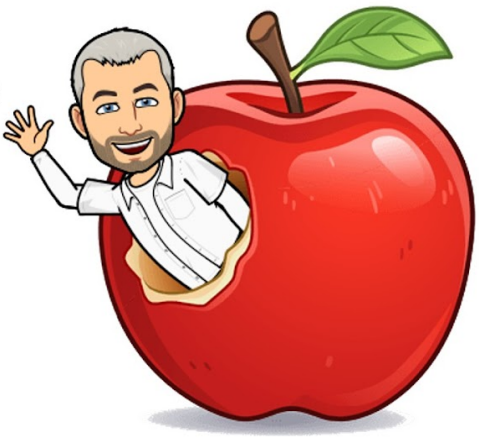
Corn is one of the most versatile crops that mankind has tamed. Today there are thousands of varieties of corn available. All of these varieties all started from the same wild plant known as teosinte. For this assignment, you will be doing research on how ancient Americans cultivated teosinte into so many different varieties of corn.

Draw A Picture

Create a picture of teosinte showing what it looked like in the wild.

Write A Paragraph

Write a paragraph explaining how the inhabitants of Ancient America cultivated teosinte, turning it into modern-day corn.



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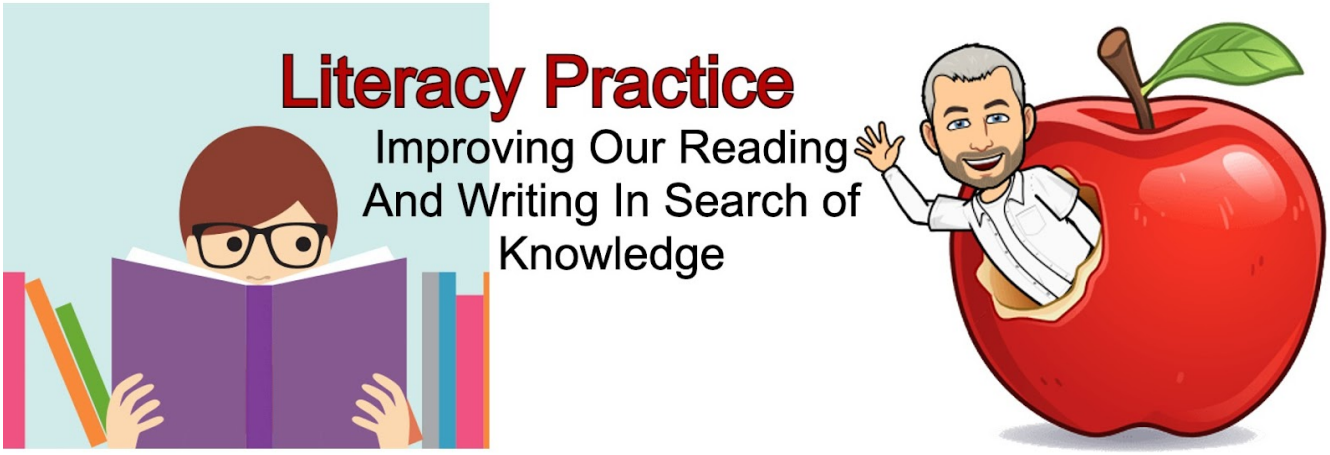
Now, Let’s Connect These New Concepts To Things You Already Knew

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 This Topic

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/artificial-selection-leads-to-changes-in-species-in-order-to-help-humankind/

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

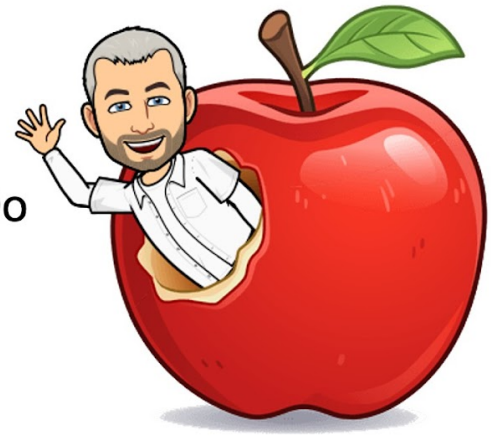
Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don’t rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words explaining what artificial selection is.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Activity: Defending Fido

Directions: Follow the direction below to help defend your loyal dog.

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 your understanding of artificial selection.

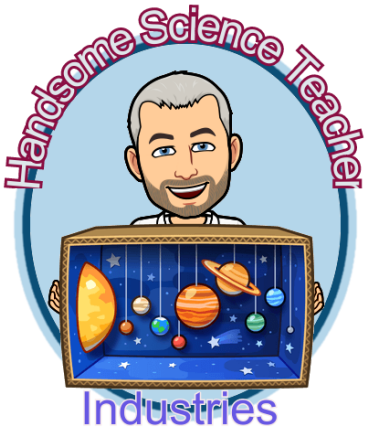
Your pet dog is very upset. The mail just arrived, and in it, your dog received a rejection letter from The Society of Lovable Canines, which stated that because your dog was not in fact a wolf, the board of SOLC has decided not to extend them membership in their exclusive club.

It turns out that the board has recently been re-elected so that only wolves now sit on it. These snobby wolves do not consider their domesticated cousins to be worthy of membership in SOLC!

Being the loving pet owner that you are, you have offered to fight for your dog's right to join their club. The wolves have scheduled you for a presentation before their board, where you will explain to them that your dog is just as much of a canine as they are.

Prepare A Slideshow
You want to go to your meeting prepared! Prepare a slideshow presentation (PowerPoint, Google Slides, etc) where you cover all of the following points.

- Must be at least 10 slides long
- Must show how dogs descended from wolves through artificial selection.
- Must show what artificial selection is, and how it occurred.
- Must make a convincing argument for why your dog should be allowed to join SOLC.



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

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Kingdoms of Life

What I Will Be Learning In This Mastery Badge:
In this mastery badge we will begin our study of living things and how they are classified. This will lay a foundation for the next three mastery badges that follow. You will learn how things are classified by scientists, and explore some of the disagreements that exist amongst scientists who work in this field. You will then be asked to choose a side. You will have to decide which scientists you most agree with, and present an argument as to why you believe that they are most correct.

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 living things are classified.
- Domain, Kingdom, Phylum, Class, Order, Family, Genus, Species
- What are the main kingdoms of life?
- Disagreement & Controversy

Name:_____ Date:_____

Activity: Discovering How Living Things Can Be Classified

Directions: Follow the steps below to learn as much as you can about how living things might be classified. If you are unable to go outside, you can pick any living things that you want (from your imagination) 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 living things can be classified.

Step 1: Go Outside (With Parental Permission). Collect samples from twenty different living things that you see. If you do not know their names that is okay. You can describe what they look like. In the case of plants, mushrooms, and mosses, take a physical sample back home with you.

In the case of animals, just take a picture (don't disturb any animals!). Insects and worms count as animals. Try to get a good variety of living things. Make sure that they are not all plants, all animals, or all mushrooms. Try to mix them up!

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Step 2: For this step you are going to create your own classification system. Don’t worry about it matching anything created by other scientists. For this activity you are the scientist! Whatever you create is great! Just make sure to have at least three different categories. (Example: Green Things, White Things, Other Colors, or Hard Things, Squishy Things, Wet Things).

Classify your samples into each of your three groups.

First Group: _____
Which of my samples fit into this group?

Second Group: _____
Which of my samples fit into this group?

Third Group: _____
Which of my samples fit into this group?

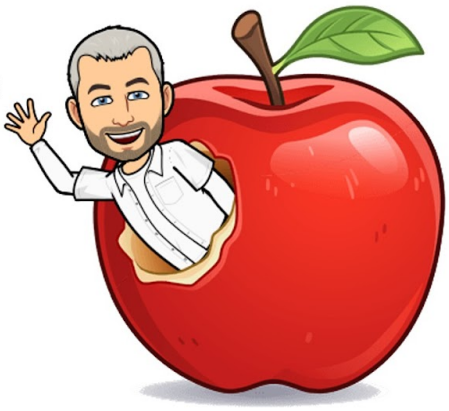
Final Questions:

1. How does classifying your samples make them easier to compare or contrast to each other?

2. How might this help a scientist better understand an environment that they are studying?

3. Explain why you think scientists classify living things into categories.

4. Do you think that there is only one correct way to categorize living things? Explain your answer.



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 video:

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.

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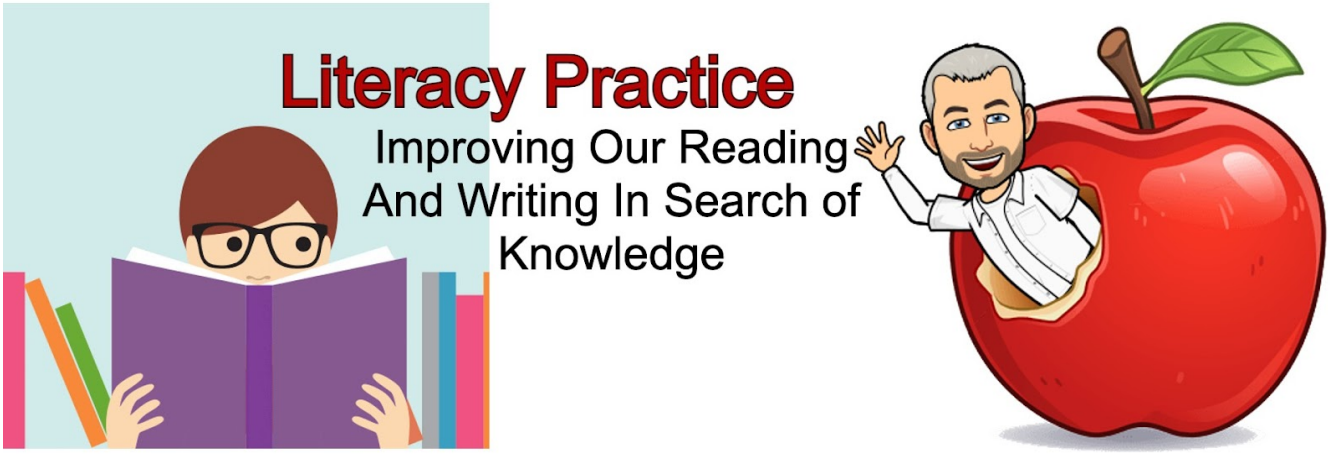
Now, Let’s Connect These New Concepts To Things You Already Knew

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 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:

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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

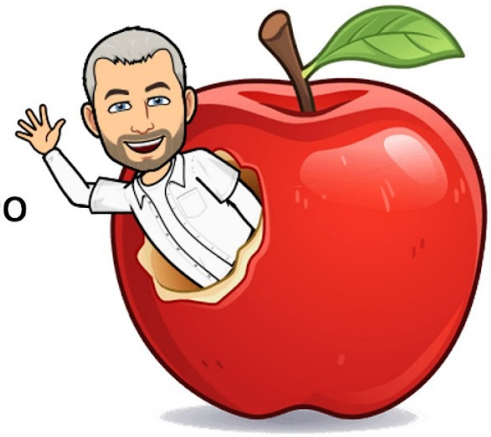
Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don’t rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write three paragraphs in your own words describing each of the kingdoms of life. Be detailed.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Activity: Applying Classification Systems - Taking Sides

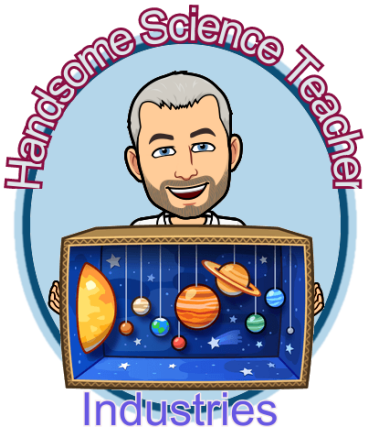
Directions: Now that you understand how the various classification systems function and how scientists use them to categorize living things, you are going to choose a side. Do you think that living things should be classified into five kingdoms or six?

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 argue your opinion using evidence to prove that you are right

Choose a side! Do you think living things should be classified into five kingdoms or six? Write three paragraphs arguing why you believe that this is the case. Your answer must cite evidence to back up your opinion. Incidentally, it is okay to reject both of these systems and create your own system from scratch. If you choose this option explain your new system in detail including why it is better than the systems used by other scientists.



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

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

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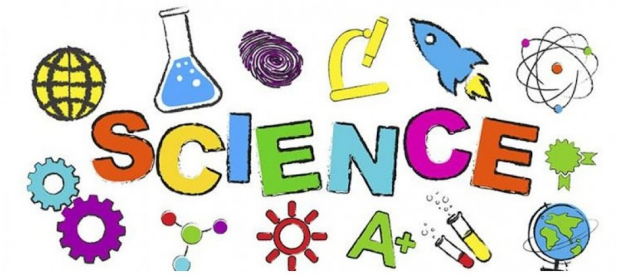
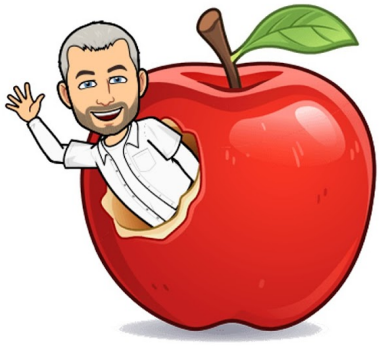




The Animal Kingdom

What I Will Be Learning In This Mastery Badge:
In this mastery badge we will continue our study of living things and how they are classified. Looking at the various phyla of the animal kingdom. We will explore what each phylum has in common, and how they are different from one another. Then you will create your own model representing these phyla.

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 Animal Kingdom
- The Phyla of The Animal Kindom
    - Porifera
    - Coelenterata (Cnidaria)
    - Platyhelminthes
    - Aschelminthes (Nemotoda)
    - Annelida
    - Arthropoda
    - Mollusca
    - Echinodermata
    - Chordata
- Characteristics of each phylum
- Vertebrate Classes (Fish, Mammals, Amphibians, Reptiles, Birds)

Name:_____ Date:_____

Activity: Discovering How Animals Are Alike, And How They Are Different

Directions: Follow the steps below to learn as much as you can about how animals are similar and how they are different from one another. If you are unable to go outside or to a zoo or farm, you can pick any animals that you want (from your imagination) to complete this assignment and then do your research through videos of the animals online. Make sure you record all of your observations and answers using complete sentences.

Important Note:
Whenever we study living things, especially animals, it is important not to disturb, frighten, or cause them any harm. Please be very careful to do all of your research from a safe distance, and do not bother the animals that you study.

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 animals are alike and how they are different

Animal Observation: With your parent or guardian's permission you will need to study five different animals, and record their behaviors. Your study of each animal should include 30 minutes of direct observation. In your notes record what behaviors you observed, as well as a detailed description of what the animal looks like. Also include a hand-drawn sketch of each animal that you observe.

Note: Make sure that each of the animals you observe is very different from the others, so that you get a good variety of observations. For example, don't do five birds, or five small mammals. Instead, you might choose to observe a bird, a fish, a worm, an insect, and a mammal.

Animal # 1:

The Animal I observed is a(n)
_____

Date and times of my observations (Must be at least 30 minutes):
_____

The behaviors I observed this animal doing:

A detailed description of what this animal looks like, and what I think the inside of it is probably like (Predict or guess whether it has a skeleton, complex organs, simple organs, no organs, etc).

Complete a hand-drawn sketch of your animal:

Animal # 2:

The Animal I observed is a(n)
_____

Date and times of my observations (Must be at least 30 minutes):
_____

The behaviors I observed this animal doing:

A detailed description of what this animal looks like, and what I think the inside of it is probably like (Predict or guess whether it has a skeleton, complex organs, simple organs, no organs, etc).

Complete a hand-drawn sketch of your animal:

Animal # 3:

The Animal I observed is a(n)
_____

Date and times of my observations (Must be at least 30 minutes):
_____

The behaviors I observed this animal doing:

A detailed description of what this animal looks like, and what I think the inside of it is probably like (Predict or guess whether it has a skeleton, complex organs, simple organs, no organs, etc).

Complete a hand-drawn sketch of your animal:

Animal # 4:

The Animal I observed is a(n)
_____

Date and times of my observations (Must be at least 30 minutes):
_____

The behaviors I observed this animal doing:

A detailed description of what this animal looks like, and what I think the inside of it is probably like (Predict or guess whether it has a skeleton, complex organs, simple organs, no organs, etc).

Complete a hand-drawn sketch of your animal:

Animal # 5:

The Animal I observed is a(n)
_____

Date and times of my observations (Must be at least 30 minutes):
_____

The behaviors I observed this animal doing:

A detailed description of what this animal looks like, and what I think the inside of it is probably like (Predict or guess whether it has a skeleton, complex organs, simple organs, no organs, etc).

Complete a hand-drawn sketch of your animal:

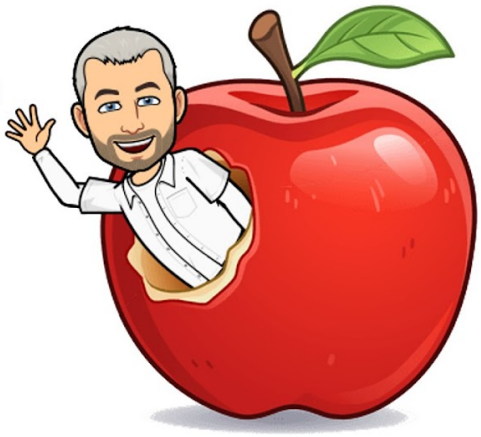
Final Questions:

1. How were the animals you observed all similar? Be detailed.

2. How were the animals you observed different from one another? Share specific examples.

3. Why do you think that different animals might be so different from one another?

4. How do you think these differences might affect the way that these animals live their lives? Give specific examples.



Handsome Science Teacher One Take Videos

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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 video:

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

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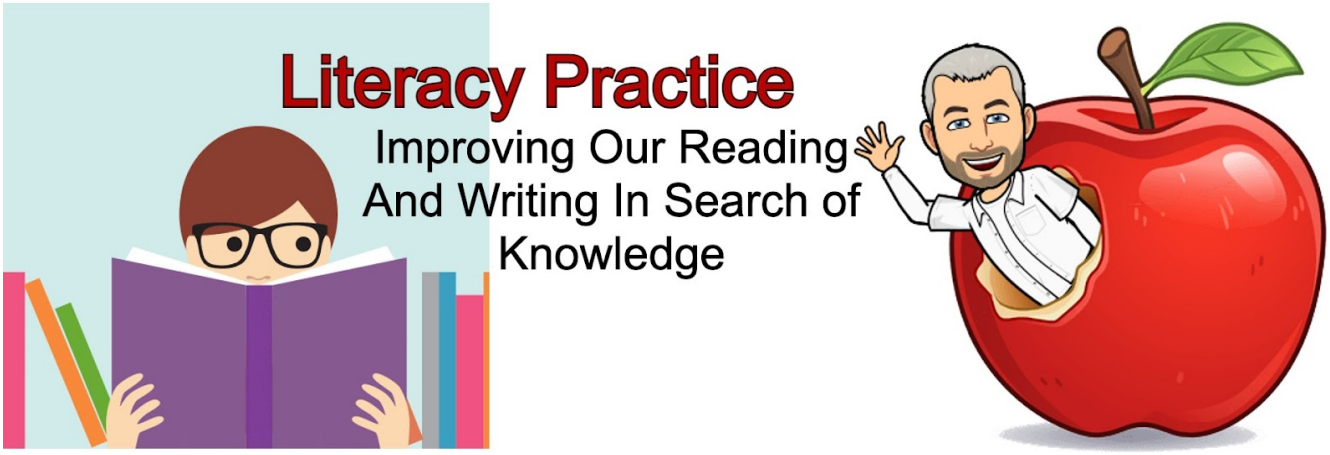
Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?



Activity: Reading And Writing About 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

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   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.**

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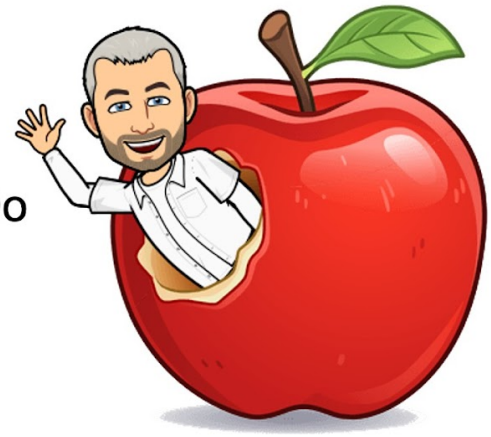
Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don’t rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write three paragraphs describing what animals are, how they are classified, and how they are alike and different.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Activity: Creating A Model of The Animal Kingdom

Directions: Now that you understand how various animals are classified, you will create a model showing the relationship between different phylum within the animal kingdom. Your model should include all ten phyla, as well as the five classes of vertebrae. This model can be either 3D, or it can be done as a drawing or diagram.

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

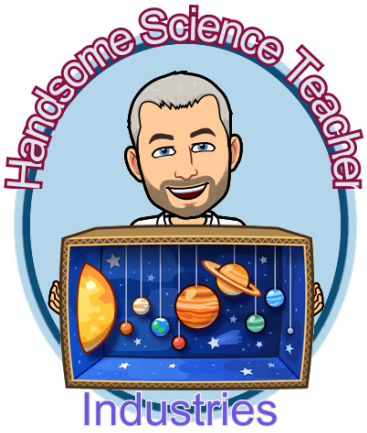
Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To create a model demonstrating your understanding of the Animal Kingdom.

Final Questions

Answer each question using complete sentences.

1. Which phyla of animals are most common on Earth?
2. What does bilateral symmetry refer to?
3. What does radial symmetry refer to?
4. Share an example of an animal with bilateral symmetry.



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:

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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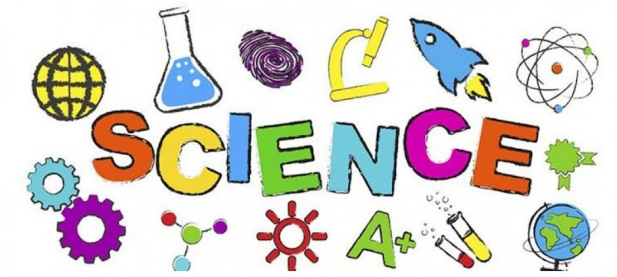
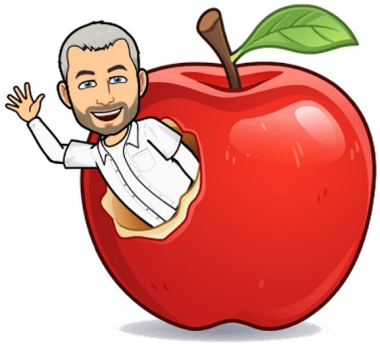




The Plant Kingdom

What I Will Be Learning In This Mastery Badge:
In this mastery badge we will continue our study of living things and how they are classified. Looking at the various types of plants. Including the major structures of plants, how plants are different from other living things, how plants reproduce, and how plants are classified.

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 plants? How are they different from other living things?
- Major structures of plants.
- How plants reproduce.
- How plants are classified.
    - Vascular
        - Seedless
        - Seeds
            - Gymnosperms
            - Angiosperms
    - Non-Vascular

Name:_____ Date:_____

Activity: Discovering Plants By Murdering Them (For Science)

Directions: Follow the directions below to learn as much as you can about plants.

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 plants are alike and how they are different

Plant Observation:

Collect three plant samples. This could be a weed, a flower, grass, or any other plant you find outside. Make sure that your samples include roots, stems, and leaves. Note that in some plants the leaves and the stems are the same things, such as grass.

Carefully dissect the plants. If you have a magnifying glass it would be a good idea to use it to make your observations. Note as much as you can about the various parts of the plant, as you carefully take it apart.

Plant # 1:

Describe what you observed in detail. Include descriptions of the parts of the plant that you saw.

Plant # 2:

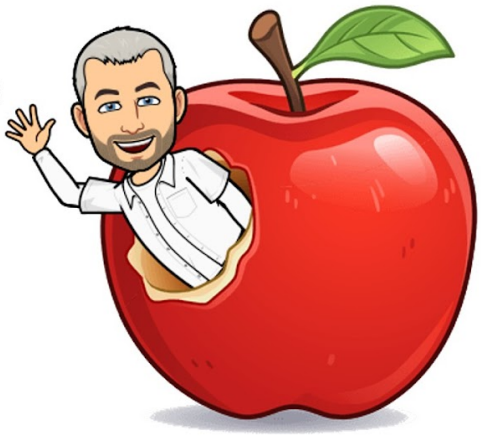
Describe what you observed in detail. Include descriptions of the parts of the plant that you saw.

Plant # 3:

Describe what you observed in detail. Include descriptions of the parts of the plant that you saw.

Final Questions:

1. How were the plants you observed all similar? Be detailed.
2. How were the plants you observed different from one another? Share specific examples.
3. Why do you think that different plants might be so different from one another?
4. How do you think these differences might affect the way that these plants function? Give specific examples.



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Recording Your Learning

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Ten Things I Learned From This Video

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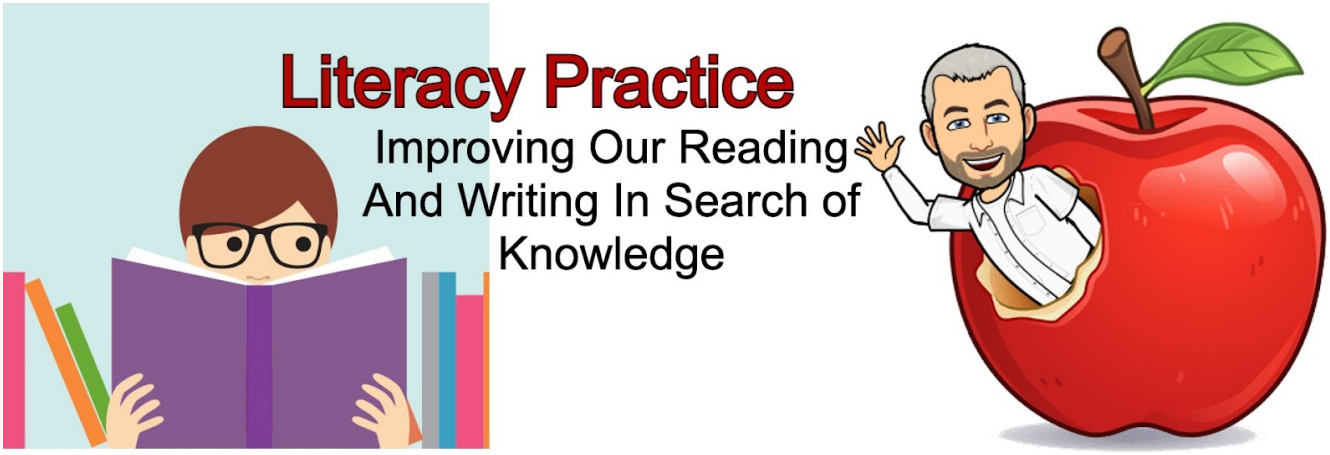

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Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

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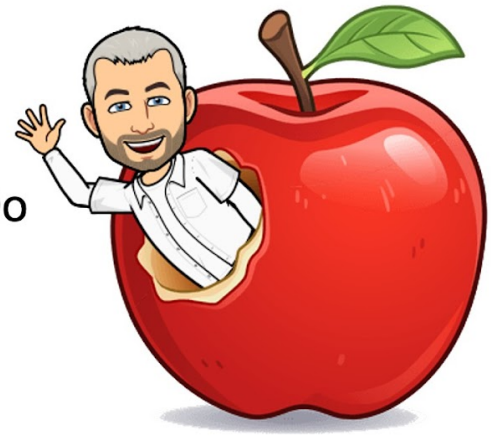
Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don’t rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write three paragraphs explaining how plants are classified. Give examples.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Activity: To Flower or Not To Flower

Directions: Imagine that you are a botanist. You have been hired by a college to give a presentation on the difference between flowering and non-flowering plants and how they reproduce. Create a PowerPoint for this presentation. Include at least 8 slides. In this presentation explain the difference between each of these two types of plants, and how these differences affect how they reproduce. Also talk about the importance of symbiosis when it comes to plant reproduction, and how many of them depend on interactions with animals in order to complete their reproductive cycles.

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

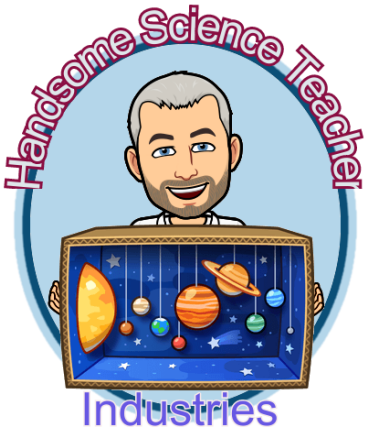
Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To create a model demonstrating your understanding of the Plant Kingdom.

Final Questions

Answer each question using complete sentences.

1. Describe the attributes of a non-vascular plant.
2. Given an example of a non-vascular plant.
3. Describe the attributes of a vascular plant.
4. Gve an example of a vascular plant.



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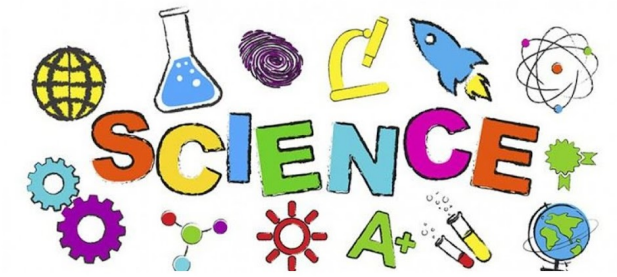

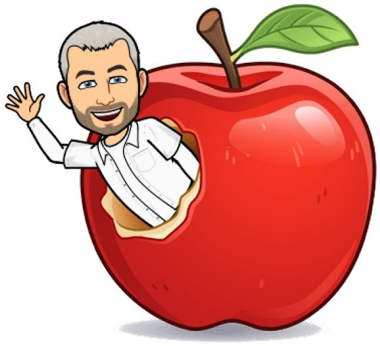

The Fungi Kingdom & Unicellular Kingdoms

What I Will Be Learning In This Mastery Badge:
In this mastery badge we will continue our study of living things and how they are classified. Looking at the various types of unicellular lifeforms and fungi. We will explore the major types of each, as well as the structures of fungi and how they are classified.

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.

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II. **Video Instruction**
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III. **Literacy Practice**
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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:

- Archaebacteria vs Eubacteria
- Structures and types of bacteria
- Protists
- How fungi are classified
- Four types of fungi
    - Sac Fungi
    - Zygospores
    - Basidiomycetes (Club Fungi)
    - Imperfect Fungi
- Structures of fungi

Name:_____ Date:_____

Activity: Observing Fungus

Directions: Follow the directions below to learn as much as you can about fungi

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 fungi.

Fungi Reproduction:

Yeast is a type of fungus that we commonly use to make bread. In this experiment, you will be observing how temperature affects yeast reproduction.

1. Fill a glass of cold water. Adding ice to the water can help you get better results.
2. Fill a second glass with warm water (not too hot).
3. Add two teaspoons of sugar to each glass and stir it in.
4. Add a teaspoon of active yeast to each glass (do not stir the yeast in)
5. Observe Both Glasses

What happened to the yeast when you first add the yeast to the surface?

Wait five minutes and then smell each glass. Describe how each smells.

Now stir each glass and then continue to observe.
After several minutes describe how the yeast in each glass is alike how it is different.

Based on your observations, how does temperature affect fungal growth?

Draw A Picture
Scientists often draw pictures to record their observations. Draw a picture showing what the yeast in each glass looked like after several minutes.

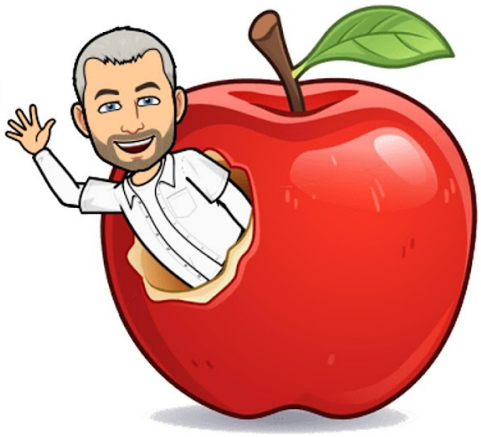
Fungi Observation:
For this observation, you will be dissecting a mushroom. You want as complete of a sample as you can find.

Mushrooms can be found in your yard, or at the grocery store. If you take one from your yard, do not eat it! They can be very poisonous.

Carefully dissect the mushroom. If you have a magnifying glass it would be a good idea to use it to make your observations. Note as much as you can about the various parts of the mushroom, as you carefully take it apart.

Mushroom:

Describe what you observed in detail. Include descriptions of the parts of the mushroom that you saw.



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

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Watch The Assigned Science Video

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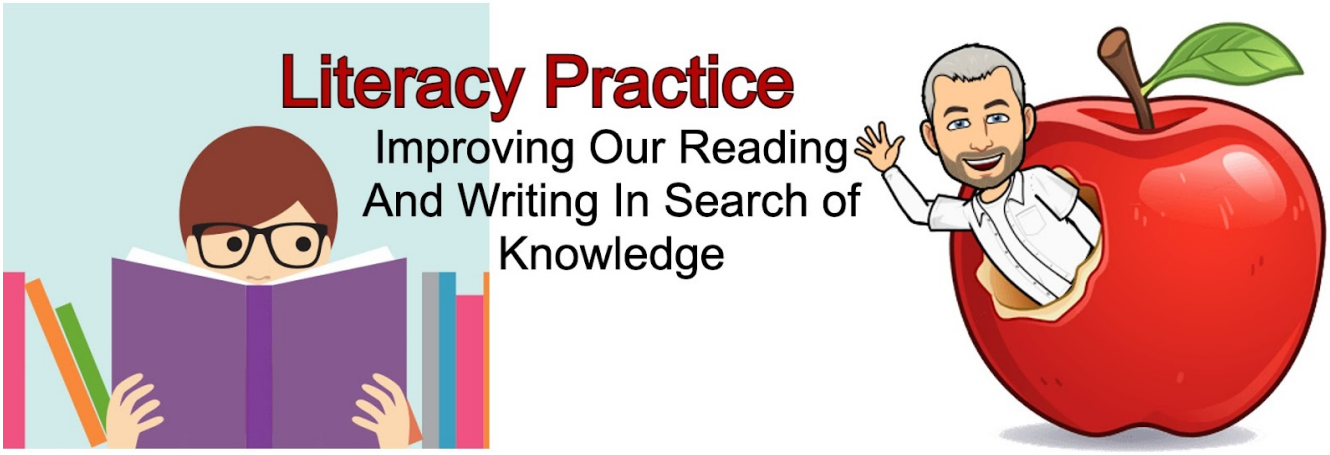

Activity: Reading And Writing About Biomes

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Quiz Time

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%

Now Let’s Write To Communicate

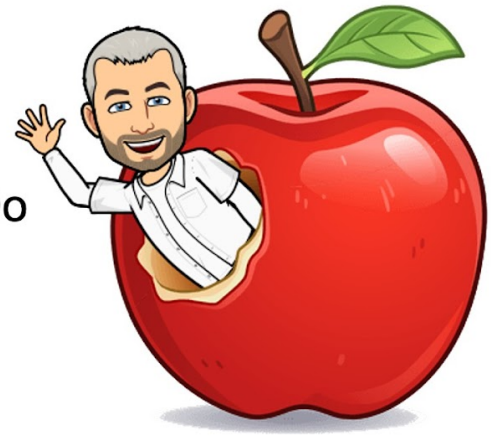
Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don’t rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write three paragraphs explaining the role that fungi play in an environment. Be detailed. Give examples.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Activity: Growing Fungi

Directions: In this activity you will be growing your own mold colony to observe how quickly fungi spreads under different conditions.

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 how fungi spread and grow.

In the video we learned that fungi spread by spores that are carried in the air. These spores are present everywhere around us. In this lab we will test whether or not there are fungi spores in the air in your house, and how long it takes for these spores to start growing.

1. Take four pieces of fresh white bread. If possible, use homemade bread. It works better for this experiment.
2. Moisten two of the pieces of bread carefully. You don't want to get them soggy, just slightly moist. You can do this using a spray bottle. Be careful not to get them too wet though. Just a few sprays.
3. Place each piece of bread into a ziplock baggie and mark which pieces are moistened and which are not.

   Important: From this point on leave the bread in the baggies. Mold spores can cause sickness.

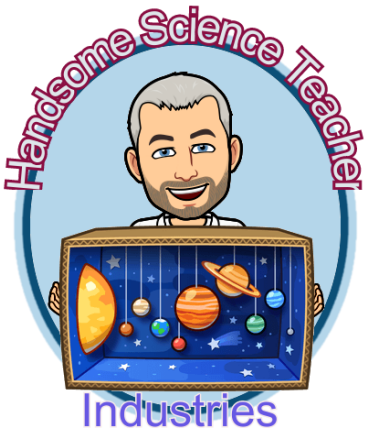
4. Place one dry piece and one wet piece into the fridge.
5. Leave the remaining two pieces out so that they stay at room temperature.

Wait 10 days

Observations
Draw a picture of each bread sample. Be careful not to open the baggies.

Moist / Cold	**Dry / Cold**
Moist / Warm	**Dry / Warm**

1. Which piece of bread had the most mold growth?
2. What pattern do you see in how moisture and temperature affect mold growth
3. **Consider:** Your bread was only exposed to the air for a very short period of time. Just a couple of minutes, before you put it into the ziplock bag. Yet, in these very brief minutes, it was exposed to fungi spores. What does this tell us about fungi spores? How common are they in the air around us?
4. All fungi and some plants reproduce using spores. Explain what a spore is and how they work.



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:
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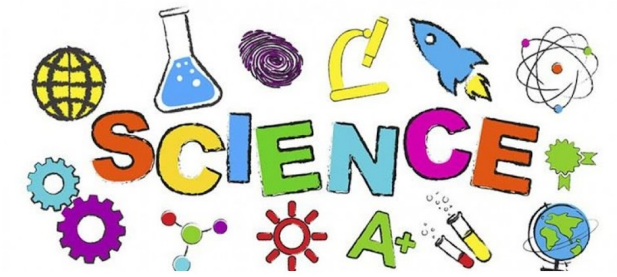
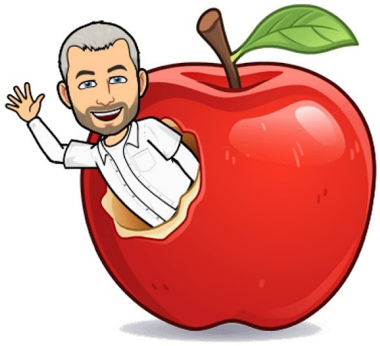




Mitosis

What I Will Be Learning In This Mastery Badge:
In this mastery badge we will learn about how cells reproduce through division in a process called mitosis. We will explore the five phases of mitosis including prophase, metaphase, anaphase, and telophase. We will also learn the key features of each phase, and how to identify them.

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:

- Cells Are The Basic Unit of Life
- Cells Reproduce Through Division
- Phases of Mitosis
    - Prophase
    - Metaphase
    - Anaphase
    - Telophase

Name:_____ Date:_____

Activity: Discovering Mitosis

Directions: Follow the directions below to learn as much as you can about mitosis

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 mitosis.

Mitosis Simulation

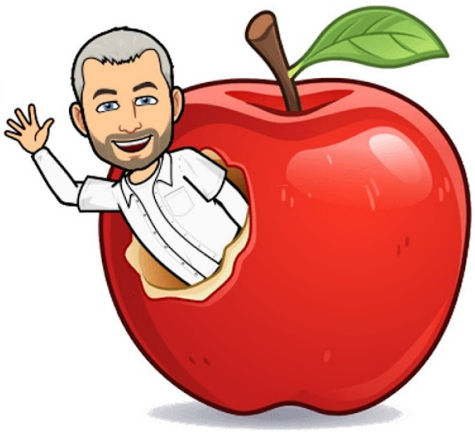
Scientists often use simulations to study things that are complicated or difficult to observe. In this lab you will be using online simulations to study mitosis. We cannot provide a link to a simulation because these links change quickly. However, there are many good ones available online. Find two different online mitosis simulations. Spend at least 20 minutes playing with and exploring each simulation. Then answer the questions below based on what you observed.

Answer The Questions On The Next Page Based On The Simulations

1. Explain the process of cell division.

2. What are the phases of cell division that you observed?

3. What happens after a cell divides?



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.
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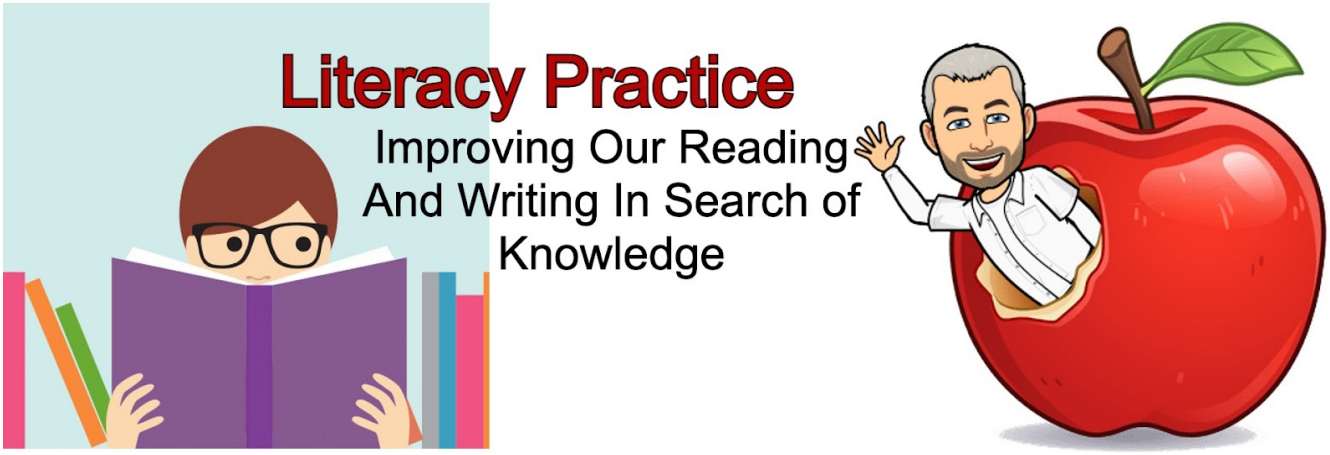
9.
10.

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 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/mitosis/

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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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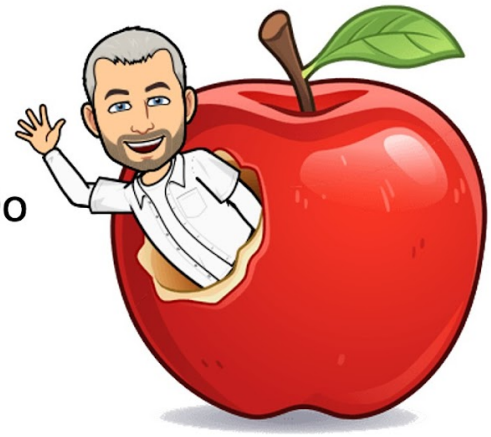
Writing Prompt: Write three paragraphs explaining in detail what mitosis is, and how it occurs. Include examples from all phases.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Activity: Modeling Mitosis

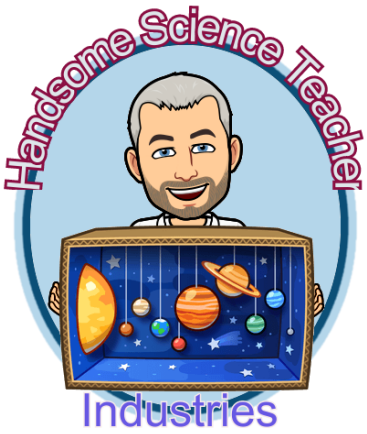
Directions: In this lab you will be creating a detailed diagram showing each phase of mitosis.

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 all four phases of mitosis.

Using colored pencils, crayons, or digital software, create an original diagram showing all four phases of mitosis. Make sure to label each phase, and include a brief explanation explaining what is occurring.



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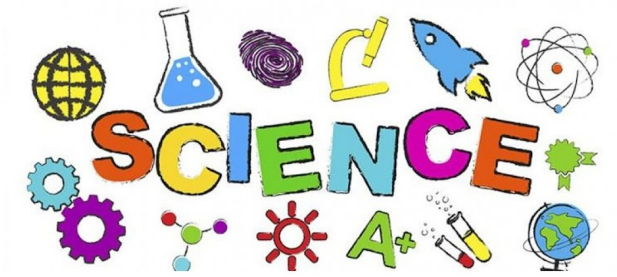

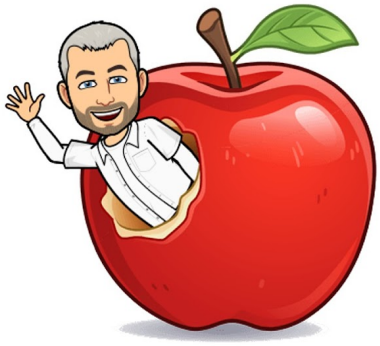

DNA, RNA, & Transciption

What I Will Be Learning In This Mastery Badge:
In this mastery badge we will learn about DNA and RNA. Including what DNA is, what genes are, and how DNA is used to direct the activities of living things.

What This Packet Includes:
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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:

- What is DNA
- Adenine, cytosine, guanine, and thymine
- What is RNA
- What is a gene?
- Where are genes located?
- DNA Transcription
- RNA Polymerase
- Messenger RNA (RNAm)
- RNAm leaves the nucleus

Name:_____ Date:_____

Activity: Discovering DNA & RNA

Directions: Follow the directions below to learn as much as you can about DNA

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 DNA

Creating A Model of DNA

You are going to create a drawing (model) of a DNA molecule. You model must include the following:

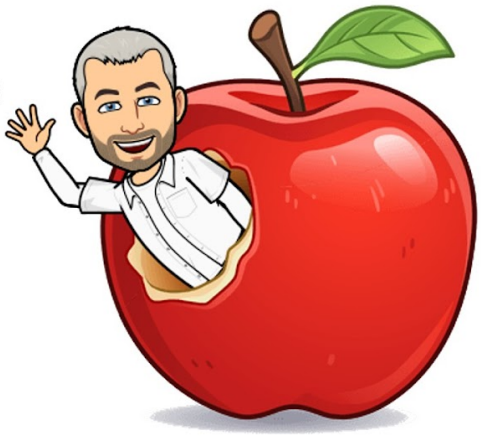
- All four main DNA base pairs (adenine, cytosine, guanine, and thymine). Which must be paired correctly.
- It must be at least 20 pairs long.
- Must be labeled.
- Must be drawn in color.

Final Questions:

1. Which base pairs with guanine?

2. Which base pairs with thymine?

3. Explain what DNA is, and what its role is in living things.



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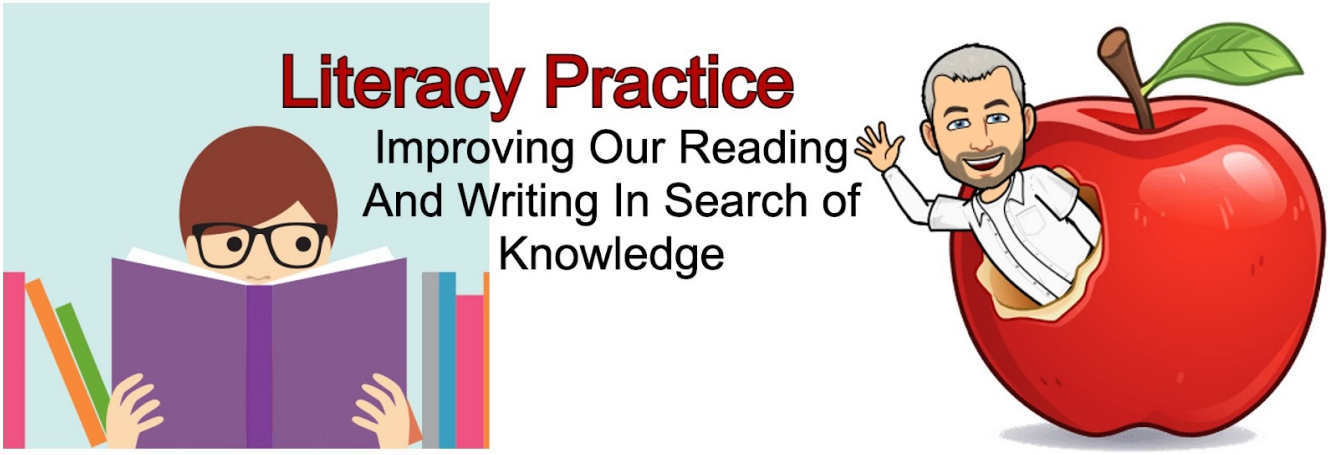

Activity: Reading And Writing

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.

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Writing Prompt: Write three paragraphs explaining in detail what DNA is and how DNA directs the activities of living things.

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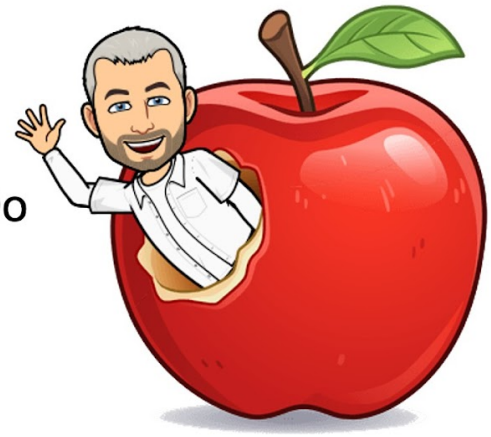
Applying Lab

Proving That We Can Do It Ourselves



Activity: Modeling DNA Transcription

Directions: In this lab you will be creating a detailed diagram showing how DNA is transcribed.

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

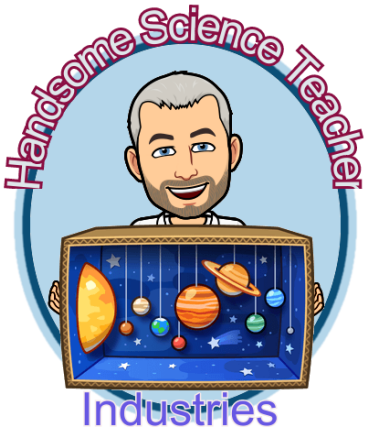
Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To demonstrate that you understand how DNA is transcribed into RNAm.

Creating A Model of DNA Transcription

You are going to create a drawing (model) of a DNA molecule being transcribed. Your model must include the following:

- A DNA molecule, that is at least 20 pairs long.
- It must show the DNA being unraveled (unzipped) so that it can be copied.
- It must show a gene being transcribed by RNA polymerase.
- Must be labeled.
- Must be drawn in color.



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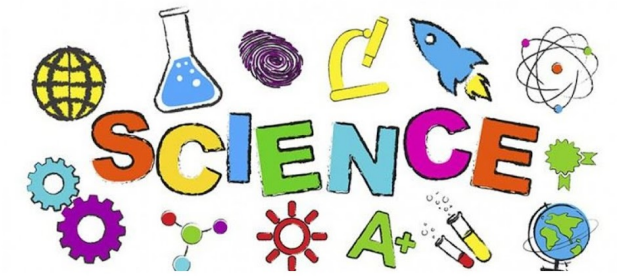

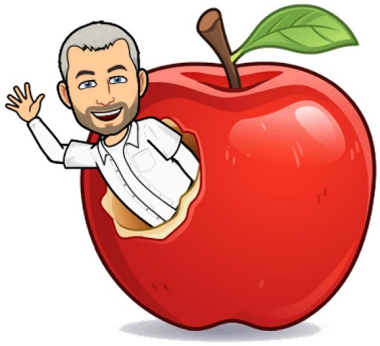

Translation And Proteins

What I Will Be Learning In This Mastery Badge:
In this mastery badge we will learn about what proteins are, how they form, and what they do. We will also study the basic make-up of proteins.

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 proteins?
- What do proteins do?
- Translation of mRNA to Protein
- Codons
- Amino Acids
- What are ribosomes?

Name:_____ Date:_____

Activity: Discovering Proteins

Directions: Follow the directions below to learn as much as you can about proteins.

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 proteins.

Protein Simulation

Scientists use simulations to explore difficult topics and make observations. In this lab, you will be using online simulations to learn about proteins. We cannot provide a link for you to a good simulation because these links change quickly. However, there are many high-quality simulations available. Using a search engine, find two simulations that show the process of RNA Translation.

Explore each simulation spending a minimum of 20 minutes on each one. Then answer the questions below based on your observations.

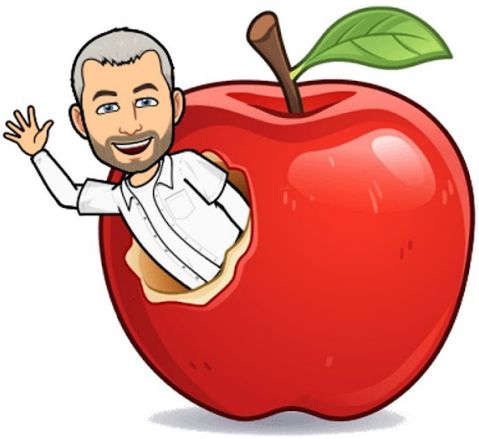
Explain how mRNA is made.

What is the job of mRNA?

How are proteins made? Explain where the instructions come from, and how those instructions are carried out.

Final Questions:
Answer each question using complete sentences.

1. In DNA which base pairs with thymine?
2. In RNA which base pairs with thymine?
3. How many bases make up a codon?



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

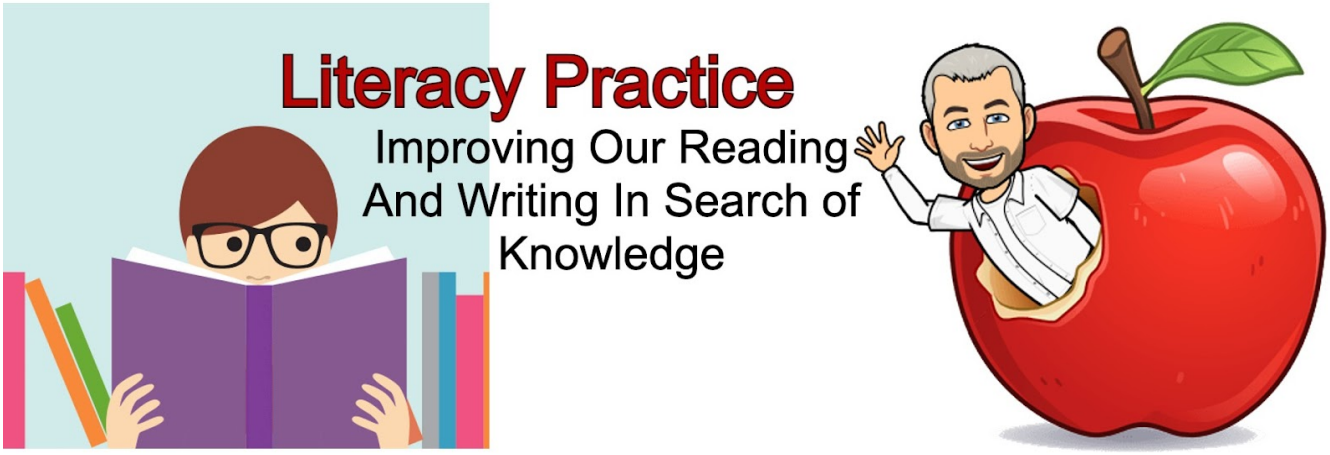
A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed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

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/transcription-and-translation/

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

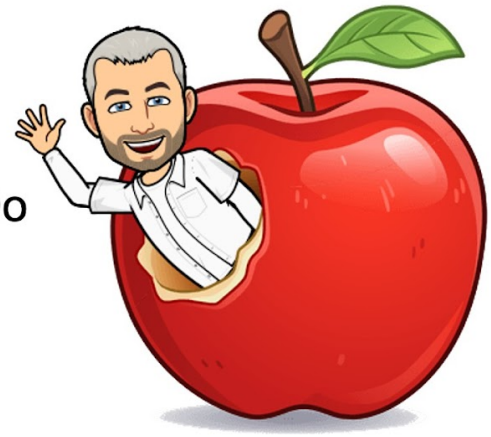
Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don’t rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write three paragraphs explaining the process of transcription and translation.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Activity: Modeling DNA Transcription

Directions: In this lab you will be creating a detailed diagram showing how mRNA is translated into proteins.

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 how mRNA is translated into proteins.

Creating A Model of mRNA Translation

You are going to create a drawing (model) of an mRNA molecule being translated into a protein. Your model must include the following:

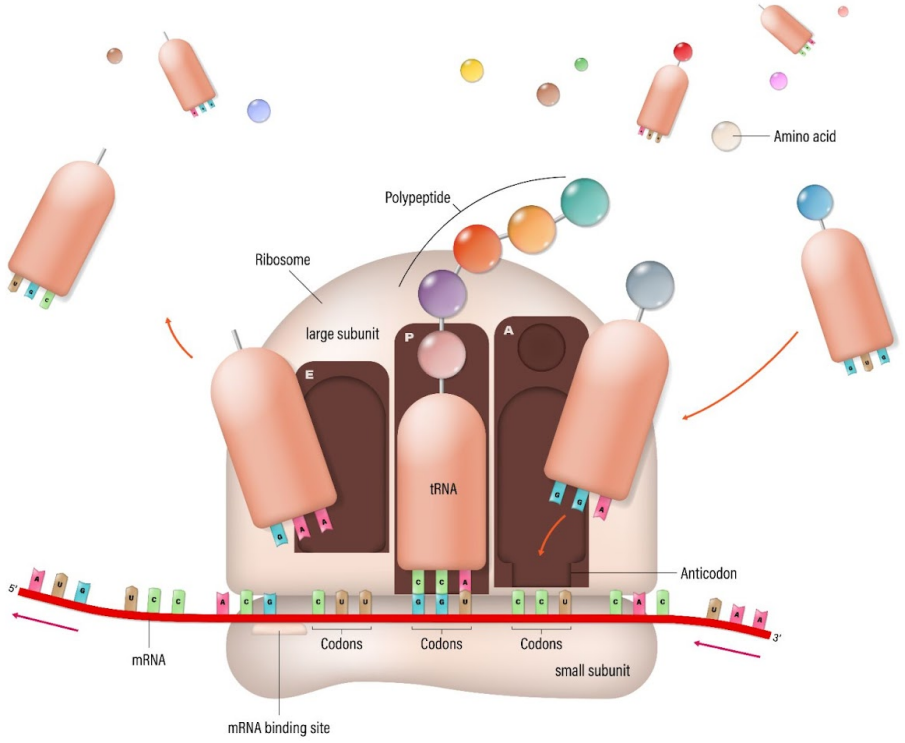
- An mRNA molecule with a start and stop codon at both the beginning and end.
- Your mRNA molecule must include at least five actual codons. Refer to the chart on the next page to help you.
- Your diagram must show the tRNA translating the codons into amino acids.
- Label mRNA, tRNA, each codon, and the ribosome.
- Your model should be in color.

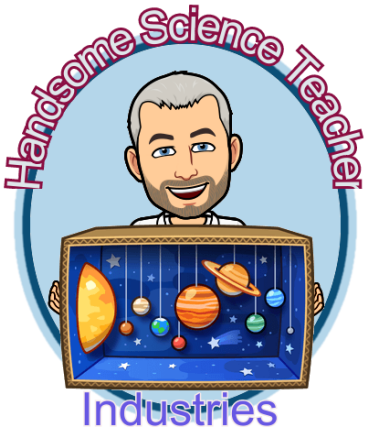
Standard genetic code

Second mRNA base

First mRNA base (5' end)	U	C	A	G	Third mRNA base (3' end)
U	UUU Phenylalanine	UCU Serine	UAU Tyrosine	UGU Cysteine	U
	UUC Phenylalanine	UCC Serine	UAC Tyrosine	UGC Cysteine	C
	UUA Leucine	UCA Serine	UAA STOP	UGA STOP	A
	UUG Leucine	UCG Serine	UAG STOP	UGG Tryptophan	G
C	CUU Leucine	CCU Proline	CAU Histidine	CGU Arginine	U
	CUC Leucine	CCC Proline	CAC Histidine	CGC Arginine	C
	CUA Leucine	CCA Proline	CAA Glutamine	CGA Arginine	A
	CUG Leucine	CCG Proline	CAG Glutamine	CGG Arginine	G
A	AUU Isoleucine	ACU Threonine	AAU Asparagine	AGU Serine	U
	AUC Isoleucine	ACC Threonine	AAC Asparagine	AGC Serine	C
	AUA Isoleucine	ACA Threonine	AAA Lysine	AGA Arginine	A
	AUG START Methionine	ACG Threonine	AAG Lysine	AGG Arginine	G
G	GUU Valine	GCU Alanine	GAU Aspartic acid	GGU Glycine	U
	GUC Valine	GCC Alanine	GAC Aspartic acid	GGC Glycine	C
	GUA Valine	GCA Alanine	GAA Glutamic acid	GGA Glycine	A
	GUG Valine	GCG Alanine	GAG Glutamic acid	GGG Glycine	G

Translation





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.

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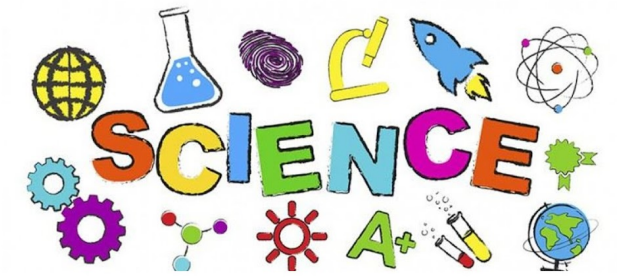
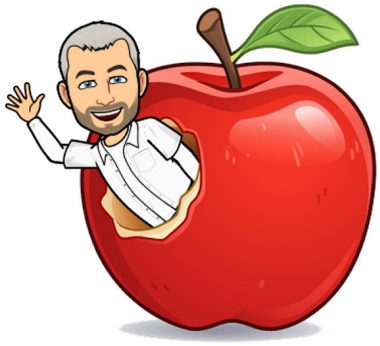




Diffusion, Cellular Transport, Osmosis

What I Will Be Learning In This Mastery Badge:
In this mastery badge we will learn about diffusion and osmosis. We will explore how substances move across a gradient until they evenly diffuse throughout a container. We will explore osmosis which is a special type of diffusion. By the end of the mastery badge, you will be able to explain the conditions that must be present for osmosis to 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 is a gradient?
- What is diffusion?
- Solvents, Solutes, & Solutions
- Active Transport vs Passive Transport
- Osmosis

Name:_____ Date:_____

Activity: Diffusion Experiment

Directions: Follow the directions below to learn as much as you can about diffusion

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 diffusion

Experiment # 1: Diffusion In Liquids

In this experiment, you will observe diffusion as it occurs in a liquid. You will need a glass of clean water and another colored liquid. For the colored liquid, food coloring works best, but if you don't have any, using anything with color in it is okay such as soda, cool-aid, etc.

Step 1 - Drip a very small amount (one or two drops) of the colored liquid into the clean water
Step 2 - Do not stir the two liquids together.
Step 3 - Observe what happens over time.

Draw a picture of your liquid after 5 seconds.	Draw a picture of your liquid after 30 seconds.	Draw a picture of your liquid after 2 minutes.

Experiment # 2: Diffusion In Air

For this experiment, you will observe diffusion as it occurs in the air. You will need something that produces strong smells. (Preferably pleasant smells…) A scented candle or baking bread/cookies works best.

Step 1 - Before lighting your candle or beginning to bake describe the smells in the room.

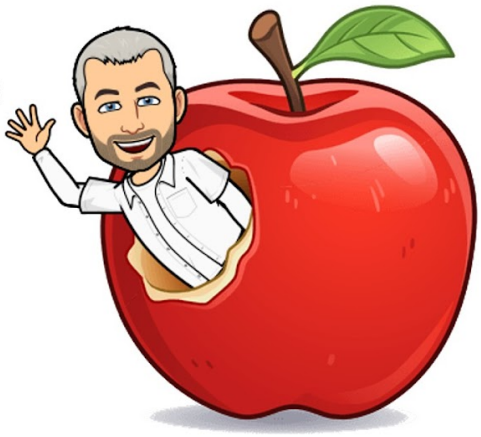
Step 2 - Light the candle, or start baking.

Step 3 - Complete the table below once every two minutes. Noting how far from the source you can smell the strong scents you are creating.

Time	Distance From The Candle or Oven I Can Smell It.
2 Minutes	
4 Minutes	
6 Minutes	
8 Minutes	
10 Minutes	
12 Minutes	
14 Minutes	
16 Minutes	
18 Minutes	
20 Minutes	

Final Questions:

1. What happened to the colored liquid over time?
2. What happened to the smell over time?
3. Why do you think this happened?



Handsome Science Teacher One Take Videos

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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

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

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Ten Things I Learned From This Video

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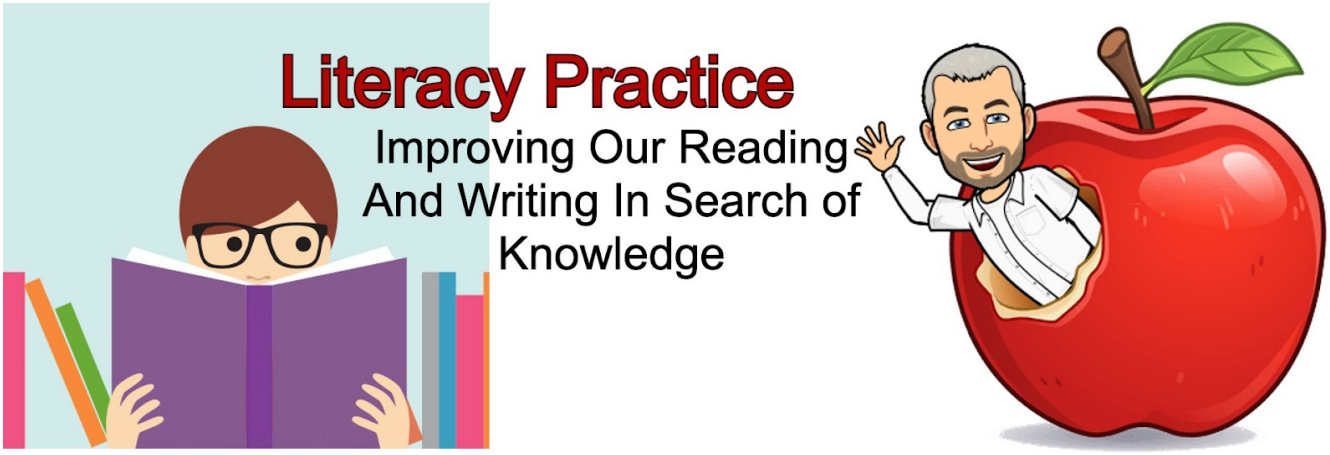

Activity: Reading And Writing

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.

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Article:

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

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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

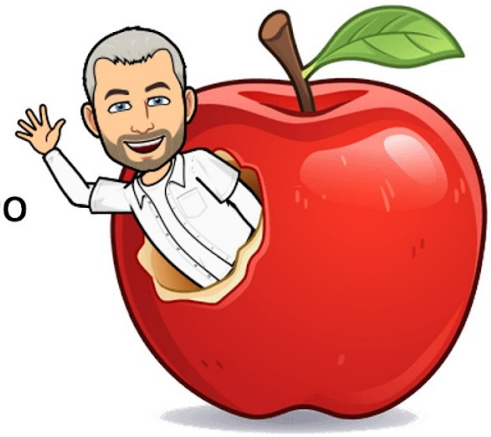
Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don’t rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write three paragraphs explaining what osmosis is, when it occurs, and why it is important to living things.

Name:_____ Date:_____

Applying Lab

Proving That We Can Do It Ourselves



Activity: Observing Osmisis

Directions: In this lab you will be observing osmosis with your own eyes.

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

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Experiment # 1: Osmosis Into An Object

For this experiment you will need some type of gummy candy, such as gummy bears or gummy worms..

1. Place the gummy candy into a glass of water. Leave a second gummy out of the water so you can compare it later.
2. Leave the candies in water for 24 hours. Then record your results below.

How did your gummy candy change?

Why do you think it changed?

Experiment # 2: Osmosis Out of An Object
For this experiment you will need a carrot and salt water. Baby carrots work great!

1. Place the carrot into a glass of saltwater. Leave a second carrot out of the water so you can compare it later.
2. Leave the carrot in water for 24 hours. Then record your results below.
3.

How did your carrot change?

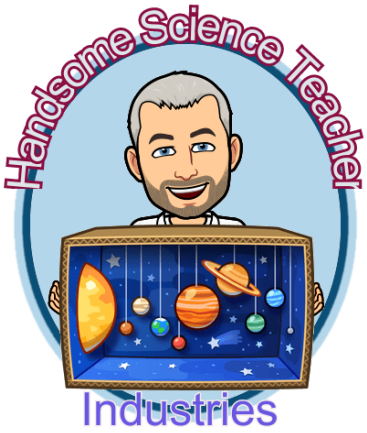
Why do you think it changed?

Final Questions:
Answer each question using complete sentences.

1. What is a gradient? Give an example.

2. Explain what diffusion is.

3. Explain what osmosis is. Explain how it occurs, and what must be present.



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:

1. Did you do every assignment?
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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?

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:
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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.

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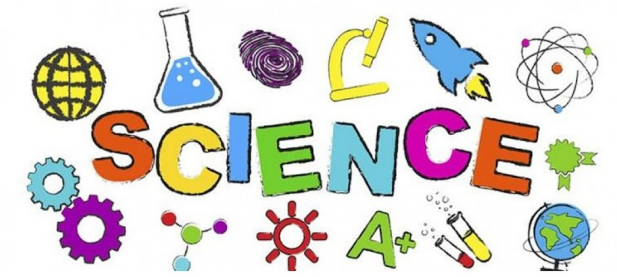
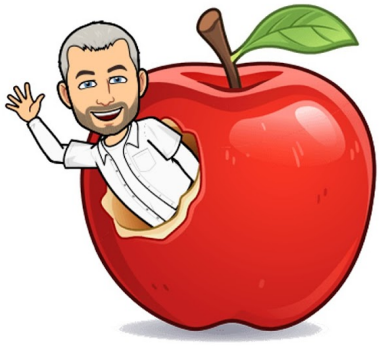




Middle School Capstone Science Project

Congratulations!
Look at you! Look how awesome you are! You have completed HandsomeScienceTeacher's Homeschool Science Curriculum. In the process, you have learned a lot! More than you probably realize in fact. Not just facts and formulas, but also how to do real science, and how to think intelligently. You have learned how to collect and interpret data, how to support your opinions using evidence, how to create models, how to write persuasively, and so much more.

It's time to put your knowledge to the test in your Capstone Project.

In This Capstone Project You Will Be Doing Real Scientific Research
It is important that you complete all aspects of this capstone project in order. Take your time, and don't stress. This is a celebration! You are now a real scientist and you are about to do real scientific research.

I. **Ask Questions & Define Problems**
You will define the problem you are going to research.

II. **Design And Carry Out An Investigation**
Once you know the area you are going to study, you will design your own experiment and carry it out.

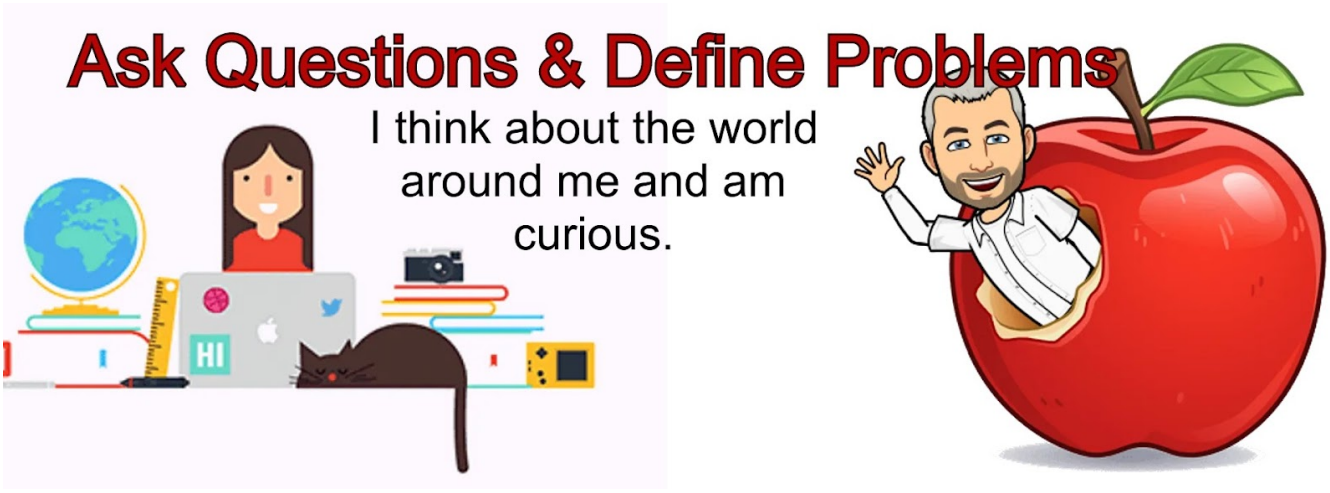
III. **Analyze And Interprete Data**
As you carry out your research you will collect data. You will then organize your data into a meaningful chart so that you can identify patterns. Finally, you will analyze your data, and draw conclusions.

IV. **Construct Explanations & Design Solutions**
Once you have collected valid data, you will use that data to construct an explanation about the phenomenon you studied. You will also design a solution to address any issues or problems you noticed.

Key Things We Will Learn In This Mastery Badge

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

- Using The Eight Science And Engineering Practices To Solve Real Problems
- I am capable of doing real science.



Activity: Asking Questions & Defining Problems

Directions: Follow the directions below to identify a problem you are curious about.
Goal: To identify an issue that you can explore in greater detail.

Scientists Are Thoughtful & Curious
Throughout your time using HandsomeScienceTeacher’s Science Curriculum you have learned that scientists begin their research with questions that they have. These questions come from their own curiosity. Sometimes we believe that all the questions have already been asked and researched and that all we have to do is search online to find these questions. Often this is true. But the reality is that there are many more unanswered questions in the Universe than there are answered questions.

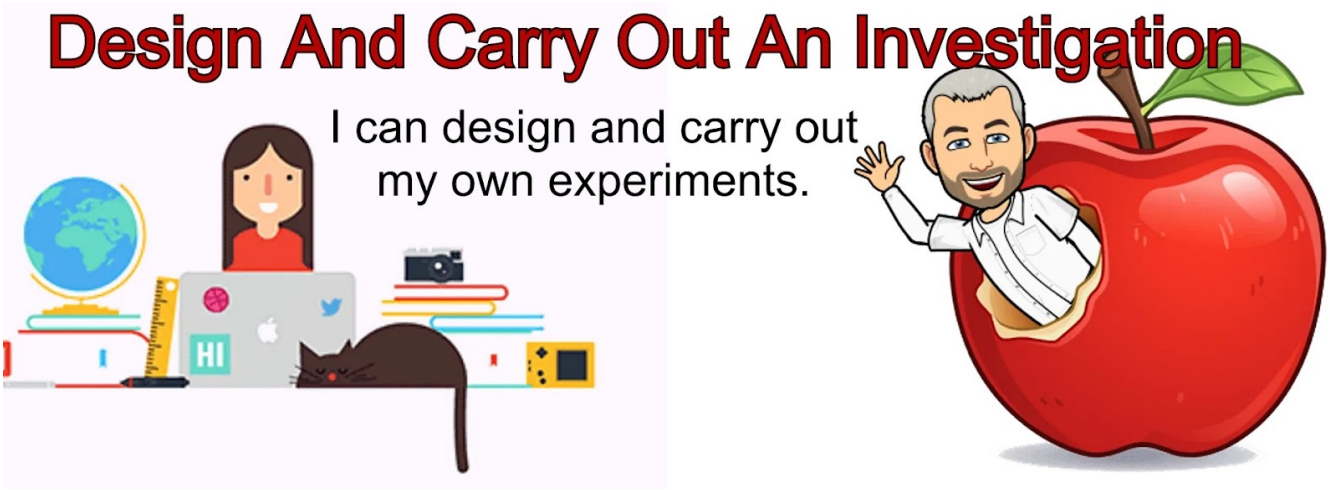
Did you know that science is probably only discovered about 10% of the lifeforms that live on Earth!

Think about how significant that fact is! This means that 90% of living things on Earth have still not been discovered. The same is true of all other branches of science.

You Can Do Good Science
You are capable of doing great scientific research. Being young does not mean that you are somehow disqualified from doing actual science or from making real discoveries.

What Do You Want To Explore?
Take a moment and think about a question that you might enjoy researching. What is something that you are curious about? It is okay if it is a topic that others have already studied. The discoveries you make will be new to you, and perhaps even new to science.

What question will you research for this project? Select a topic that you won’t mind studying for the next two weeks.



Activity: Design And Carry Out And Investigation

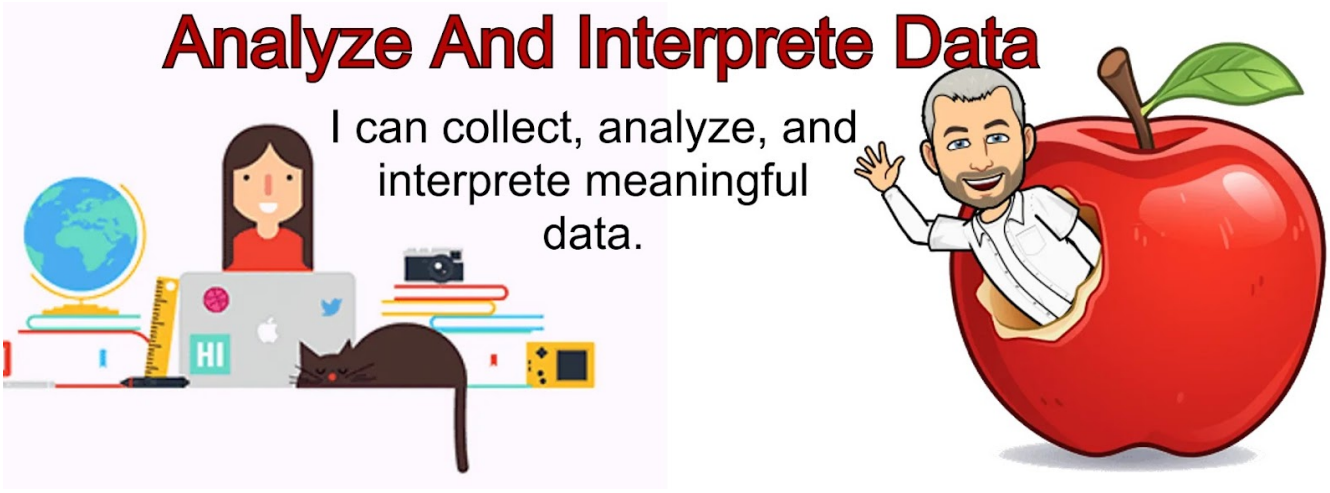
Directions: Follow the directions below to design an experiment that will allow you to learn more about your problem.
Goal: To learn about the issue you have identified.

Scientists Design And Carry Out Investigations
Doing science experiments is fun. Often when we do these experiments we follow the procedures that someone else has written for us. Throughout this course you have done many experiments. Some of them were created by us, and you followed our directions. Other times we had you write your own step by step instructions and carry them out.

Think about the problem that you identified for your capstone project.
How can you solve your capstone problem?

Is your problem something that someone else has already researched? If so, can you learn more about it by studying the work of others? Is the problem you identified something that you can learn about by doing some sort of experiment or observation?

Explain in detail how you will learn about the problem you identified. In the next section, you will be asked to collect data. How will you collect data about your capstone problem? If there is not enough space in this box, it is okay to use a separate sheet of paper.



Activity: Analyze And Interprete Data

Directions: Follow the directions below to collect, analyze, and interpret data about your problem.
Goal: To analyze and interpret data about the problem you identified.

Scientists Support Their Opinions Using Data And Evidence
Science is a tool that humans use in order to better understand the world around us. The goal of science is to help people learn how the Universe really functions. In order for this process to be successful it is critical that scientists support their views, opinions, and claims with data and evidence.

How Can You Collect Data About Your Problem?
Think about the problem you defined earlier. What data could you collect about it? This might be data that comes from your research. It could be data that comes from the results of an experiment that you designed. It might be data from observations that you made.

You Will Use This Data In The Final Section of Your Capstone
In the last step of your capstone you will use this data to support your final conclusions. Make sure that you are precise, detailed, and accurate in your data collection. Otherwise, your conclusions will not be as valid.

Collect And Organize Your Data
Collect your data on a separate sheet of paper or in a computer program, such as a spreadsheet. Using a spreadsheet will make graphing your data much easier.

Graph Your Data
Select a type of graph that you think will be best for the data you collected. This might be pie charts, bar graphs, scatter plots, or any other form. It is up to you to decide the best way to organize your data. Graph all of your data as accurately as possible.

Look For Patterns In Your Data
What patterns do you notice in your data? What conclusions can you draw?

Activity: Construct Explanations & Design Solutions

Directions: Follow the directions below to construct explanations and design solutions.
Goal: To communicate my discoveries to others.

Scientists Share Their Discoveries With Others
The purpose of science is to make the world a better place. When scientists make discoveries, they share them with others. For this assignment you will be writing a one-page essay communicating your discoveries with the rest of the world.

Write About Your Process And What You Learned
Start by sharing your question with your readers. Then explain how you went about answering your question or solving your problem. Then share the results of your research, your experiments, and/or your observations. Finally, draw conclusions and support those conclusions with evidence from your data.

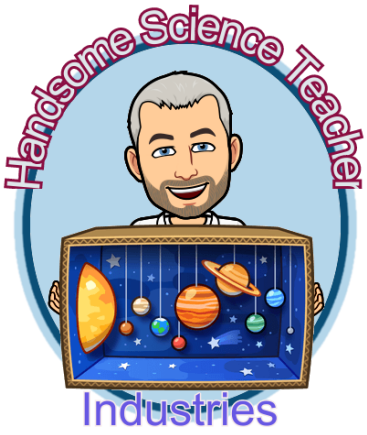
Don't Doubt The Validity of Your Science
Just because you are young doesn't mean that your research is any less valid than the research of someone older than you. A scientist with an advanced degree can be wrong and you can be right. If you have done good research, take confidence in that, and don't be afraid to stand up for what you have learned.

Write your essay with the confidence of a true scientist!

Go Forward Being Science-Minded
You have just completed an advanced middle school science curriculum. You have proved your science credentials by doing a capstone project. My parting advice to you is to maintain the abilities that you have gained throughout this course for the rest of your life.

Remember to ask questions, collect data, do research, think intelligently, demand evidence, and have confidence in your own ability to think about and understand the Universe.

Congratulations On Finishing This Course!



Congratulations! You Have Completed All of The Mastery Badges!
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 collect good data?
3. Did you take pride in your work?

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.