



**YOUNG INVENTOR'S  
ASSOCIATION OF AMERICA**  
*Empowering the world's next inventors*

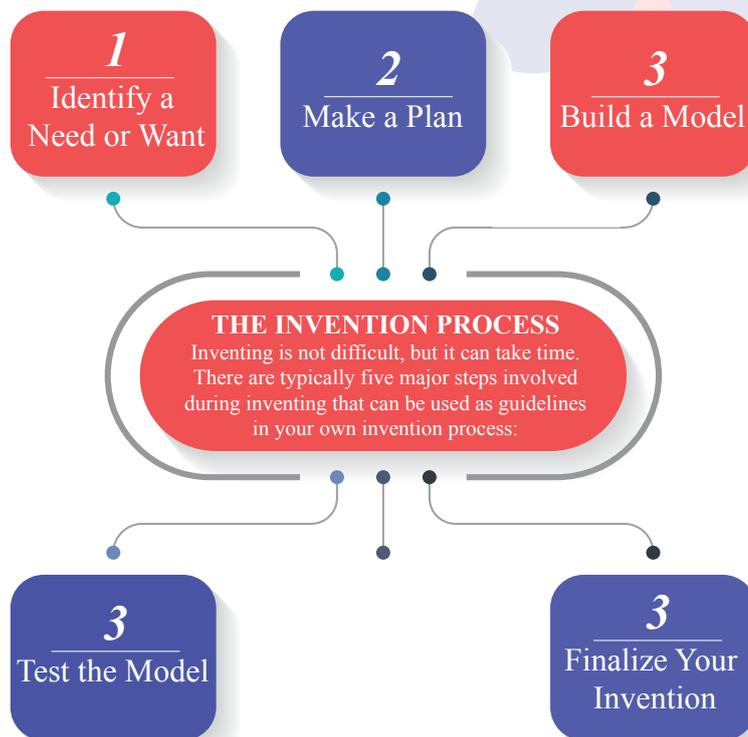
# THE INVENTION PROCESS



# ANYONE CAN INVENT!

Children have a natural curiosity and desire to experiment which has led them to play a critical role in the history of inventing. Children have directly invented or helped to invent snack foods, toys, games, clothes, furniture, school supplies, and technology and there are countless examples of young inventors who made an impact on their world with their inventions.

- 1873 - Chester Greenwood at the age of 14 decided he needed something to protect his ears from the cold. He and his grandmother sewed together the very first set of earmuffs.
- 1921 - A fourteen-year-old Philo Farnsworth came up with the key idea that would lead to his inventing the television while working on his father's Idaho farm.
- 1935 - George Nissen, at the age of 16, got a pile of stuff from a local junkyard and, in his parents' garage, built a jumping device that he took to a camp where he and some friends worked. The Trampoline was an instant hit!
- 1958 - Robert Heft redesigned the American flag for a class project. His teacher initially gave him a B-grade, but told him that he could get a better grade if he could get Congress to adopt his flag. His flag was adopted by Presidential Proclamation and is the flag we use today.
- 1987 — In kindergarten, Houstonian Jeanie Low invented a stepstool that children could use to reach the sink that would fold up and be held magnetically in place, so it wasn't in the way of parents.
- 1997 - At the age of 13, Kavita Shukla invented a lab safety cap for containers holding hazardous chemicals after watching her mom forget to put the gas cap back onto the car.
- 2005 - At the age of 10, Taylor Hernandez invented "Magic Sponge Blocks," large building blocks made from sponge that can safely stack high without worry that they could fall and hurt a child.



Inventing is a creative process so you do not have to follow any rules. Instead, follow the ones that help you create and improve your invention and limit the ones that slow you down or prevent you from completing your invention. Take the steps in any order that makes sense for you and your invention - don't be afraid to skip a step, go back to a previous step, or repeat a step.

If you make a mistake or something fails, don't worry! All inventors have setbacks, but the successful ones learn from their mistakes to move forward and eventually succeed.

In 1968, Dr. Spence Silver was trying to create super-strong glue, but instead, he made a very weak adhesive that wouldn't

permanently stick. Six years later, another researcher at his company was looking for a way to stick book-marks into a book without damaging the paper. He discovered that Dr. Silver's weak glue was perfect for his needs, turning what was thought to be a failure into a top-selling office supply - the PostIt™ Note.

So, if you get stuck, take a step back, look over what you've done, and don't be afraid to move into a new direction.

REMEMBER, THE MOST IMPORTANT THING WHEN INVENTING IS TO HAVE FUN!



*Finally, give your idea a name – you can change it later, but it helps to keep you motivated and brings your idea more to life once it has a cool name!*

What do you do if none of the solutions you brainstormed are within your abilities? You can either brainstorm more solutions (maybe with some other people to help you come up with ideas) or even go back to your list of problems and choose a different one. There is nothing wrong with this – inventors often have ideas they put off until later or never manage to build. Even Thomas Edison, for all of his patents, still had many ideas he never created.

## STEP 2: MAKE A PLAN

### DO RESEARCH

Research is an important part of the invention process. A good inventor is well-informed about what they are inventing. Research is also important when it comes to developing your model or prototype, which you'll do in the third step. 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!



#### THERE ARE TWO KEY THINGS YOU NEED TO RESEARCH:

1. *Has anyone already made your invention*
2. *Important information to understand the problem and to help you plan your invention*

You must do the research to make sure someone has not already claimed the patent for your idea or something very close to it. A patent is a legal document saying that you own an invention. If you make an invention that is already patented, it is called infringement. Infringement means you are stealing someone else's work and claiming it as your own. Even if it is unintentional, infringement is wrong and

illegal. You can determine if an invention already exists by searching the website of the United States Patent and Trademark Office ([www.uspto.gov](http://www.uspto.gov)) or you can use search engines such as Google™.

Once you're sure your idea hasn't already been created, go ahead and make a list of questions you have and topics related to your invention. Make sure to put this list in your Inventor's Log.

### APPLY THE RESEARCH

Write down a list of the important facts you learned in your Inventor's Log. Consider each one as you think about your problem and possible solutions.

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

Frank Epperson is a good example of someone who successfully applied research to his invention. In 1905, when he was 11 years old, Frank accidentally left his soda on the porch overnight. When he found it the following morning, it had been frozen by the weather and this is how he got the idea of a frozen, flavored treat. However, there weren't freezers in the home at the time, so Frank spent years researching about how things freeze and doing lots of experiments. Eventually, he invented a machine and process by which he could quickly freeze flavored syrup to create the Popsicle.

## STEP 3: BUILD A MODEL

Now that you have an idea and completed your research, you're ready to begin building your first model. Before starting, try to find a place to set up a workshop: a safe space where you can keep all your materials and tools used to build and test your invention. Once you have your space, review all your research and begin with a sketch or drawing of your invention in your Inventor's Log. You don't have to be an artist and the drawing doesn't have to be complicated. The important thing is that your sketch illustrates your idea clearly and that it is easy to understand.

**THERE ARE TWO MAJOR TYPES OF MODELS THAT ARE BUILT FOR INVENTIONS - FUNCTIONAL AND CONCEPTUAL:**

### Functional Models

Many invention models are working versions of the invention. These models are early versions, or prototypes, of the final invention. They are used to test the design and the materials used in order to refine the invention before the final product is built.

### Conceptual Models

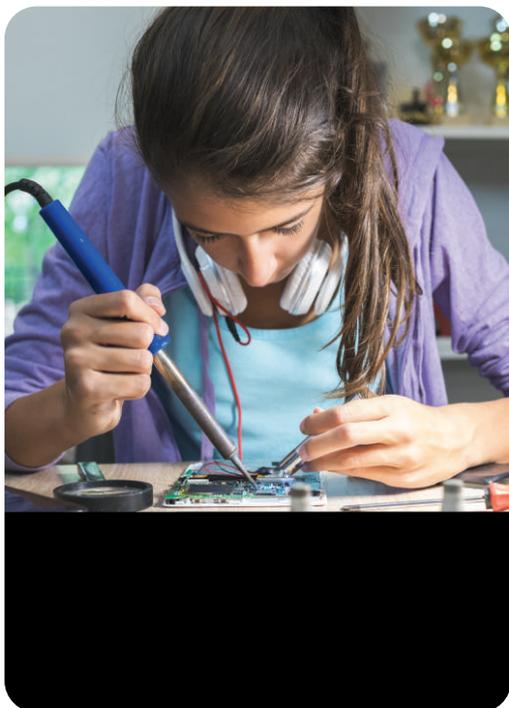
Not all models of inventions are meant to be working models. Some models are intended as a way of illustrating the idea. Often, this is done when an idea is too large or expensive to do in full-scale. Another reason may be that to test the invention would be unsafe, too expensive, or simply not possible in full-scale. For example, if your invention is a new type of roof that can withstand hurricane winds, you wouldn't build a full scale house and roof when you are just starting the invention process.

*Think about which type of model will be best for your invention.*

As you build, you may think of other ideas for the design; be sure to write them down in your Inventor's Log. You may also realize that your initial sketch for your idea won't work. If that happens, think about it some more and then make the changes to your model. Make sure to record your changes in your Inventor's Log. When you're all done, look at your creation and think if there are any other changes you feel are needed before you begin your testing.

## STEP 4: TEST THE MODEL

This is one of the most essential steps in inventing, as this is where you learn what you need to do to make your model/invention work. Often, you will cycle between building and testing models while developing your final invention. Each test you conduct tells you more about the invention and changes that you need to make. Perseverance, determination and tenacity are important qualities of an inventor! Make sure to record all your data in your Inventor's Log along with any changes you choose to make to your invention. Get stuck? Ask family members and friends to help you test. Sometimes if there's a problem, they will be able to see things that you might miss - take advantage of fresh eyes!



JUST AS THERE ARE TWO MAJOR TYPES OF MODELS, EACH MODEL IS TESTED DIFFERENTLY:

## Functional Testing

When conducting functional tests, you want to make sure that your invention does what you intended and that it does it consistently. This step is also where materials are tested; your invention may work once but the material you have chosen might not stand up to a second try or it just might not be the best material for the job. There is often a great deal of testing, tinkering, and retesting in the invention process, so don't get discouraged. Have fun with the process! When Thomas Edison was creating the light bulb, he was once asked if he had failed because he didn't have results despite all his tests. He replied, "Results? I have gotten a lot of results. I know several thousand things that won't work." Edison was also quoted as saying that "genius is one percent inspiration and ninety-nine percent perspiration," meaning that the idea is just the beginning, you need to put in a lot of work to be a successful inventor.

## Conceptual Testing

When testing conceptual models, the goal is to see if others understand your invention and how it is supposed to work. This is when you'll need to enlist the help of friends or family. They should look at the model and offer suggestions on changes you can make to better illustrate your invention's purpose. The most important part of conceptual testing is to listen to their comments—they are telling you what they perceive, which is often different from what you see—do not get defensive about your model. Take their comments and use them to create a final model that everyone can understand!

# STEP 5: FINALIZE YOUR INVENTION

*This is it!* Go back, review all your tests and observations, check over all the modifications you've made to your inventions, and make sure everything makes sense. Once all that is done, go ahead and put on your final touches to make your inventions your own: add decorations or color, give it a final name.

## *For More on Inventing, Check Out These Books!*

**ELECTRIC MISCHIEF: (Battery-Powered Gadgets Kids Can Build by Alan Bartholomew)**

Ever had an itch you can't scratch or had to eat your dinner during a blackout? Now you can tackle these pesky problems with your own electric backscratcher or illuminated fork! With lots of ideas that build on the basics, this book will make you a gizmo wiz.

**Put a Fan in Your Hat! Inventions, Contraptions, & Gadgets Kids Can Build by Robert Carrow**

Besides providing 12 ultra-neat projects such as a battery-operated, air-conditioned hat to keep them cool in the summer, this book encourages children to invent their own contraptions.

**Kids Inventing! A Handbook for Young Inventors by Susan Casey**

You'll meet inspiring kids just like you who designed their own award-winning inventions. Discover how exciting it can be to rethink the world around you, solve problems, and surprise and delight others with the results. Anything's possible with Kids Inventing!

**The Kids' Invention Book by Arlene Erlbach**

The stories of twelve kid inventors. Erlbach uses the success of 15-year-old Chester Greenwood, who invented earmuffs in 1873, as the takeoff point for introducing more than a dozen contemporary children who have created their own inventions. Each double-page spread profiles one child and his or her invention, some of which have won national recognition in inventors' contests.

## **MISTAKES THAT WORKED: (40 Familiar Inventions and How They Came to Be by Charlotte Foltz Jones)**

Presents the stories behind forty things that were invented or named by accident, including aspirin, X-rays, frisbees, silly putty, and velcro.

## **MARGARET KNIGHT: (Girl Inventor by Marlene Targ Brill, Joanne Friar)**

Knight was interested in how things worked and in building and inventing. This picture book tells the story of how she came up with the idea to make a safer loom at age 12.

## **POPULAR MECHANICS FOR KIDS: (Make Amazing Toy and Game Gadgets by Amy Pinchuk)**

Children learn how to build five toys and games by using inexpensive, easy to find tools. Provides easy-to-follow instructions for creating a light box, blinking jewelry, spy camera, and other electric gadgets. With the depth and accuracy you expect from Popular Mechanics for Kids, this lively activity book is any budding engineer's delight!

## **So You Want to Be An Inventor? by Judith St. George, David Small**

Are you a kid who likes to tinker with machines that clink and clank, levers that pull, bells that ring, cogs that grind, switches that turn on and off, wires that vibrate, dials that spin? You maybe inspired by what other inventors have accomplished.

## **GIRLS THINK OF EVERYTHING: (Stories of Ingenious Inventions by Women by Catherine Thimmesh)**

Tells the story of how women throughout the ages have responded to situations confronting them in daily life by inventing such items as correction fluid, space helmets, and disposable diapers.

## **Brainstorm!: The Stories of Twenty American Kid Inventors by Tom Tucker**

Tom Tucker reveals some of the amazing inventions of the past and present that have come from young Americans, ages eight to 19. The achievements of some of the kid inventors gathered here were prominent once but have become obscure over time; others are relatively unknown.

## **THE KID WHO INVENTED THE POPSICLE: (And Other Surprising Stories About Inventions by Don L. Wulffson)**

Brief factual stories about how various familiar things were invented, many by accident, from animal crackers to the zipper.

## ***For More on Inventing, Check Out These Websites!***

### **BY KIDS FOR KIDS: ([www.bkfk.com](http://www.bkfk.com))**

By Kids for Kids' website gives children information about the process of inventing, examples of other inventors (kids and adults), and tools to help children explore their invention ideas. Children are invited to join the online Kids Club where they have access to hundreds of articles and other valuable resources. Parents, teachers, and mentors can also register with the website to help children in creating their own inventions.

### **BUILD IT FOR YOURSELF: ([www.build-it-yourself.com](http://www.build-it-yourself.com))**

Build it for Yourself inspires children to use their creativity to build various projects. These projects include robots, puppets, and dream houses. Parents, teachers, and students collaborate in the construction of these projects. Through this collaborative process, children learn valuable lessons in problem solving, team work, and how to apply technology in "real- world" situations.

### **INVENTION DIMENSION: ([web.mit.edu/invent/invent-main.html](http://web.mit.edu/invent/invent-main.html))**

Invention Dimension is a fun-filled and at times wacky approach to making learning about invention exciting for the kid in all of us. Have some fun with invention games and explore the wealth of inventor and invention resources, including inventor profiles and patent guidelines.

### **INVENT NOW:** ([www.invent.org/index.asp](http://www.invent.org/index.asp))

Invent Now brings to the world a wide range of programs, places, content and other experiences. Everything offered celebrates and fosters the spirit and practice of invention.

### **UNITED STATES PATENT AND TRADEMARK OFFICE'S (FOR KIDS):** ([www.uspto.gov/go/kids](http://www.uspto.gov/go/kids))

Kids who want to be inventors or just want to know more about inventors and intellectual property can find lots of interesting information here and some great games!

### **ABOUT INVENTORS:** ([inventors.about.com](http://inventors.about.com))

This website is an excellent source that includes many aspects of invention. It provides an insight into recent inventors, inventions of the year, and inventors who are kids. There are also resources and articles pertaining to inventors and links to other sites to continue learning about inventions.

### **INVENTOR ED:** ([www.inventored.org/k-12](http://www.inventored.org/k-12))

Aimed directly at kids, InventorEd provides several topics on inventing from the History of Inventing to Inventing Safely. Other links lead to school invention sites and links contributed by educators.

### **ACADEMY OF APPLIED SCIENCE:** ([www.aas-world.org](http://www.aas-world.org))

The Academy is recognized nationally as an educational resource center offering enrichment programs for students, and professional development for teachers and educational administrators.

### **PARTNERSHIP FOR AMERICA'S FUTURE, INC:** ([nmoe.org/competitions.htm](http://nmoe.org/competitions.htm))

An eagerness to continue learning, without a teacher's prodding, has characterized those students who have participated in the Partnership's programs. In this way, students have become convinced that education is valuable; and when students believe that education is valuable, then they will value their education.

### **Celebrating the Achievements of Children:** ([www.amazingkids.com](http://www.amazingkids.com))

Amazing Kids! is dedicated to inspiring excellence in children. They base this mission on the belief that every child has the potential to be "amazing" in her or his own way. They believe it is through the realization of this potential that children will be able to live more productive and satisfying lives.

### **BIG LEARNING:** ([www.biglearning.com](http://www.biglearning.com))

This site exists to contribute resources for big learners and promote big learning as a valid way for kids to learn. So explore the treasure troves, check out the links, sign up for the newsletter, and go have fun learning something!

### **THE KIDS HALL OF FAME:** ([www.thekidshalloffame.com](http://www.thekidshalloffame.com))

Spotlight on the famous and the soon-to-be famous kids throughout the world by age level (up to age 19). View the archive of their accomplishments. These children are positive peer role models for all kids.

### **EXPLORAVISION AWARDS:** ([www.exploravision.org](http://www.exploravision.org))

ExploraVision is a competition for students of all interest, skill, and ability levels in grades K-12. The purpose of the competition is to encourage students to combine their imaginations with the tools of science to create and explore a vision of a future technology.

## WHAT NEXT?

YIAA holds the Young Inventors Showcase (YIS) every Spring in Houston, TX and we welcome all kids and inventions. It does not matter if you attended a YIAA endorsed school program or you have just invented something in your free time.

We would love for you to join us and show-off all your hard work!

To learn more, go online to <https://yiaa.org/young-inventors-showcase> or contact us at [info@yiaa.org](mailto:info@yiaa.org).

***We look forward to seeing you next Spring!***

# INVENTOR'S LOG

Name:	Date:
Notes:	

Diagrams:

Inventor's Signature: \_\_\_\_\_

Witnessed by \_\_\_\_\_ on \_\_\_\_\_



## YOUNG INVENTOR'S ASSOCIATION OF AMERICA

*Empowering the world's next inventors*

### Get In Touch

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