YIAA Invention Program Guide

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About YIAA & Inventing

"All you need to invent is imagination, and a pile of junk!" – Thomas Edison

Young Inventors Association of America

Young Inventors Association of America (YIAA) is a non-profit organization founded in 2002 to provide opportunities and mentors that promotes the growth and success of young inventors around the world.

Young Inventors Showcase

For over 30 years, the Young Inventors Showcase (YIS) has been held each year to find, celebrate, and support the inventions of our children.

The showcase was established with the intention to foster public and private partnerships that would ultimately fund the most commercially viable inventions.

Young Inventors

Kids are naturally curious and creative, so inventing is a perfect activity to help them expand on these skills. An inventor also doesn't need to be a "smart" kid with good grades. Inventors use critical thinking and skills that aren't necessarily tested in normal classroom settings.

Inventing teaches them:

- Creative problem solving
- How to brainstorm
- Communication skills
- Critical thinking
- Builds self confidence
- Research skills
- How to market ideas
- Public speaking
- Time management
- Thinking outside the box
- To accept and learn from "failures" – which are a natural part of the process

Introduction to Guide

Dear Young Inventor Advocate,

We are very happy to bring you this guide created specifically to help educators, teachers, parents, and other advocates teach children how to invent. Teaching students how to be inventors is a rewarding experience for both the teacher and students and all the information you need to get started is in this guide.

Following this guide will align your program with the basic standards of the Young Inventors Association of America's and will prepare the students for future participation in the annual Young Inventors Showcase.

This guide was developed with the support of existing teachers who have already established invention programs in their respective communities. If you have any comments, concerns, tips, or suggestions on what is covered (or not covered) within this guide, let us know. YIAA is here to support young inventors and their advocates, so we want to provide the best guide to get you started on this exciting journey.

Sincerely,

Greg Micek

Founder of Young Inventor's Showcase

How to Use this Guide

This guide is made up of individual lessons that teach future young inventors the skills, process, and guidelines for successfully inventing.

The format of your inventing program is dependent on your situation and can work for any number of situations including:

1. Classrooms
2. After-school programs
3. Weekend intensive events
4. Summer camps
5. At-home learning

Lessons can be held over a series of meetings or in a one-time type event. Multiple lessons can be held in one sitting or a single lesson can be split into multiple sessions. The lessons included here are just the basics; interspersing additional lessons can be helpful and is encouraged.

The lessons provided vary in detail and age appropriateness, but we have tried to keep it simple enough for most ages. Based on the ages of the students in your class you can vary the lessons accordingly.

You are the advocate so have fun with the program and don't be afraid to improvise how you see best!

The amount of time you have to put towards the program will influence how long until your student(s) will be ready to invent on their own and ultimately have a final invention to call their own. A good rule of thumb for your planning is at least 12 weeks of 1-hour lessons and 40 hours of time for actual invention work. This invention work may happen within the program or independently at home; again, this is based on your own situation and time schedule.

Lessons in this guide are broken into 2 or 3 sections: Teacher's notes, Student Handout, and Homework.

- The Teacher's Notes are for you, the Advocate, to help facilitate the lesson and should be read prior to engaging the students. Within the Teacher's Notes is a section called Discussion and this is the key points of the lesson – you can either read the discussion directly, paraphrase, or come up with your own way to explain the lesson.
- The Student Handout is what should be printed out for each student for each lesson. You can revise/edit/change/delete/add to make the handouts match your lesson.
- Homework is a printable that completes a lesson or prepares the student for the next lesson, although not every lesson has homework. If you are completing the program in a short time frame, homework can be additional activities done in class in between lessons done within the same day.

Supplies

Supplies for lessons are typically only the Inventor's Log, writing utensils, and glue/staples (to adhere handouts and worksheets into the Inventor's Log pages). Additional items are optional at the discretion of the teacher and explained within each lesson.

Letters to Parents

We have provided templates for letters that should be sent to parents at the beginning and throughout the program. These letters keep parents involved and supportive, so we encourage you to use them but also to modify them to exactly what you plan for your specific program.

These letters explain to parents what you are doing during the lesson and what students need to complete as homework before subsequent lessons. You may leave them as they are or edit them to your preference, but each letter ends with a spot for you to add with your own name and some have blanks for you to add your own contact information.

Inventor's Log

The Inventor's Log is not only a very important component of the inventing process, it's also a requirement for competition in the Young Inventors Showcase. The Inventor's Log is used to document the invention process from brainstorming to the final product. Students in this course will also use the Inventor's Log to complete their lessons including gluing each lesson, worksheet, and homework to the pages so that all their learning notes are in one place and can be easily referenced in the future. The first Lesson will introduce the student to the Inventor's Log.

Student Inventions

There are 3 options for the students' final inventions:

1. Students build the invention during lessons. This will require students to bring supplies and/or the teacher to provide supplies. This option ensures inventions are nearly 100% the students work and not too much parental interference which can be an issue.
2. Students build the invention at home as homework. This will put the responsibility on the parents to find supplies for their child. This option will result in some parents doing their child's work for them so you must emphasize to parents and the students that the inventions need to be 100% the student's work.
3. Students build the invention during the lessons with final touches being made at home before final competition. This will require students to bring supplies and/or the teacher to provide supplies. This option ensures inventions will be mainly the students work without too much parental interference, but you will need to emphasize when the students take their inventions home that the parents are not to do any work on the invention. THIS IS THE DEFAULT FOR LESSON PROVIDED HEREIN.

Supplies for the actual invention portion of the program will vary depending on what your students decide to invent and what option from above you follow. Some ideas for collecting invention materials are listed below.

1. Have students create a material list for their inventions and then send them home with the list and parents will be responsible for collecting what is needed and many missing materials can be

substituted as best as the Advocate / Parent decide. THIS IS THE DEFAULT FOR LESSONS PROVIDED HEREIN.

2. Have students create a material lists for their inventions and the Advocate can go out and to collect the supplies. This puts the cost and time commitment onto the Advocate.
3. Hold a “drive” with your class to collects things that could be used to help students build prototypes. However, due to the infinitive types of inventions your students could come up with, this may not meet your needs.
4. Similarly, have students create a material list for their invention, then send a combined list home with the students and hold a “drive” to collect as much as possible. Any missing supplies can be substituted in any way possible.

Letters to Parents

Introduction to Program

Dear Parents,

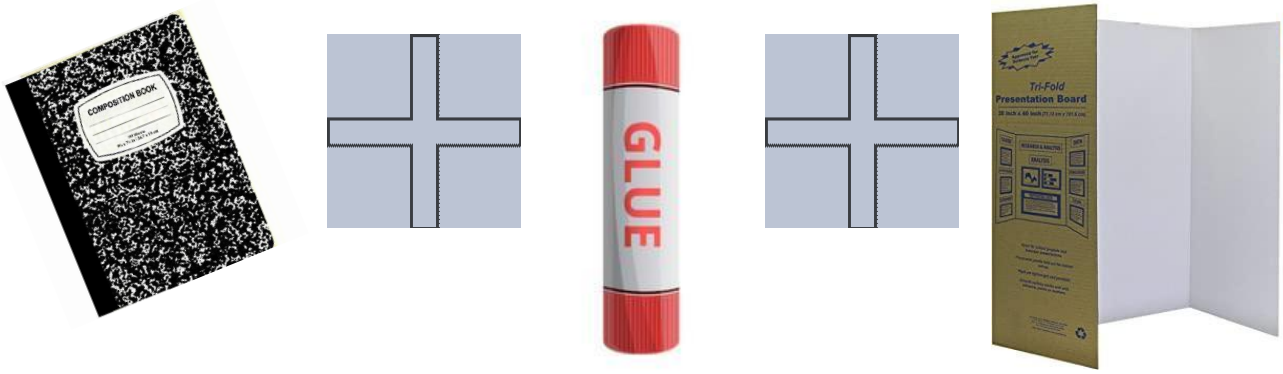
We are extremely excited about your child participating in our invention program and we hope you are too! Before we kickoff the program, we wanted to introduce you to what we will be doing and what you can expect from now until the last day.

Our program is designed to help students learn how to invent. It's really quite simple and we want to build confident young inventors out of everyone that participates in our program. To do this, we have worked with the Young Inventor's Association of America (www.yiaa.org) to build our lesson plan.

The first few lessons will introduce the kids to inventing, the lessons after that will give them practice learning specific skills that inventor's use, and the last set of lessons will be geared toward students creating their own invention. The goal of this program is for your child to walk away with an actual invention and a prototype that can be submitted to the Young Inventor's Association of American annual YIAA Showcase event.

Along the way, we will be sending your child home with additional letters and instructions on how you can support their progress. We have worked hard to build a program that is sustainable and does not require excess time or money to participate and complete but there are a few items we ask you to help us with along the way:

Supplies: Please send your child to the first class with a Composition Book, glue sticks, and tri-fold presentation board.



We know that as parents it can fun to help our child on projects like they will be working on in this program. However, we ask you to refrain from helping beyond very basic support. We truly want the work in this class to be the children's work and something they can be proud of doing all by themselves. Thank you for giving your child this opportunity and we look forward to working with them!

Sincerely,

Permission Slip for Inventors Program

I give my child, _____, permission to participate in [insert school and teacher name here] Inventors Program from dates _____ to _____.

Parent Signature _____

Date _____

Lesson 1 – Inventor's Contract

Dear Parents,

All students have agreed to a contract to participate in our Inventors Program. They have glued this contract into their Inventors Log to remind themselves of the agreement and we would like you to sign the Parent's Contract as well before your child returns to the next lesson. If you have any questions related to the contract that your child signed or that you are asked to sign, please contact the teacher at

_____

Thank You!

Sincerely,

Lesson 2 – Learning About Inventions

Dear Parents,

Today was our first lesson! We learned “What is an Invention?” and the students brainstormed all types of inventions they use at school and home including clothes, games, and electronics. The goal of today’s lesson was to show students that they use inventions every single day.

Students were given a research worksheet to complete at home before the next lesson. They have been asked to think of 3 inventions they use and to research a few key questions about the inventions. Students can go to the library or use the internet to complete this assignment.

Please ensure your child completes this worksheet before our next lesson.

Thank You!

Sincerely,

Lesson 3 – Supplies for Dissecting Class

Dear Parents,

Inventors, like scientists, have a natural curiosity of the world around them and should be aware of how things work. These skills help them to succeed in inventing their ideas.

In a future lesson, we will be dissecting a machine to show students that it can be fun to learn how things work. Please help us make this lesson extra special by sending your child to class with something to dissect.

If you don't have something already lying in a drawer around the house, then a quick trip to Goodwill will usually yield many options. You can also ask family, friends, and neighbors since most people are happy to get rid of something they do not use anymore. Do not send them with anything that you would want back because we will not be reassembling the item in this class. In fact, we may use parts from these machines in later classes when we begin to build invention prototypes.

Suggestions for machines to dissect include:

1. Telephone
2. Radio
3. Clock
4. Music player
5. Electronic game
6. Walkie talkie
7. Kitchen gadget
8. Old toy

Thank you for helping us make this lesson a success and we hope you hear all about what your child learned afterwards!

Sincerely,

Lesson 4 – Finding Problems

Dear Parents,

Students have been sent home with a worksheet and instructions to interview friends, family, teachers, etc. about problems or issues they have. The intent of this exercise is to get students to start thinking about possible problems they could create an invention to solve. By interviewing people, they are performing the first stages of market research by determining a need.

Please make sure your child completes this worksheet by interviewing at least 3 people including 1 family member, 1 friend, and one non-family or non-friend (like a teacher, church leader, neighbor, etc.)

Sincerely,

Lesson 6 – Choose an Invention

Dear Parents,

Today we learned about brainstorming and students are now ready for a very important step in our program – it's time to decide what to invent! Before the next lesson, every student must choose a problem, brainstorm solutions to that problem, and then come up with an invention for that solution.

We also learned in one of our first lessons, that some inventions can be just for fun or can be improvements on an existing invention. If a student wants to invent something just for fun, like a toy, then the worksheet still needs to be complete and the "problem" is simply that the invention doesn't exist. The rest of the worksheet would be the same – brainstorm and then chose an idea to move forward with in the coming lessons.

We are very excited to see what all the students come up with in this homework!

Sincerely,

Lesson 7 – Missing Homework

Dear Parents,

Your child was missing important homework during today's lesson and we hope you can ensure they complete the following before the next class so that they do not fall too far behind:

1. Complete Brainstorm homework where they decide on an invention to make in the coming lessons.
2. Complete the Patent Search from today's lesson for their chosen invention. This is required as a step in the invention process if they want to participate in the final invention competition.

If you have questions, please don't hesitate to contact me at _____.

Sincerely,

Lesson 8 – Patent Application & Invention Materials

Dear Parents,

Today we completed research and planning on our inventions so next lesson we start building our invention! Each student put together a materials list for their invention so review this with your child and send them to the next lesson with as many of the supplies as possible. If there are any supplies that you cannot get, you can substitute something else that will work. We will also work with the students to determine appropriate alternate materials as needed.

You child has also been sent home with two homework assignments:

In our last lesson, we learned about patents and how important it is to:

(1) Research existing patents before pursuing our own inventions to make sure the idea hasn't already been invented, and
(2) Apply for a new patent for our inventions to make sure someone else cannot steal or market our idea.

After completing research in today's lesson, your child is ready to complete a sample patent application. This is not a real patent application; it is a simplified example of the real thing to help students think through their own invention idea.

Please let the student complete this application on their own but support them if they need help.

Students were also sent home with a market research worksheet to complete. They should interview 3 people, including friends, family, neighbors, etc., about their invention idea. Please ensure they complete this before next lesson.

Sincerely,

Lesson 10 – Invention Price

Dear Parents,

Today, we continued to work on building our invention models, but we also learned about pricing our invention. Students have homework to do research and decide on a reasonable price for their invention, considering the following:

1. Cost of materials
2. Cost of creating parts from materials
3. Cost of assembling parts
4. Cost to market and package
5. Profit

Please help your child complete their worksheet and decide on a good price range for their invention based on their research. Help them understand why the choose the price they did so they can later explain to judges at our invention competition at the end of the program.

Sincerely,

Lesson 11 – Invention Convention

Dear Parents,

Today, students discussed their inventions with their classmates and provided feedback to each other on what they liked and suggestions they had. Students are encouraged to read through their classmate's comments and assess whether they should make any final tweaks to their invention before the end of the program and our Invention Convention. We will spend our next lesson working on their presentation boards for the Invention Convention, so they need to complete their invention, including any revisions based on feedback, at home before the Convention. Please support these last days of effort.

Invention Convention

We are excited to announce an Invention Convention to allow all the students to showcase their hard work and wonderful inventions. The Convention will be held in two parts: one for a formal judging by members of the community and one for parents and family to come see all the inventions we have worked so hard on over the past couple months.

The Invention Convention Judging will be held on _____ from _____ to _____ and any child that participated in our program is welcome, and encouraged, to participate. We will be inviting judges from the Young Inventors Association of America (YIAA) around the community to come and help us choose the top inventions of the program. Winners of the Invention Convention will be invited to participate in the YIAA Young Inventors Showcase held once a year. Additional information about the Showcase will be provided at a later date.

The Invention Convention Family Day will be held on _____ from _____ to _____ and any child that participated in our program is welcome, and encouraged, to participate.

[insert any additional details needed here]

Sincerely,

Program Final Letter

Dear Parents,

We had so much fun working with your child in our invention program and we hope they had as much fun as us! We've covered just the basics to introduce your child to inventing but there is an infinite supply of more ideas and knowledge in books, teachers, and internet. We encourage your child (and you!) to never give up that curiosity that makes childhood so interesting.

Children really are the perfect age to start inventing because their minds are open to every idea and possibility. Help them continue inventing for as long as they want. We are also here to

Provisional Patents & Additional Support

We hope that they continue with the invention they have come up with (and new ones!) and enter it into competitions and try to market it for real use. If you choose to do this, you need to complete a provisional patent application to safeguard your child's idea. You will also benefit by speaking with professionals who are familiar with child inventors and actions that are in your best interest.

The Young Inventors Association of America can support you in this step and we encourage you to reach out to them for additional information and steps. You can contact them at info@yiaa.org and they also have a Facebook page (https://www.facebook.com/inventwithyiaa) and a LinkedIn (https://www.linkedin.com/company/yiaa) page.

Sincerely,

Lessons

Lesson 1 – The Inventor's Log

An Inventor's Log is one of the most important steps in the invention process.

What is an Inventor's Log?

An Inventor's Log is where you keep notes of your invention activities. This notebook serves multiple purposes:

1. Keeps your thoughts and activities organized
2. Provides history of your process should you ever need to go backwards (which happens a lot!)
3. Protects your ideas as your own if someone tries to steal them. While rare, it can happen.

The notebook should be where your write down anything related to your invention process:

- Dates and times that you work on anything related to inventing
- Brainstorming problems or solutions
- Results of discussions with friends or family on your ideas
- Sketches of invention ideas
- Patent researching
- Invention name ideas
- Contact information for anyone helping you

Start your Own Inventor's Log

Take out your notebook and write your name on the front.

Next, take the Inventor's Contract and glue it inside the front cover. This is a contract to yourself, your teacher, and your parents that you are willing to put int the effort to complete this program and create an invention! Sign the contract after reading it carefully and then take your log home and ask your parents to sign the contract as well.

Inventor's Contract

Student Contract

I _____ commit myself on this day _____to do the work necessary to make an invention and enter my invention in one invention contest. I understand that these commitments are essential for program participation and if I am not able to make these commitments, I should decline from participating.

Signature: _____

Parent Contract

I _____ commit on this day _____to helping my child with their invention and understand that they must enter one inventor competition. I understand that I am not to help my child, beyond simple support, because this invention should be 100% my child's work. I understand that these commitments are essential for program participation and if I am not able to make these commitments, my child should decline from participating.

Signature: _____

Lesson 1 – The Inventor's Log – Teachers Notes

Supplies

Inventor's Log

Pen/pencils

Glue Stick

Discussion:

It's important that an inventor keeps track of their entire process with detailed dates, notes, and graphics. It is recommended that students take each worksheet they do, and glue or stapler the worksheet into their logbook with the day's date. This will help them keep all their notes and activities together in one place for quicker reference in the future.

In addition, the Inventor's Log should be for:

- Ideas and how you came up with them
- Thoughts or concerns about your ideas
- Materials tested and used
- Parts and where you got them (plus costs)
- Research — both the facts and books, magazines, and/or websites where you find them
- Diagrams, sketches, and drawings
- Problems you encounter
- How you solved problems and what you couldn't solve
- Data, charts, and graphs

A log book should be bound where pages cannot be temporarily removed. Otherwise, any type of notebook will work.

Activity

Have the students personalize their Inventor's Log and glue their Inventor's Contract inside the front cover. The students should carry their Inventor's Log home and have their parents sign the Parental Contract as well.

Its recommended that the students carry their Inventor's Log around wherever they go so they can write down ideas and problems over the course of the next 12 lessons.

Lesson 2 – What is an Invention?

In order to invent, we must first understand what it means to invent. What exactly is an invention?

An invention is something that:

1. Is new
2. Is "nonobvious"
3. Is useful
4. Is made by people

Look up the word "invent" in the dictionary and write down the definition here:

_____

_____

_____

_____

_____

Name up to 3 inventions in each of the categories below.

ELECTRONICS			
FOOD			
TOYS & GAMES			
KITCHEN			
SCHOOL			

SCIENCE			
CLOTHES			

Lesson 2 – What is an Invention? – Teacher's Notes

The purpose of this lesson is to introduce students to the idea of inventing by talking about what an invention is and thinking about the types of inventions they see and hear about every day.

Supplies:

Inventor's Log

Pen/pencils

Glue Stick

Reward (optional, if playing Scattergories style activity)

Discussion:

An invention is something that…

1. Is New

If something already exists, it cannot be invented. An invention must be different from what already exists. An invention CAN be only slightly different than what already exists.

For example, in 1979, someone invented a new pen that is also erasable with a special type of eraser! Even though a pen had already been invented, the fact that this pen's ink can be erased made it new and therefore a new invention.

2. Non-obvious

An invention must be "non-obvious" which means there needs to be enough of a difference between an invention and what has already been invented.

For example, someone invented a square table a very long time ago. Making the top of the table circular cannot be its own invention because it's an obvious change to the existing invention; a table can be any shape and it's still just a table.

3. Is useful

For an invention to be useful, it must work as planned now and not in some theoretical future.

For example, a pill that makes you float is a cool idea, but it couldn't actually be invented right now with current scientific knowledge. However, a pair of shoes that will hover a few inches above the ground could be invented right now so if you can figure out how to do that, then you've got yourself a great invention!

4. Is made by people

Naturally occurring things already exist so they cannot be invented – they are typically "discovered" which means finding something that already exists (like a new bug species). You cannot invent rain since its naturally occurring, but you could invent a machine that makes rain in a small room – assuming your invention actually works (is useful) and hasn't been invented already (is new).

Activity

Have students define “invent” by googling it or using a dictionary.

Here is a good definition: “to produce (something, such as a useful device or process) for the first time through the use of the imagination or of ingenious thinking and experiment.”

Next, have students think about inventions that fall into the categories on their activity list. Here are a few examples that you may want to give to students to help them with their own list. This activity can be done individually or in teams. The activity can also be made into a competition like the game Scattergories:

- Call out a letter and each invention listed for each category must start with that letter.
- 1 point is given for each invention that no one else in the class wrote.
- Repeat as many times as desired using different letters each time.

Category	Examples
Electronics	batteries, Vacuum Cleaner, Watch, Scooter, virtual reality glasses, calculator, camera, microphone, headphones, iPhone
Food	Microwave, Coke, Ramen instant noodles, peanut butter, cotton candy, corn dogs, chocolate milk, astronaut food
Toys & Games	Monopoly, Drone, Pool Noodle, kite, Rubik’s cube, fidget spinner, Nintendo, super soaker, slip-n-slide, whoopee cushion, Jenga
In the Kitchen	Blender, Spork, Cutting Board, toaster, can opener, salt & pepper shakers, Tupperware, cheese grater
School related	Backpack, Dry-erase board, Lock, vending machine, school bell, Scantron, pencil, pencil sharpener, highlighter, bookmark
Science	Telescope, Penicillin, submarine, periodic table, glasses, robotics
Clothes	zipper, jeans, button, bikini, shoes that light up, tag-less shirts, Crocs, necktie, shoelaces, sunglasses, clothes hanger
Health & Beauty	cotton balls, press-on nails, Band-Aids, hearing aid, prosthetic leg, scale, aerosol spray

Homework

Ask the students pay attention to the inventions they use throughout their week at home, school, or play. They should then do research and find out the answers to the questions provided.

Letter to Parents

Send students home with a note to their parents about today’s lesson and homework.

Lesson 2 – Homework

List 3 inventions that you often use at school or home (or anywhere!). Do research in the library or online to find out the following facts about the inventions:

Question	Invention #1	Invention #2	Invention #3
What is the invention?			
Who invented it?			
When was it invented?			
Where was it invented?			
Why or How was it invented? (what problem did it solve? Was it an accident?)			

Lesson 3 – Why Invent?

Why do people spend time, energy, and money trying to invent things?

People invent things…

1. To solve a problem or fill a need
2. To improve or make something better
3. For fun!

List 3 problems you have (you don't have to have a solution for the problem):

Example: I hate to mow the lawn. Example: My sandwich always gets squished in my backpack. Example: I burn my fingers when roasting s'mores

List 3 inventions you think could be improved (you don't have to know how to improve it right now):

Example: The vending machine at school is constantly getting food stuck – there must be a better way to make a vending machine… Example: There's nothing worse than a flat tire on my bike when I'm blocks from home…could a better tire be made? Example: I'm always losing my phone charger

Invention Steps

Inventing typically follows the same steps:

1. Identify a problem, something that can be improved, or a want (today's lesson)
2. Brainstorm ideas to solve the problem, improve something, or to create what you want
3. Research and design your invention
4. Build a model / prototype
5. Test, evaluate, and redesign

Homework

Two lessons from now, we will be dissecting a machine. Your homework is to start looking for something to bring into class with you. You will be sent home with a letter to your parents that will help you both decide what to bring.

Lesson 3 – Why Invent? – Teacher's Notes

The purpose of this lesson is to get the students thinking like an inventor and to understand that even the smallest improvements can be wonderful inventions. You want to start building confidence in the student's ideas and teaching them to look all around for possibilities, especially in their day-to-day lives.

Supplies:

Inventor's Log

Pen/pencils

Glue Stick

Previous Homework

Go over last lesson's homework activity to ensure all the students were able to correctly complete the task. You can:

1. Review the homework yourself.
2. Let each student read out one of their inventions to the whole class. This will help them practice public speaking.
3. Put the students into groups and have them discuss some of their findings in a small group setting.

Discussion:

<u>Why Invent?</u>

1. To solve a problem – Inventors are always looking for ways to solve problems. Inventors are special because they don't accept problems as unfixable! When they notice things that aren't perfect, they try to come up with a solution instead of ignoring the problem.
2. To improve things – Almost everything around us can be improved in some way even if it's just a small improvement. If we didn't have inventors that look for ways to make things better, we wouldn't have most of our current everyday items like computers, cars, phones, lights, etc. If you ever think "I wish this was ….." or "if only, it could…" then you are already thinking about ways to improve things!
3. For fun! – Sometimes it is just fun to come up with new things that don't already exist. Creative thinking keeps our brains sharp, makes us happy, and gives us something to do in our free time outside of school. Even if you aren't TRYING to invent something, just by tinkering and playing with everything around you, you can sometimes have a good idea that would be fun to make! For example, candy or games were invented just for fun.

<u>Invention Steps</u>

Inventing typically follows the same steps and we will be discussing each step as we move through the program. Today we covered step one, which is to identify a problem, an issue, something that can be improved, or something that we want that doesn't exist yet.

Step 2 is to come up with ways to solve the problem, improve what we want to make better, or what can be created to get what we want. Once we have a list of possible ideas, we choose one to move forward with into the next steps.

Step 3 is to do research on your planned invention and begin to design it in our heads and on paper (in our Inventors Log).

Step 4 is to build a model of the invention. A model is a representation of your invention and not necessarily a working invention.

Step 5 is to test your invention, design, and model. This step helps you test your idea, work out design flaws, and make improvements in your idea. Then you make those improvements and repeat Step 4 to create a final model for your invention. You repeat this step as many times as necessary to get a final invention.

Activity:

Come up with you own answers to the activity questions and share them with the students before asking them to complete the activity. Make sure at least 1-2 of your answers are minor problems or improvements so that students understand that they don't have to invent a flying car and fix global warming. Examples are already given in the student's handout and some more examples are below. The students aren't required to come up with a solution to their problem yet, but encourage them to do so if they want (the examples below have possible solutions):

List 3 problems you have:

1. I have a hard time removing my hair band once my hair gets wet…a new type of hair band could solve that.
2. My candy melts in my backpack on hot days…a heat proof container could help?
3. Mom always has me pull the plants inside when it freezes outside… but what if there was a heated pot that helped?

List 3 existing inventions you think could be improved:

1. They should make lockers that aren't so noisy.
2. My dad always complains about mom's burnt toast – there must be a way to make a toaster NOT burn the toast…?
3. Can you make a hoodie that doesn't have to EVER be washed???

Letter to Parent

Send each student home with the letter explaining the dissection lesson to parents.

Lesson 4 – Game Time

Let's practice using our inventor's brain to create a new game.

Last time we learned that inventions don't have to be serious, they can be just for fun…and what is more fun than games?

Invent a Game

Here are the things you need to decide about the game you invent.

Name of your Game:	Instructions & Rules
Object of the Game:	
Sketch of game:	

Materials to make and play game:

Lesson 4 – Game Time – Teacher's Notes

Today's lesson is a fun way to start students thinking about new ideas and being creative by inventing a game. This activity can be done individually, in pairs, or in teams.

Supplies:

Inventor's Log

Pen/pencils

Glue Stick

Discussion:

No discussion is needed today so the students can use the entire time to invent their game.

Activity:

While the students are brainstorming and filling in their worksheets, go around and ask them questions about their game to get them thinking about different perspectives of the game.

Game Questions:

1. What age kids will be playing the game?
2. Can adults play too?
3. Is it easy to carry around?
4. How does [ ] work?
5. Why did you [ ] ?

If you put a time limit on the activity and allow time at the end, you can have all the kids explain their games to the class or to small groups. If you are limited on time, you can pick just a few students to get up and present their game. This helps with their presentation and public speaking skills.

Homework:

Remind the students to bring machines to dissect if they haven't already.

Send the students home with a worksheet for interviewing friends, family, or teachers about problems they could possibly solve with an invention in later lessons. This should be completed before the brainstorming lesson.

Lesson 4 – Homework

In preparation for future lessons, interview your family, friends, and/or teachers about problems they have or something they wish was better. Their answers will help you later when you decide what you want to invent. At a minimum, include 1 family member, 1 friend, and 1 non-family or non-friend person.

Name of Person Interviewed	Date/Time Interviewed	Result of Interview

Lesson 5 – Curious Dissection

Inventors, like scientists, need to be aware of how things work. This helps them to invent anything they like.

Sometimes an object or machine can look simple on the outside, but it is complex on the inside. Like the human body! Dissecting things helps you understand how things work.

REMEMBER, dissecting machines should only be done:

1. When they have permission to dissect the machine
2. When an adult is around and supervising the dissection
3. When the machine is unplugged and has no batteries installed

Create a work area for yourself before you start dissecting, clear an area except for your Inventor's Log and pencil. Now take your machine apart using your tools and answer the questions below.

Explain what you see inside your machine:

_____

_____

_____

How do you think your machine works?

_____

_____

_____

What did you learn and what questions do you now have?

_____

_____

_____

_____

Lesson 5 – Curious Dissection – Teacher's Notes

Today's class is meant to get the students excited about tinkering and playing around with things to learn how they work.

Supplies:

You will need a handful of tools to support the children taking apart their machine. The basics are listed below (and you should have multiples of each), but it would be beneficial for you to have a small tool chest on hand. Old or unused machines may be harder to take apart if pieces have melted, had food and drink spilled on them, or any number of other events that cause dissection to be tricky. Here are the basic supplies you should have at a minimum.

- Shoe box covers, newspapers, etc. to cover the table and create a working space
- Screwdrivers (flat and Philips)
- Small wrenches
- Other tools

It's also suggested you have a few extra machines in case a student was unable to bring one. You can also pair up students if you have more students than machines to dissect.

Students will also need the typical supplies:

Inventor's Log

Pen/pencils

Glue Stick

Discussion:

It's not necessarily important for students to understand the exact mechanisms of a machine, just seeing how something is made and having them try to explain what they see is a good exercise. Hopefully, they will enjoy the process and a curiosity bug can be born.

Make sure that they understand that dissecting machines should only be done:

1. When they have permission to dissect the machine
2. When an adult is around and supervising the dissection
3. When the machine is unplugged and has no batteries installed

Activity:

Walk around and help the students dissect and discuss what they find.

Lesson 6 – Brainstorming

No brainstorm idea is wrong… they can be simple, crazy, or weird!

Brainstorming is thinking up ways to solve a problem by writing down all the ideas that come to your head. Ideas can be simple, complex, crazy, or weird. The goal of brainstorming is to just let you brain think of whatever it wants. There is no right or wrong at this step.

Identify a Problem

First Choose one of the problems from previous lessons and homework, or a new problem, and write it here:

_____

_____

Brainstorm solutions to the Problem:

Use lists, sketches, doodles, words, sentences, or whatever helps you come up with as many ideas as you can on how to solve your problem:

Lesson 6 – Brainstorming – Teacher's Notes

This lesson will teach students how to brainstorm and think outside the box which fosters creativity that will help them start thinking about their own inventions and what they want to do for the remainder of the program.

Supplies:

Inventor's Log

Pen/pencils

Glue Stick

Handful of everyday items: hula hoop, ball, plastic cup, Tupperware, pool noodle, scarf, blanket, hat, pillow, planter, hammer, etc.

Previous Homework:

All students should have completed the interview homework from two lessons ago. Make sure they all have that with them as they will need it for Activity #2. If they do not have it, they should be able to use previous lessons to come up with their brainstorm problem.

Discussion:

Brainstorming is spontaneously coming up with ideas related to a specific topic. The point of brainstorming is to take time to come up with many ideas on the topic and then review all the ideas and pick one (sometimes more than one) that you want to move forward with exploring.

If your mom asks you what you want to do this weekend, she is basically asking you (and your family) to brainstorm ideas of activities. If you are trying to name a new puppy, you typically brainstorm ideas of possible names before choosing one.

Today, we want to practice brainstorming so that students can come up with solutions to a problem and decide on an invention to create in this program.

[Complete Activity #1 and #2]

Once you have a list of ideas and are done brainstorming, you begin crossing off ideas to ultimately end up with one (or maybe a few) final ideas. You cross off ideas on your brainstorm list for any number of reasons, but some examples are:

1. Not realistic
2. Expensive
3. Boring
4. Complicated
5. Dangerous
6. Idea already exists
7. Etc.

Your Homework will include brainstorming invention ideas and then ultimately coming up with one to take forward into the next lessons to research and build!

Activity #1:

Today's brainstorming game is simple: have the students come up with new ways to use the common household items you have brought. Give the students a time limit for each item to force them to just throw out answers without thinking or analyzing the answers.

The students can work individually to write down their brainstorming ideas, work together in small teams writing down their ideas, or brainstorm together as a class out loud, or a combination of these.

Its important that the students understand that brainstorming is open to any idea and there are no wrong answers at this point.

You can give some examples to students before starting to help get their creative minds rolling:

Example item: Cup

> Possible uses: flower planter, pencil holder, old fashioned string telephone, bird bath, candle, drum, ping pong game….

Example item: Tennis racket

> Possible uses: mosquito swatter, ball hoop (if you remove the strings and hang it up), hula hoop, extra-large bubble maker, drum (if add foil across it)….

Activity #2

After you have gone through the household items you have brought, its time to let the students brainstorm solutions to the problem of their choice. Have the students go back to previous lessons and homework and decide on a problem for which they want to brainstorm solutions. This activity should be individually completed.

If you have time at the end of the lesson, you can allow students to stand up and explain their problem and a few of their best brainstorming solutions.

Homework:

This week's homework is just like Activity #2 but this is step 1 for their actual invention and is a key step to prepare the students for their future classes so encourage everyone to complete it before the next lesson.

Remind students that they can also invent something just for fun and if they chose to do this, then the worksheet still needs to be filled out. The "problem" would be that the invention doesn't exist already but they can still brainstorm ideas for inventions and then choose just one to move forward with in the coming lessons.

Lesson 6 – Homework

Its time to decide what YOU WANT TO INVENT!

You've already come up with lists of problems and you now know how to brainstorm solutions, so its time to apply this new knowledge to your own invention. Before next Lesson, you need to decide on a problem to solve, brainstorm solutions to that problem, and decide on 1 invention to move forward with in the coming lessons and activities.

My problem is:

My Brainstorm Solutions:

My invention is:

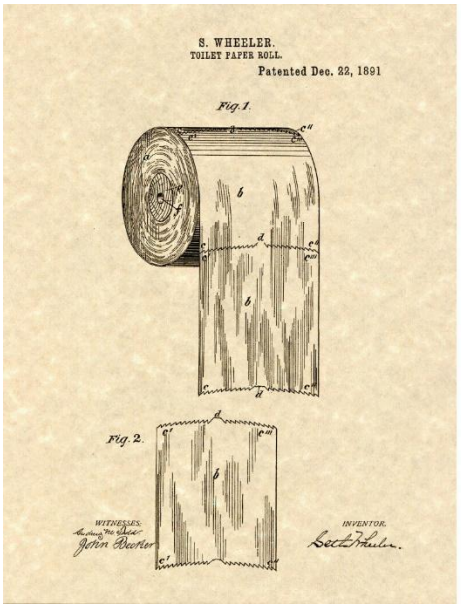
Lesson 7 – Patents

Patents keep other people from stealing your ideas and making your invention without your permission.

The first step of the invention process is to make sure that someone else hasn't already invented the same idea. Just because you don't think something doesn't exist yet doesn't mean another inventor hasn't already invented it. To make sure you aren't "stealing" someone else's idea, you should always do a patent search.

What is a Patent?

A patent gives someone the right to the be only person allowed to make, sell, or use a product/invention for a set number of years into the future. That way, when you invent something new, someone can't come behind you and start making and selling it too. Below are pages from the original patents for toilet paper roll, a pencil, and Legos.



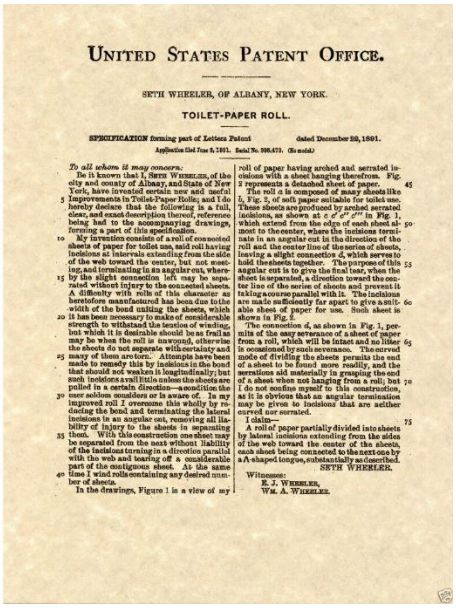
S. WHEELER.
TOILET PAPER ROLL.
Patented Dec. 22, 1891

Fig. 1.

Fig. 2.

WITNESSES:
John Becker

INVENTOR.
Seth Wheeler



UNITED STATES PATENT OFFICE.

SETH WHEELER, OF ALBANY, NEW YORK.

TOILET-PAPER ROLL.

SPECIFICATION forming part of Letters Patent dated December 22, 1891.

Application filed June 6, 1891. Serial No. 395,473. (No model.)

To all whom it may concern:

Be it known that I, SETH WHEELER, of the city and county of Albany, and State of New York, have invented certain new and useful Improvements in Toilet-Paper Rolls; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming a part of this specification.

My invention consists of a roll of connected sheets of paper for toilet use, said roll having incisions at intervals extending from the side of the web toward the center, but not meeting, and terminating in an angular cut, whereby the slight connection left may be separated without injury to the connected sheets. A difficulty with rolls of this character as heretofore manufactured has been due to the width of the bond uniting the sheets, which it has been necessary to make of considerable strength to withstand the tention of winding, but which it is desirable should be as frail as may be when the roll is unwound, otherwise the sheets do not separate with certainty and many of them are torn. Attempts have been made to remedy this by incisions in the bond that should not weaken it longitudinally; but such incisions avail little unless the sheets are pulled in a certain direction—a condition the user seldom considers or is aware of. In my improved roll I overcome this wholly by reducing the bond and terminating the lateral incisions in an angular cut, removing all liability of injury to the sheets in separating them. With this construction one sheet may be separated from the next without liability of the incisions turning in a direction parallel with the web and tearing off a considerable part of the contiguous sheet. At the same time I wind rolls containing any desired number of sheets.

In the drawings, Figure 1 is a view of my roll of paper having arched and serrated incisions with a sheet hanging therefrom. Fig. 2 represents a detached sheet of paper.

The roll *a* is composed of many sheets like *b*, Fig. 2, of soft paper suitable for toilet use. These sheets are produced by arched serrated incisions, as shown at *c c' c'' c'''* in Fig. 1, which extend from the edge of each sheet almost to the center, where the incisions terminate in an angular cut in the direction of the roll and the center line of the series of sheets, leaving a slight connection *d*, which serves to hold the sheets together. The purpose of this angular cut is to give the final tear, when the sheet is separated, a direction toward the center line of the series of sheets and prevent it taking a course parallel with it. The incisions are made sufficiently far apart to give a suitable sheet of paper for use. Such sheet is shown in Fig. 2.

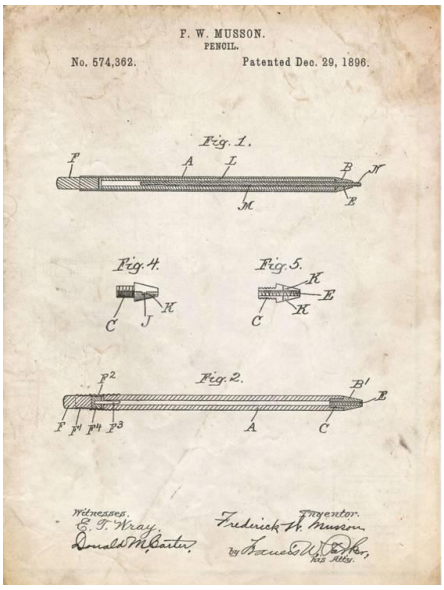
The connection *d*, as shown in Fig. 1, permits of the easy severance of a sheet of paper from a roll, which will be intact and no litter is occasioned by such severance. The curved mode of dividing the sheets permits the end of a sheet to be found more readily, and the serrations aid materially in grasping the end of a sheet when not hanging from a roll; but I do not confine myself to this construction, as it is obvious that an angular termination may be given to incisions that are neither curved nor serrated.

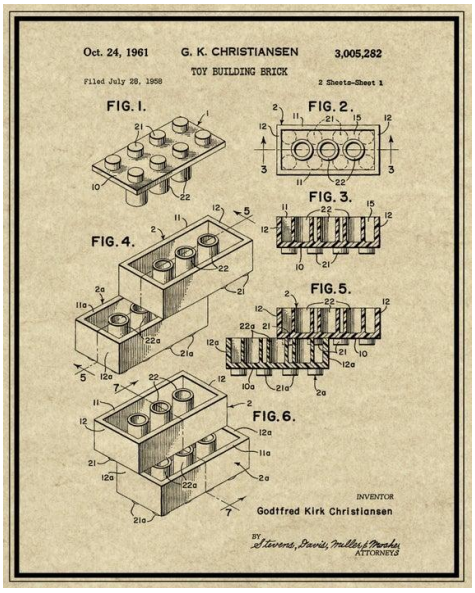
I claim—

A roll of paper partially divided into sheets by lateral incisions extending from the sides of the web toward the center of the sheets, each sheet being connected to the next one by a Λ-shaped tongue, substantially as described.

SETH WHEELER.

Witnesses:
E. J. WHEELER,
WM. A. WHEELER.





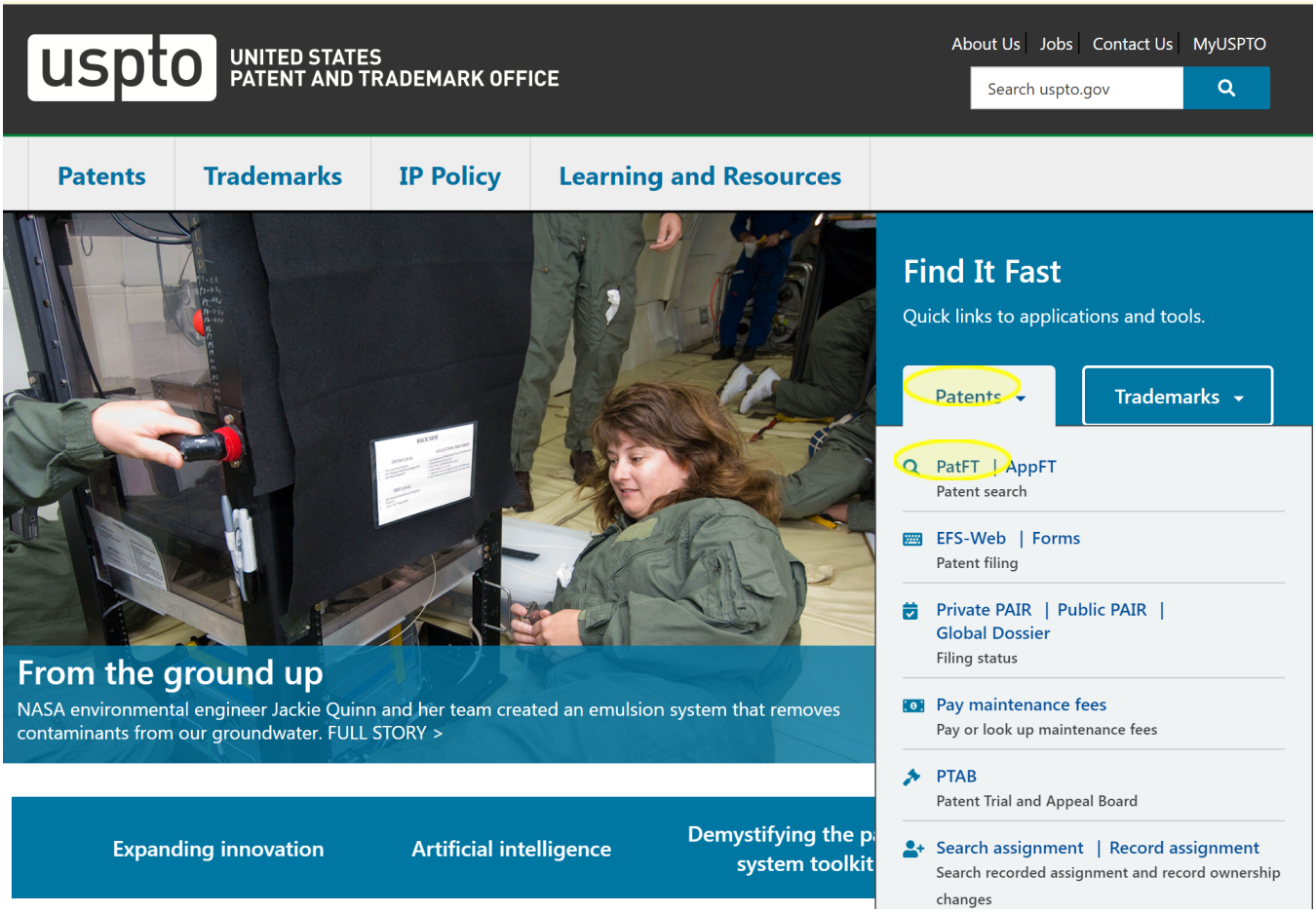
Patent Search

It's time to complete a simplified patent search on your invention idea. This step ensures you move forward with a "uniquely different" idea for an invention BEFORE you put in time and effort to research and plan it.

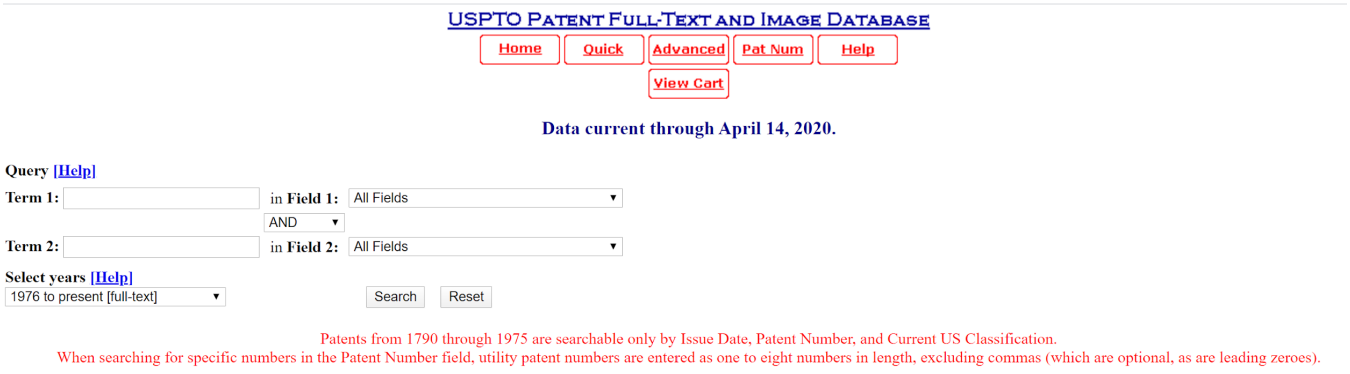
Step 1. Before doing a patent search, you can save time by Google searching your idea first. If something similar is out there, a Google search may find it with a few variations of search text. If you do find the same invention as your idea, then you know you need to find a new idea and you won't have to do any more of the steps below. If after a Google search, you haven't found that your invention idea already exists, then you can move on to the patent search steps below.

Step 2. The US Patent & Trademark website (www.uspto.gov) is where you search for patents and patent applications.

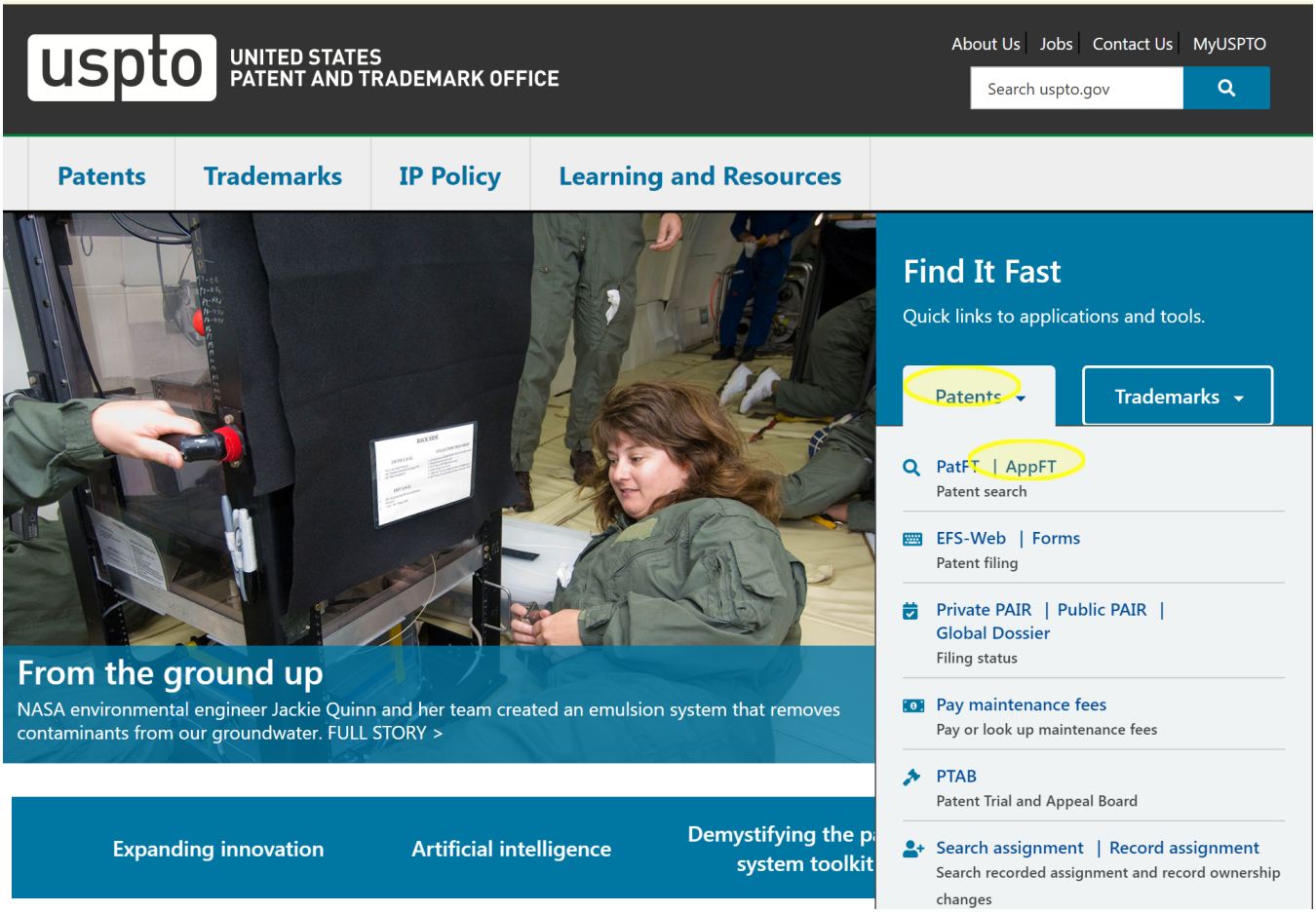
Click on "Patents" "PatFT" (which stands for Patent Full Text Search).

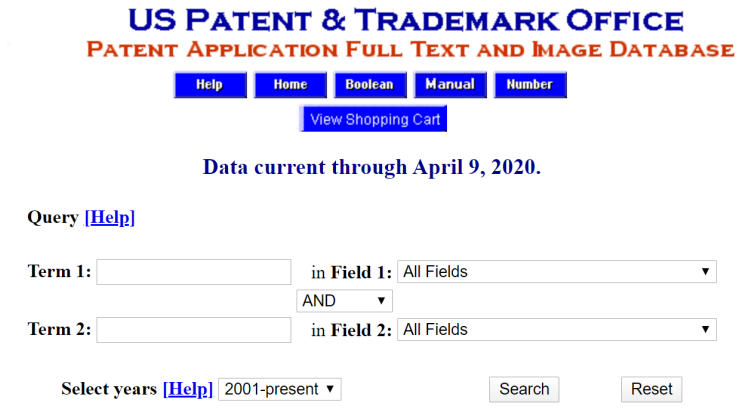


Search existing patents. This should take you to the "Quick" Search option where you can enter in text you want to search. Try different single word descriptions of your invention to see if anything pops up that looks like your invention idea. Start by using only one word and keeping Field 1 to "All Fields." After that, you can start to add multiple words and use "Term 2" and "Field 2." Make sure that the search words you use are descriptive and detailed. For example, entering "bike" will return thousands of options including bicycle, motorcycle, fitness treadmills, toy bikes, etc. If instead, you search "bicycle" and combine it with "cellphone" you will pull up patents more specific to bicycle mounted cell phone holders.



Search patent applications. Go back to the main page, click on "Patents" "AppFT" (which stands for Patent Application Search). Once on the search page, search applications in the same way you searched existing patents.





Step 3. Your searches will bring up a list of titles of all patent (or applications) that include your search words. Review the titles and click on any of them that appear similar to your invention idea so that you can review the images and abstracts.

If you find any patents that are the exact same as your idea, you will need to find a new idea to pursue or a way to modify your idea. However, remember that in Lesson 1 we learned that an invention can be very similar to an existing one but if it is not the exact same it is still considered “new” or unique.

Complete the worksheet listing out 3 examples of similar patented inventions to your invention idea.

Patent Search Worksheet

Fill in the information below about 3 patent / patent applications that are like your planned invention.

	Patent 1	Patent 2	Patent 3
Patent Title			
Patent Inventors			
Patent or Application No.			
Filing Date			
First sentence of abstract			

Lesson 7 – Patents – Teacher's Notes

This lesson is a brief discussion about patents without going into too much detail since the process can be detailed and lengthy. The lesson can be short or long depending on whether you have students complete a patent search during the lesson or as homework.

Supplies:

Inventor's Log

Pen/pencils

Glue Stick

Computer (or phones) with access to internet for patent searching

Previous Homework:

Make sure that the students have completed previous lessons homework as they will need it for today's lesson. If they do not have their homework completed, you can:

- Have ready a list of inventions to hand out to those kids so that they have something to search for in today's activity. Students will need to complete previous homework AND do the patent research before the next class. Send students home with a letter requesting parents ensure their homework is completed as they will be behind if they do not complete their homework.
- Have them complete their invention brainstorm worksheet while the rest of class does the patent activity and then have them complete the patent activity as homework. Send students home with a letter requesting parents ensure their homework is completed as they will be behind if they do not complete their homework.

Discussion:

Before you research, build a prototype, or test your invention, you should complete a patent search to determine if someone else has already invented what you want to invent. You do this by searching existing patents and patent applications on the United States government website.

Inventors who apply for patents hire lawyers that spend many hours doing research but for this class we will do a simplified search just so you understand the process. The patent application process is very involved, and we will not go into depth in this class covering all the steps required to get a patent. However, just remember that if you have an invention that you want to take to a competition or do anything with besides tinkering at home, then you need to consider getting a patent so that someone cannot take your idea away from you. We will discuss this again at the end of the program once you have completed your own inventions.

Activity:

The activity today is to have students log on to the internet and check out existing patents that may be like their chosen invention for this program. This step is to get the students familiar with the patent website for future use should they need it and also so that they remember that patents are important and making sure existing patents don't exist for their idea is very important.

The student handout takes them step by step through the website of the US Patent Office, so you just need to help them move through the steps and complete the worksheet. It would help if you have familiarized yourself with the website before class so you can answer any questions.

Homework:

If it was not completed during class, homework will be the patent search. You may accept printed out pages from patents they find or just have them complete the worksheet.

Lesson 8 – Research & Planning

"Someone's sitting in the shade today because someone planted a tree a long time ago" – Warren Buffett

In other words, planning today means the next steps in inventing will go easier. So, today we are going to plan a few key parts of our inventions so that we can move on to the most fun part in the next lesson – building our models!

Component Drawings of Invention:

Model Drawings:

Your model won't be exactly like the real invention, so think about how your model will look and work so that it is the best representation of the invention. Also think about what materials you will need and complete the next section as well.

Invention Materials & Cost:

List out each component of your invention and the material. Then research how much each will cost so that you can decide what to sell your invention for later.

Component	Material	Cost

Materials for Model:

List out components you will include in your model and a material to use. You will use this list to collect materials to start building your model next lesson. Make sure you take this list to your parents and have them help you collect supplies before next lesson.

Component	Material

Invention Names:

Brainstorm ideas for naming your invention using the worksheet prompts and what we discussed in this lesson. Try to come up with at least 3 ideas each.

Names that tell What the Invention Does	Named After the Inventor	Named for Materials of the Invention	Fun, Catchy, Rhyming, Witty Names

My Invention Name Is:			

Lesson 8 – Research & Planning – Teacher's Notes

Today's lesson teaches students the third step in inventing which involves the research and planning of their invention.

Supplies:

Inventor's Log

Pen/pencils

Glue Stick

Computer (or phones) with access to internet

Previous Homework:

All students should have completed all homework including picking an invention and completing their patent search. If they have not, unfortunately, they will be behind, but you can have them complete whatever steps they are missing during this class while the other students are doing research and planning. Whatever worksheets any student does not complete in class can be taken home as additional homework.

Discussion:

Research and planning are important parts of the invention process. A good inventor is well-informed about what they are inventing. For example, before they started building their various airplanes, the Wright brothers, researched how different animals fly, wing shape, weight, balance, wing motion, and more!

Today we will discuss a few key things to think about during this step:

<u>Drawings</u>

You should have a good idea of how your invention is put together in order to move to the next step of building a model. The best way to do this is to create drawings of your invention in as much detail as you can. Start with a drawing of the entire invention and then draw out each individual piece of the invention noting what the material will be and any notes, questions, comments you have for those pieces.

As you move through later steps, you will come back to these drawings and revise them as necessary.

<u>Materials</u>

As the inventor, it's up to you to decide on every component of your invention and from what materials each component will be made. Should it be plastic, metal, wood? Should the material be stretchy, sticky, hard, soft? You may not know the exact material to use yet but you should understand what type of material will be needed. You can work on the specific details and materials as you work through the remaining steps in the invention process.

<u>Model</u>

Typically, you start by creating a model of your invention. A model is a non-working, representation of that can be used to illustrate the main components and purpose of the invention. It's rare we can build a finalized, full working invention so we start by creating a representation of the invention. So, you also need to determine what is the best way to build a model – what materials and tools will you need to create a model that adequately shows off your invention idea?

Invention Name

Naming your invention is a fun step in the planning process but it takes careful thought to choose a good name. An invention name can:

- Tell how the invention works or what it does (like doghouse, rocking chair)
- Be named after the inventor (like Levi jeans, Heinz Ketchup)
- Explain what the invention is made of (like rubber cement, wax paper)
- Clever, funny, interesting, rhyming (like silly putty, hula hoop, cracker jacks)

Preliminary Market Analysis

- Before you get too far into creating your invention, it is smart to do some preliminary market analysis. That's a fancy way of saying you should talk to people about your idea and find out if they would use your invention, if they would buy your invention, or if they don't like your invention then you can find out why or what they would change before they would use it.
- A word of warning to remember. Talking to anyone outside your family and friends about your invention should only be done AFTER you have filed for a provisional patent. You don't want to talk to a stranger about your idea and then they go and create the exact same thing fast and get credit for your idea. This isn't necessarily what would happen, but you do want to protect yourself just in case.

Additional thoughts

There are many things to consider in addition to the points we've already discussed so keep these questions in mind as you research and plan:

1. Are there any hazards you hadn't considered?
2. Is there an easier way to build your model?
3. Has anyone already tried and failed? What did you learn from them?
4. Was anyone successful in a related topic? Can you use their findings to help you?
5. Are there any important ideas to keep in mind as you design your invention?

Activity:

The students have multiple worksheets to complete in today's lessons; each one covers one of the discussion points. You can intersperse the worksheets between discussions or complete the discussion and then complete all the worksheets.

Homework

Now that students have thought more about their invention, they are ready to practice completing a patent application. They have a very simplified version of a patent application that will help them think through their invention and prepare them for next steps.

We also want students to understand the importance of market research so send them home with a worksheet that will require them to interview a few people about their idea and get feedback on the idea.

Sends students home with letter to parents explaining that they have a materials list that they need to gather and bring to the next lesson so that they can start building their model.

Lesson 8 – Homework

My Patent Application

Patent No.:

Date of Issue:

Inventor:

Invention Name:

Abstract (describe invention):
Drawings: (use additional pages if required)

Lesson 8 – Homework #2

Market Research Worksheet

Complete the worksheet below by interviewing friends, family, neighbors, teachers, etc. about your invention. You can then use what you learn to make your invention better. Start by explaining the problem to the person and why you decided to tackle that problem. Then describe your invention to them including the name and approximate cost of your invention. After that, ask them the following questions, and any more you want, and fill in their responses in the worksheet.

	Interviewee #1	Interviewee #2	Interviewee #3
Name of Person Interviewed			
Do they like the name of the invention? Do they have an idea for a different name?			
Do they like the invention idea?			
Would they buy the invention idea for the price? Would they expect it to be more expensive or cheaper?			
Would they want different materials?			
Do they think it should have additional features?			
Is there any other ideas they have about your invention?			

Lesson 9 – Model Time – Teacher's Notes

Today we start building models of the student's inventions.

Supplies:

Inventor's Log

Pen/pencils

Glue Stick

Student-brought materials from home based on last lesson's materials list

Any materials or tools you can bring that may be useful: glue, scissors, construction paper, cardboard, markers, tape (any kinds), shoeboxes, old boxes, paperclips, rulers, rubber bands, old Legos, etc.

Previous Homework:

Students created a model material list in the last lesson, and you sent them home with a letter to parents explaining the list and the need to bring in the materials. There will be materials that the students were unable to find and bring so you will need to request any student with missing materials to speak to you so you can come up with alternatives together.

Have all students turn in their patent application so that you can review them. After you review them, and if you have no issues, you can "Approve" their applications and give them a "Patent No." and "Date of Issue." Return their homework and have them glue it into their Inventor's Log.

Students should have completed the Market Research worksheet so have them turn that in or review it as you walk around helping students during today's lesson.

Discussion:

Today, there is no real discussion. You want to make sure everyone brought supplies and can start working on their models.

Provide a brief safety lesson if students are young enough to need it.

Activity:

Today's activity is to start building their invention model. Just walk the room and help students as needed.

For Next Time:

Have the students bring in any additional materials they need for the next class as you will continue to build their model.

Lesson 10 – The Price is Right

Would you buy a paperclip for $1? Would you sell your house for $1?

Of course not! You would buy a coke for $1 but not a paperclip. You would sell a friendship bracelet for $1 but not your house!

What is in a Price?

The cost of something is very important because people won't buy something if its more expensive than its worth. It's also important because if you sell something for less than its worth, then you end up losing money!

When you buy (or sell) something, that prices includes:

1. Cost of materials
2. Cost of creating parts from materials
3. Cost of assembling parts
4. Cost to market and package your invention
5. Profit you want

Lesson 10 – The Price is Right – Teacher's notes

Today, students will continue to create their models, but we want to take a few minutes to discuss pricing our inventions so the students

Supplies:

Inventor's Log

Pen/pencils

Glue Stick

Computer (or phones) with access to internet

Discussion:

In order to market and sell your invention, you must decide on a reasonable price. To do this, start by researching similar inventions and find out how much they cost. Then you can compare your invention to those and decide whether your invention would cost more cost less than that invention.

You also want to understand how much it would cost to make your invention, so you can list out all the components of your invention (not the model) and try to put a cost against each component. To determine those costs, you can do internet searches or go to local stores to find prices.

The price of something is always more than what the materials cost. This is because the final price includes:

- Cost to turn those materials into pieces needed for the invention (such as creating a shape out of metal)
- Cost to assemble those pieces together to make the invention
- Cost to package and market the invention
- Profit

"Profit" is the money you get after you subtract all your expenses to make and sell your invention. You don't want to sell your invention for just the cost of making it, you want to make a proft

Once you know the cost of similar invention and the cost of each individual part of your invention, then the final price of your invention can be estimated.

Profit means that you make money…if it cost $10 to make your invention, you want to sell it for more than $10 so you make a profit.

Activity:

Today's activity is to continue building their invention model. Just walk the room and help students as needed.

Homework:

Student homework is to research and decide on a reasonable price to sell their invention. Send students home with a letter to parents so that parents can help their child on this homework.

Lesson 10 – Homework

Cost of Similar Inventions:

Go online and search for similar type inventions and find out how much they cost. Then decide whether your invention should cost more or cost less based on the differences between that invention your idea.

Similar Invention	Cost	Will your Invention be more of less?	Why?

Based on the above information, my invention should cost around: _____

Invention Materials & Cost:

List out each component of your invention below. Research how much each piece.

Component	Cost
TOTAL COST ($)	

Based on the above information, and considering additional cost for turning materials into parts for my invention, assembling my invention, packaging and marketing my invention, and finally adding additional cost so that I make a profit, I think **my invention should cost**:

between _____ and _____

Lesson 11 – Test, Evaluate, & Redesign

Market Analysis

Inventor's Name _____

Invention Name _____

What I Liked:

My Suggestions, Questions, or Concerns:

Lesson 11 – Test, Evaluate & Redesign – Teacher's notes

Today's lesson will teach students about the final steps of inventing which is to review and test their invention, as they currently have it designed, and decide if it needs to be redesigned in any way to make it the best version of their invention idea.

Supplies:

Inventor's Log

Pen/pencils

Glue Stick

Discussion:

Testing, evaluating, and redesigning is a necessary part of inventing and is usually one of the longer steps of inventing because it's an iterative process. Iterative means that it is repeated as many times as necessary to get to a final invention that is ready to be shown off to others.

Test: If your invention is supposed to DO something specific, then you test it at this stage. Since you only have a model of your invention, you cannot do real testing. If you have a prototype, which is a working model, then you would be able to test your invention. Since you cannot test your model, you can describe in your Inventor's Log what tests you would put a prototype through to ensure it works.

Evaluate: After you test your invention, you evaluate what you have created. Does your invention address the problem or need you set out to solve? You can also do a "market analysis" which is basically making sure that people understand your invention and want to use it. This is what we will do today after we finish our discussion.

Redesign: After testing and evaluating your invention, you may want to redesign, or make changes to, your invention based on what you found. So at this step you are improving, fixing, and possibly changing your invention based on tests and your evaluations.

Activity:

Print out enough worksheets for each student to complete a few

To test and evaluate your invention, we will be performing mini-presentations to each other. Half of you will be showing your inventions to the other half and then we will switch. We will do this a few times, so that you get input from multiple classmates on your invention.

I want you to find someone in the room, explain to them your invention and show them your model. Explain to them the initial problem you chose to solve and how you chose your invention and then show them how your model and real invention would work.

For those of you who are listening the mini-presentations, I want to ask the inventor questions about their invention so that you understand it and so that they practice explaining their thought process. You can ask any question you want, or some examples would be:

1. Why did you do _____ ?
2. Why didn't you do _____?

3. How would you improve this invention if you had more time?
4. How could you make it cheaper?
5. Can you show me how _____ would work?

After you both have presented to each other, I want you to go back to your seats and spend 5 minutes complete the worksheets I gave you explaining your classmate's invention and what you thought about it. Then we will do this a couple more times.

*Collect all the worksheets and give them to the inventors at the end of class so that they can assess their invention and whether they can / want to improve it any way.

Homework:

Students can take their inventions and Market Analysis worksheets home to continue to evaluate, redesign, and complete their inventions for the Invention Convention. Next lesson will be their presentation boards so any additional work on their invention should be from home.

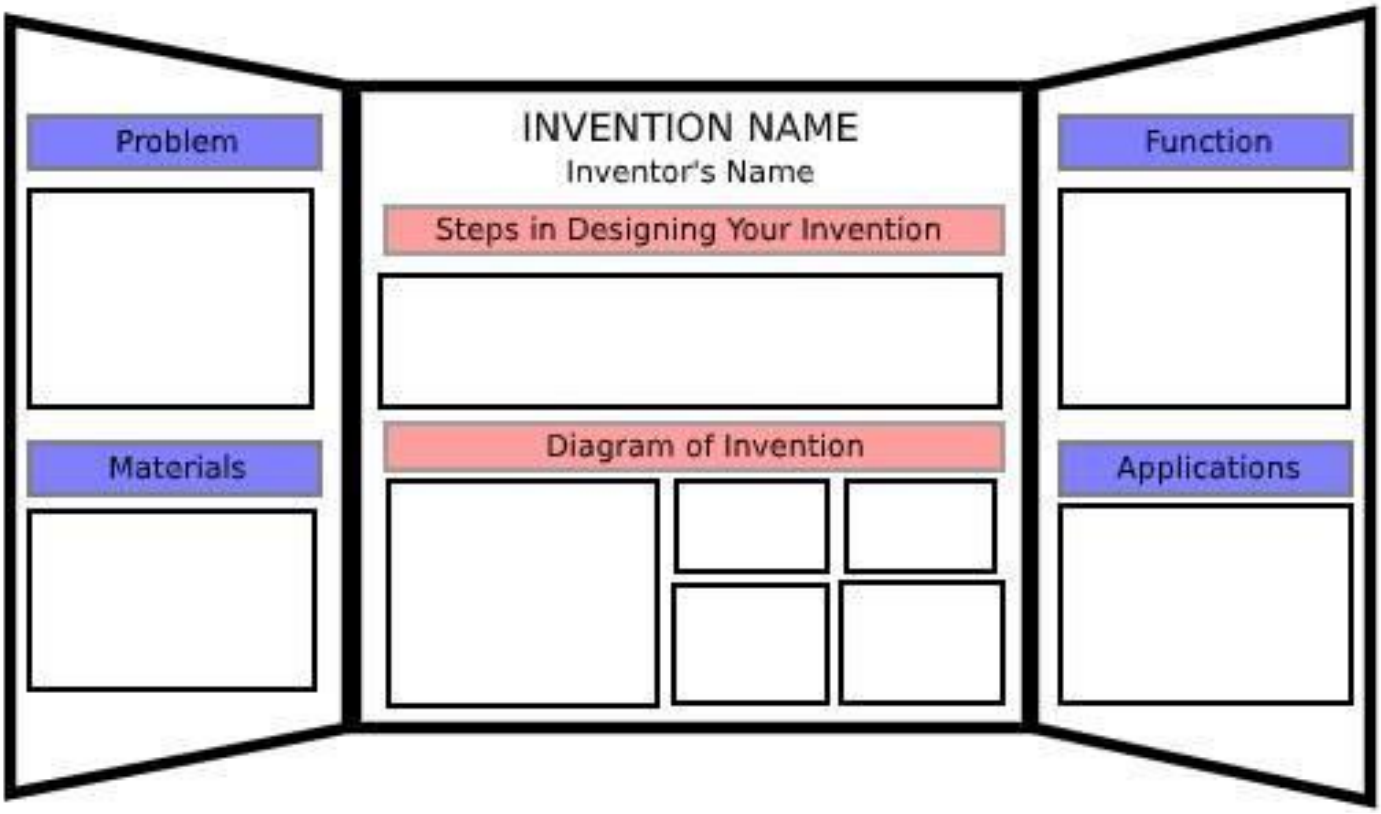
Lesson 12 – Presentation

Your invention is awesome, but you need to convince someone else that it is awesome and that they want to buy it. So, you need to present your invention to them in a clear and organized way. You will be presenting through a poster board and with a short verbal explanation.

Visual Presentation

Your display is a "silent" salesperson for your invention

Your board should be organized and show the following information at a minimum, but how you choose to show the information and anything you want to add is up to you. You can use markers, crayons, colored pencils, printouts, clipart, photographs, magazine cutouts, etc.



Verbal Presentation

Think of your verbal presentation like a TV commercial

You should explain the problem you were trying to solve and how your invention solves that problem. Then briefly discuss your steps in designing the invention. Next, show off the model you created, explain how the real invention would differ from the model and what tests you have planned for the real invention to ensure it will work properly.

You can memorize a presentation or use notes (flashcards) but its very important your practice what you are going to say. Stand in front of the mirror to practice and have your parents be your audience as well.

Lesson 12 – Presentation – Teacher's notes

Supplies:

Inventor's Log

Pen/pencils

Glue Stick

Tri-fold presentation boards

Construction paper, scissors, glue, markers

(optional) You can printout out the titles for the sections of the tri-folds or have the students do it themselves on the computer or with markers on paper or directly on the board. By printing out the titles for the students, the boards will be more uniform in appearance. If you let students write the titles themselves, it is recommended that they do it on paper and glue it on the board instead of directly on the board as this allows for mistakes. Printouts include:

1. Student's Name
2. Student's Invention Name
3. Labels for:
    a. Problem
    b. Materials
    c. Function
    d. Applications
    e. Steps in Designing Invention
    f. Diagrams of Invention

Discussion:

Today is the last day of our Invention Program. I hope you have learned a lot with us and had fun learning how to invent! I know we had fun teaching you.

We will soon be showing off all your hard work at our Invention Convention, so we need to put together our presentations to show everyone the problem you solved and how you came up with your invention.

When you present your idea to someone new, you have to make sure you tell them all the important things about your invention so we will be using your tri-fold presentation boards to do this.

The key pieces of information are:

- Name of Invention
- Inventor's Name
- Problem you were solving
- Steps you went through to get to your invention
- Materials
- Function – What the invention actually does
- Applications – How the invention will be used and Who will Use it

Activity:

Today, we will be putting together your poster boards and then you will be taking the board and your invention home to complete and finalize before the Invention Convention.

More Resources

Here are some additional resources that you may find helpful in creating new lessons and assignments.

http://www.inventored.org/k-12/

https://www.uspto.gov/kids/