

EDUCATOR'S GUIDE

to

Inventor's Guide

*Teacher/Parent/Guardian: _____

School/Organization: _____

Grade(s): _____ Room #(s): _____

Start Date: _____, 2023

Due Date : _____, 2024

*Register INTENT to participate in WNY Invention Convention @ wnyic.zfairs.com

Dear Teacher/Parent/Guardian ,

The materials in the WNY Invention Convention *Guides* for educators and students work together to promote creative problem-solving, entrepreneurship, and innovation skills for youngsters to create inventions that solve real-world problems.

The project-based learning *Guides* support 21st Century and higher order thinking skills. They may be used in part or in their entirety. Students may get support from others, research and resources.

Begin the journey by reading the “Student Inventor” letter with your pupils. Next, support commitment and novelty with the “Statement of Originality”. After, explore the *7-Step Invention Process* for divergence (thinking of many ideas) and convergence (selecting best ideas). The sequence of steps will foster problem-solving strategies and communication. Finally, at the bottom of each page students add initials to encourage ownership and collaboration.

Plan a timeline that concludes with a school/home invention convention by working backwards from the registration date for the regional WNY Invention Convention. Combine your judgment with the needs and learning styles of your students to determine the most appropriate level for success throughout the *7-Step Invention Process*: **L-I** (Gr. K-3) and **L-II** (Gr. 4-8).

Differentiate lesson plans, time and activities throughout the *Guides*.

Students may work independently or in a team (max. 4 members), in school and at home. The *Guides* can be used with local and state curriculums, NYS NGLS, enrichment classes, Inventor’s Club, and/or other STEAM programs. Email info@wnykidsinvent.org for support.

Whether competing locally or supplementing your curriculum, have fun inventing and make this a memorable, life-long STEM experience.

Best regards,

The WNY Invention Convention Team and Education Committee



www.wnyinventionconvention.org / Facebook @ WNYInventionConvention

P.S. Hope to see you at the Regional WNYiC, April 28, 2024.



L-I and L-II

WNYiC Lesson Plan: INTRODUCTION

Teacher/Parent _____

Date(s) _____

AIM

Students will be able to define an invention, be introduced to the WNYiC *Inventor's Guide: My Invention Story*, and understand the commitment to and originality of the S.T.E.M. Challenge.

TIME MANAGEMENT

Whole Class, 2-4 Sessions, 40 minutes/lesson

MATERIALS

SmartBoard (SB)
Pencils/Paper
Student iPads/Tablets
Inventor's Guide: My Invention Story (copies or download)

MOTIVATION

Display and Tell: Lesson Objective with students.
Share details about the WNYiC S.T.E.M. Challenge.

Ask:

What is an invention?

Students brainstorm, write (paper or tablet) and share ideas in an idea map/web. Accept all reasonable answers. Teacher records ideas on SB within an idea-map/web.

Tell:

Every invention begins with an idea! Any new idea put to use/work is an invention.

Ask:

Why do we invent?

Students share ideas aloud. Students and the teacher add to idea-map/web.

Show:

L-I "Kid Inventors Tell All" [11.35 minutes]

<https://www.newyorker.com/video/watch/kid-inventors-tell-all> OR

"What Are Inventions?|Young Explorers - PBS LearningMedia [2.05 minutes]

<https://ny.pbslearningmedia.org/resource/af529161-155c-4d8f-be63-8f7da1e66d7e/what-are-inventions-young-explorers/>

L-II “Kid Inventors Tell All” [11.35 minutes]

<https://www.newyorker.com/video/watch/kid-inventors-tell-all> OR

“Episode 2: What is an Invention” 3-C The Creative Content Co. [6.21 minutes]

<https://www.youtube.com/watch?v=Flv7ttyeSkM>

Ask:

How did the inventions in the video solve real-world problems?

Are the inventions from new ideas or improvements on existing objects?

Analyze similarities and differences between an invention and innovation.

PROCEDURE Allow time!

Distribute: WNYiC *Inventor’s Guide: My Invention Story* (copies or download).

Together read, write, discuss, Q&A...

- Cover
- Letter “Dear Student Inventor” Page 1
- Students choose to work independently or with a team of 2-4 members.
Allow time for team-member selections!
- “STATEMENT OF ORIGINALITY AND AUTHENTICITY” Page 2
- Initial lower right-hand pages as completed

SUMMATION

EXIT SLIP: Students write a response to a task on paper or post in a chat room online. Encourage bulleting ideas so the teacher can quickly assess students’ understanding.

Task:

Name an invention that you’ve used today.

What problem does it solve?

Pros/cons of invention?

HOMEWORK

Students share and review with parents the *Inventor’s Guide: My Invention*

Story :

- Letter “Dear Student Inventor” Page 1
- “STATEMENT OF ORIGINALITY AND AUTHENTICITY” Page 2
- Students identify preference to invent independently or with members.
List classmates’ names if a team effort is preferred. Parent/Guardian needs to approve participation in a team, since much work will be at home.
Parent signs and dates for approval.
- Return *Inventor’s Guide* to next class.

EXTENSION

Students can research inventions around their home or school. Record inventor, problem solved, and how the invention helps others or improves quality of life?

Positive/negative effects on lives and environment?

Type of patent on invention (if any)? Add to a bulletin board display.

COORDINATES

ELA: <https://childrenslibrarylady.com/teaching-stem-inventors-books/>
<https://www.scholastic.com/parents/books-and-reading/raise-a-reader-blog/7-books-to-inspire-young-inventors.html>

Art:

<https://www.artsy.net/article/artsy-editorial-9-inventions-revolutionized-artmaking-paint-tubes-neon>

Music: <https://www.youtube.com/watch?v=SHBBxtGDyHY>

P.E: <https://study.com/academy/lesson/technology-in-physical-education.html>

NYS NGLS LINKS

ELA:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/nys-next-generation-ela-standards.pdf>

Math:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/nys-next-generation-mathematics-p-12-standards.pdf>

Science:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/p-12-science-learning-standards.p>



L-I and L-II

WNYiC Lesson Plan: THEME

7-Step Invention Process

Teacher/Parent _____

Date(s) _____

AIM

Students will be able to comprehend, analyze and apply the *7-Step Invention Process* to a real-world problem using the *Inventor's Guide*.

TIME MANAGEMENT

Whole Class, Individual and Teams, 3 Sessions, 40 minutes/lesson

MATERIALS

SmartBoard (SB)

Pencils/Paper

Student iPads/Tablets

Inventor's Guide: My Invention Story (copies or download)

MANAGEMENT Allow time!

Students need to organize and re-seat themselves according to their preferred effort for inventing: independent or team.

Teacher reviews each *Inventor's Guide: My Invention Story* for homework completed on Page 2 "STATEMENT OF ORIGINALITY AND AUTHENTICITY".

- Parent signature (approval).
- If inventing in a team, members must approve and sign each other's *Guide*.
- When a teacher approves independent or team effort, teacher signs *Guide*.
- Incomplete or unsigned *Guide* will be managed as per teacher's discretion.

MOTIVATION

Display and Tell: Lesson Objective with students.

Ask:

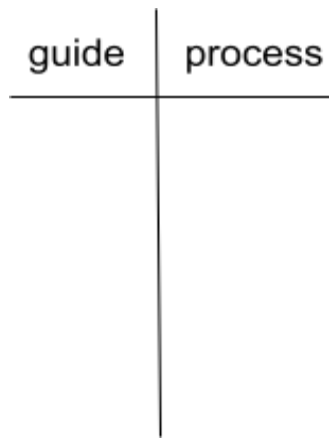
What is a guide?

What does it mean to guide? Who has guided you?

Explain a process? Synonyms?

How is brushing your teeth or searching a topic on google, a process?

Students share ideas aloud while the teacher records key ideas in a T-chart on SmartBoard. Discuss: compare and contrast ideas.



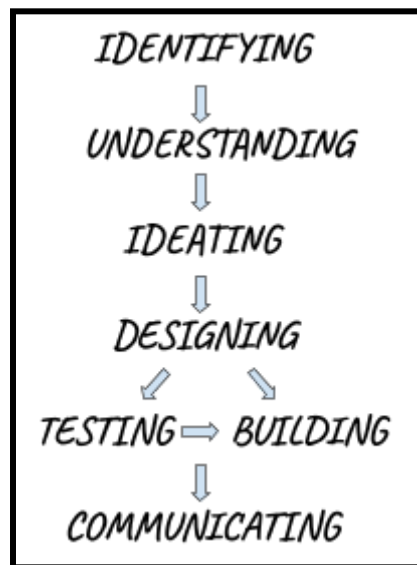
Tell:

A guide shows or directs the way for others and the path of action toward a goal, while a process is the steps taken to get to that goal.

The WNYiC *Inventor's Guide* will show you how following 7 steps can lead to a successful invention.

PROCEDURE **Briskly!**

Teacher guides the whole class through analysis of the *Inventor's Guide 7-Step Invention Process* (copies or download) on Page 3, while students work independently or in teams. Display or reproduce this diagram to allow teacher &/or students' note-taking. Adapt to grade level as needed.



Step 1 IDENTIFYING: Teacher identifies a problem that needs solving; e.g. can't water the plants (home or garden) while on vacation. [If more time permits, allow students to brainstorm a problem that needs to be solved or improved.] This problem will be carried throughout each step.

Step 2 UNDERSTANDING: With empathy, help students better understand the cause & effect of the problem from *Step 1*.

Ask: Who else has the problem?

How do you/they feel about the problem and why?

Wouldn't it be nice if...?

Step 3 IDEATING: Allow students to brainstorm ideas to solve the problem from *Step 1*.

Let the students share their one (1) best idea to solve the problem.

Class votes on favorite solution.

STEP 4 DESIGNING: Each student inventor, whether working independently or in a team, sketches a *design* for the solution/model/prototype for the problem from *Step 1*.

Step 5 BUILDING and Step 6 TESTING: Briefly discuss potential materials, sequence, people, resources, and concerns needed to build and test model from *Step 4*. (Change can be good.)

Step 7 COMMUNICATION: Think of a fun and witty name for invention from *Steps 5 and 6*. [If time permits, individuals or teams share highlights of how invention solves the problem and the process to create this invention.]

SUMMATION

- L-I** CHECK FOR UNDERSTANDING: Teacher asks students questions about today's lesson, e.g. *How many steps in the invention process?*
- L-II** WHAT'S THAT STEP?: Teacher says key words or synonyms, and students work backwards with *Inventor's Guide* Page 3 to identify the step from the invention process :
 - plan, create model (prototype) ----> *Step 5*
 - sketch, label, draw model (prototype) ----> *Step 4*
 - bugs me, annoying ----> *Step 1*
 - brainstorm ideas to solve problem ----> *Step 3*
 - name, share, explain process, display ----> *Step 7*

- understand problem, cause & effect ----> *Step 2*
- tryout, assess, change, retest ----> *Step 6*

3. Inventors initial lower right-hand corner on Page 3 of *Guide*.

HOMEWORK

Inventor's Guide: My Invention Story Pages 1 and 2: Students who need to share, review and get necessary parent signature must return to the teacher next class.

L-I and **L-II** Examine resource: GLOSSARY OF WORDS Pages 18-20.

EXTENSION

Students can use Powerpoint, Nearpod, Canva, Prezi... to create their own, new and unique flowchart of the *7-Step Invention Process*. Share with class or add to a bulletin board display.

COORDINATES

ELA & Science: Students can write letters to living inventors and tell them about the WNYiC S.T.E.M. Challenge. Mail or email for correspondence.

Art: Students talk with an art teacher to get pointers on sketching techniques.

Music: Students select inspirational music for inventing and to foster creativity.

Social Studies: Research inventors in your hometown or in your favorite city/country/continent.

NYS NGLS LINKS

ELA:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/nys-next-generation-ela-standards.pdf>

Math:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/nys-next-generation-mathematics-p-12-standards.pdf>

Science:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/p-12-science-learning-standards.pdf>



L-I and L-II

WNYiC Lesson Plan: Step 1 IDENTIFYING ~ Choose a Problem

Teacher/Parent _____

Date(s) _____

AIM

Students will be able to define a problem or *pet peeve*, brainstorm (divergent thinking) everyday problems, and identify/choose (convergent thinking) a real-world problem for their invention; *Step 1 of Invention Process* from *Inventor's Guide*.

TIME MANAGEMENT

Whole Class, Individual and Teams, 2 Sessions, 40 minutes/lesson

MATERIALS

SmartBoard (SB)

Pencils/Paper/Coloring Media

Student iPads/Tablets

Inventor's Guide: My Invention Story (copies or download)

MOTIVATION

Display and Tell: Lesson Objective with students.

Ask:

What is a problem? *Pet peeve*?

Give examples of everyday problems or pet peeves at home, school, play, etc.

Name things that bug or bother you.

How does an invention solve a problem?

Tell:

A problem or *pet peeve* is a matter that can be solved; may annoy or bother someone; a situation that needs improvement.

Brainstorming problems is thinking of lots of ideas without holding back.

Choosing a problem to solve is the 1st step in the invention process.

PROCEDURE

1. Teacher circulates around class to facilitate *Step 1 of Invention Process* from *Inventor's Guide: My Invention Story*.

2. Introduce, explain and practice the rules of Brainstorming on Page 7 *Inventor's Guide*, with students. For younger students, make-up hand gestures that go along with each rule.
3. Diverge - *Inventor's Guide*. Individually or in teams, students apply the Brainstorming rules to think of problems or *pet peeves*; **L-I** Page 4 or **L-II** Page 4a. .
4. Converge - *Inventor's Guide*. Individually or in teams, students choose/identify a problem to solve and sketch it with details and specifics; **L-I** and **L-II** Page 5.
5. Inventors initial lower right-hand corner of respective pages in *Inventor's Guide*.

SUMMATION

THINK-PAIR-SHARE: Individual students pair-up or teams answer a prompt for a Ticket to Leave.

Ask:

In a sentence or two, share your problem or *pet peeve* from today's lesson that may turn into an invention.

Show: Students who can identify with that problem or *pet peeve*, snap their fingers in agreement.

HOMEWORK

Inventor's Guide: My Invention Story Pages 1 and 2: Students who still need to share, review and get necessary parent signatures must return to teacher ASAP.

L-I and **L-II** Review resource: GLOSSARY OF WORDS Pages 18-20.

EXTENSION

Play "I Spy a Problem". Students take 30 minutes to walk around their homes, recording problems or *pet peeves* they, friends and/or family members experience or wish could be solved. Students can share their findings and feelings, and that of others, on a shared drive and/or as part of an online meeting.

COORDINATES

ELA: Write an acrostic poem using each first letter in the word PROBLEM and the Brainstorming rules.

Math: Find at least three (3) different ways to solve a math word problem. Show and check your work.

Art: Use your iPad to take pictures of problems or *pet peeves* in your environment.

Science: The problem with finding truly random numbers in human society.
<https://www.youtube.com/watch?v=ZNyMzSIHI7E>

Social Studies: Using AI (Chat GPT) to research the top three (3) global problems.

NYS NGLS LINKS

ELA:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/nys-next-generation-ela-standards.pdf>

Math:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/nys-next-generation-mathematics-p-12-standards.pdf>

Science:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/p-12-science-learning-standards.pdf>



L-I

and

L-II

WNYiC Lesson Plan: Step 2

UNDERSTANDING ~ Know Cause & Effect of Problem

Teacher/Parent _____

Date(s) _____

AIM

Students will be able to discover, describe and connect the cause and effect of their problem; *Step 2 of Invention Process* from *Inventor's Guide*.

TIME MANAGEMENT

Whole Class, Individual and Teams, 1 Session, 40 minutes/lesson

MATERIALS

SmartBoard (SB)

Pencils/Paper

Student iPads/Tablets

Inventor's Guide: My Invention Story (copies or download)

MOTIVATION

Display and Tell: Lesson Objective with students.

Ask:

How do cause and effect go together?

What is the relationship between cause and effect?

Show:

L-I "Cause and Effect" | English for Kids | Mind Blooming [2.34 minutes]

<https://www.youtube.com/watch?v=T7uq3g0TVpU>

L-II "What is Cause and Effect | Explained in 2 Minutes [2.22 minutes]

<https://www.youtube.com/watch?v=KRVgOn27c4k>

Tell:

Key words ~ When, since, if, because something happens...then, thus, so, therefore, there is an effect or result.

Cause = reason why something happens

Effect = the result of what happened

Tell:

Understanding the cause and effect of a problem is the 2nd step in the invention process.

PROCEDURE

1. Teacher facilitates *Step 2 of Invention Process* from *Inventor's Guide: My Invention Story*.
2. Individual inventors or teams: **L-I** Page 6 or **L-II** Page 6a.
3. Save the sketch portion for homework.
4. Inventors initial lower right-hand corner of respective pages in *Inventor's Guide*.

SUMMATION

CHECK FOR UNDERSTANDING: Teacher says a cause or effect of real-world problems. Students in-turn make connections by stating effects or causes for each problem. Accept reasonable answers that show relationships.

e.g. TEACHER: When/Since/If/Because my taco shells breaks apart... (cause)

STUDENT: The result is the filling within the shell falls out and it's messy to eat. (effect)

e.g. TEACHER: Therefore, I'm late for school/work. (effect)

STUDENT: When/Since/If/Because I'm sound asleep and can't hear my alarm. (result)

HOMEWORK

Inventor's Guide: My Invention Story **L-I** Page 6: Sketch at bottom or **L-II** Page 6a. sketch on back. Use pencil, colored media, or tablet's drawing tools.

EXTENSION

L-I Read, enjoy and make cause and effect connections with Laura Numeroff and Felicia Bond's books:

If You Give a Mouse a Cookie

If You Take a Mouse to School

If You give a Cat a Cupcake

If You Give a Pig a Pancake

If you Give a Pig a Party

If You Give a Moose a Muffin

L-II Cause and Effect Chains

<https://theowlteacher.com/not-your-traditional-cause-and-effect/>

COORDINATES

ELA: <https://teachingwithamountainview.com/using-pictures-to-teach-reading-and/>

Math: <https://jeopardylabs.com/play/cause-and-effect>

Art: <https://www.readwritethink.org/classroom-resources/lesson-plans/engaging-cause-effect>

Music: <https://bookunitsteacher.com/wp/?p=4105>

Science: <https://alyssateaches.com/cause-and-effect-activities-in-science/>

Social Studies:

<https://www.teacherspayteachers.com/Product/Cause-and-Effect-Famous-Americans-Task-Cards-Cause-and-Effect-Game-1150057>

NYS NGLS LINKS

ELA:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/nys-next-generation-ela-standards.pdf>

Math:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/nys-next-generation-mathematics-p-12-standards.pdf>

Science:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/p-12-science-learning-standards.pdf>



L-I and L-II

WNYiC Lesson Plan: Step 3

IDEATING ~ Brainstorm Best Idea to Solve Problem

Teacher/Parent _____

Date(s) _____

AIM

Students will be able to apply Brainstorming rules in order to think divergently of many ideas to solve their problem; think convergently to choose and defend the best idea to solve their problem; *Step 3 of Invention Process* from *Inventor's Guide*.

TIME MANAGEMENT

Whole Class, Individual and Teams, 1-2 Sessions, 40 minutes/lesson

MATERIALS

SmartBoard (SB)

Pencils/Paper/Coloring Media

Student iPads/Tablets

Inventor's Guide: My Invention Story (copies or download)

MOTIVATION

Display and Tell: Lesson Objective with students.

Ask:

How did the rules of Brainstorming in Step 1 help you choose a problem to solve?

Tell:

We know that brainstorming is thinking of many ideas while not judging the value of the ideas. Ideate is just a fancy way of saying brainstorming.

Show:

Reintroduce and practice the Brainstorming Rules on Page 7 from *Inventor's Guide*.

Tell:

Brainstorming the best idea to solve a problem is the 3rd step in the invention process. Let the ideating begin!

PROCEDURE

1. Teacher supports students with *Step 3 of Invention Process* from *Inventor's Guide: My Invention Story*.
2. Individual inventors or teams begin: **L-I** Page 8 or **L-II** Page 8a.
3. Then, allow students time (15 minutes) to move about the classroom to share and get help with their ideas about their problem and solution with **L-I** Page 8 or **L-II** Page 8a. and Page 9. Encourage communication, task-commitment and inside voices.
4. Only **L-II** inventors record interviews with classmates or others on Page 9.
5. Inventors initial lower right-hand corner of respective pages in *Inventor's Guide*.

SUMMATION

THUMBS UP-SIDE-DOWN: Teacher asks students to use a thumb to signal their depth of confidence in their solution to their problem. Students place crossed-arms on the table top with head down on arms. No peeking! A thumbs-up means "I really like how my solution solves my problem". Thumb to side means "I'm ok with the solution to my problem but it needs tweaking", and a thumbs-down means "I don't like my solution to my problem but will explore better options". Teacher asks students to evaluate and notes those who may be struggling and/or any "a-ha" moments .

HOMEWORK

Inventor's Guide: My Invention Story **L-I** Page 10 or **L-II** Page 10a.: Research from home and in the community, along with help from different resources (parents, team members, other adults/classmates, internet, stores), to determine if the solution to the problem is original. Assess the pros and cons of the solution. Add to or modify classwork as needed on **L-I** Page 8 or **L-II** Page 8a. & 9.

EXTENSION

Interview an expert in your community who knows more about your problem and solution. Gain knowledge as to how better to solve your problem. Record a short interview with this professional on your iPad that you can share with your classmates or invite this mentor to talk with your class.

COORDINATES

ELA: Analyze how a character in a story may have solved a problem better had they used some of the steps in your invention process.

Math: Differentiate and justify how many ways there may be to solve a word problem and still come up with the same answer. Value different perspectives. Favorite or preferred method for solving the word problem?

Art: Look at drawing an object from a new and different point of view. In the end how is the drawing of the same object perceived by different perspectives?

Music: Listen to music from Vivaldi's "Four Seasons". What problem does Vivaldi solve by composing different tempos (e.g. allegro, andante, adagio...) of music to represent different seasons?

Social Studies: How have people around the world solved the problem of meeting the needs of survival when settling an area?

NYS NGLS LINKS

ELA:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/nys-next-generation-ela-standards.pdf>

Math:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/nys-next-generation-mathematics-p-12-standards.pdf>

Science:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/p-12-science-learning-standards.pdf>



L-I and L-II

WNYiC Lesson Plan: Step 4

DESIGNING ~ Deciding Invention Solution for Problem

Teacher/Parent _____

Date(s) _____

AIM

Students will be able to design their solution for their problem; apply researched information to support the design; create a detailed image of the prototype (model) for the invention; *Step 4 of Invention Process* from *Inventor's Guide*.

TIME MANAGEMENT

Whole Class, Individual and Teams, 1 Session, 40 minutes/lesson

MATERIALS

SmartBoard (SB)

Post-It/Sticky Notes

Pencils/Paper/Coloring Media

Student iPads/Tablets

Inventor's Guide: My Invention Story (copies or download)

MOTIVATION

Display and Tell: Lesson Objective with students.

Share:

To promote convergent thinking, teachers give each individual student or team one (1) Post It/Sticky Note on which to write a key idea or pro/con about their invention from their research. Students refer back to Step 3 in their *Inventor's Guide*. Students produce a map of Sticky Note key ideas on SmartBoard/wall/online to share information. Discuss how these key ideas support the invention's design and its solution.

Tell:

Deciding the best solution to solve a problem and its design is the 4th step in the invention process.

PROCEDURE

1. Teacher supports students with *Step 4 of Invention Process* from *Inventor's Guide: My Invention Story*.
2. Individual inventors or teams: **L-I** Page 11 or **L-II** Page 11a. Write, draw, label, and color the solution to their problem. Decide on the best design for their invention prototype (model).

3. Brainstorm a temporary name for the invention prototype (model).
4. Inventors initial lower right-hand corner of respective pages in *Inventor's Guide*.

SUMMATION

DESIGN FLASH: Teacher counts 1, 2, 3 and then students hold-up and show the teacher and classmates their design prototype (model) for their invention on **L-I** Page 11 or **L-II** Page 11a. Teacher does a quick sweep and gives a constructive comment to individuals or teams before students put the *Inventor's Guide* away (hardcopy or tablet). Teacher pulls any students together that need more support and re-teaches.

HOMEWORK

Inventor's Guide: My Invention Story **L-I** Page 11 or **L-II** Page 11a.: Modify, change, add to, or delete the design for the invention prototype. Make your design the way you want it!

EXTENSION

"It's All About Prototypes (There's Got To Be a Better Way - E 3)" [4.47 minutes]
<https://www.youtube.com/watch?v=8KVGDQJJzAU>

COORDINATES

ELA, Math, Art, P. E., Science, Soc. St.:

Establish a collection of books in your classroom, school library or at home where children can experience how engineers use [design-based thinking](#) and creativity to solve problems. Develop an appreciation for inventions and innovative solutions of everyday objects, across cultures and areas of study.

<https://news.txst.edu/the-conversation/2021/childrens-books-that-teach-valuable-engineering-lessons.html>

Music:

<https://www.booknerdmommy.com/10-fantastic-picture-books-and-reference-books-about-music-and-instruments-for-kids/>

NYS NGLS LINKS

ELA:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/nys-next-generation-ela-standards.pdf>

Math:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/nys-next-generation-mathematics-p-12-standards.pdf>

Science:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/p-12-science-learning-standards.pdf>



L-I and L-II

WNYiC Lesson Plan: Step 5

BUILDING ~ Plan & Create Prototype Invention Solution (Model)

Teacher/Parent _____

Date(s) _____

AIM

Students will be able to develop a plan to build an invention prototype from their design drawing; identify and gather materials to build the invention prototype; embrace the help and feedback of others when creating the invention prototype;

Step 5 of Invention Process from Inventor's Guide.

TIME MANAGEMENT

Whole Class, Individual and Teams, 1-2 Sessions, 40 minutes/lesson + Unlimited Home Hours

MATERIALS

SmartBoard (SB)

Pencils/Paper

Student iPads/Tablets

Inventor's Guide: My Invention Story (copies or download)

FROM HOME: Materials to create invention prototype (found, repurposed, borrowed, recycled, reused, and/or purchased-\$25 or less overall)

MOTIVATION

Display and Tell: Lesson Objective with students.

Tell:

You and/or your team will turn your drawing from **L-I** Page 11 or **L-II** Page 11a. in your *Inventor's Guide* into a 3D model or prototype.

- Prototypes do not have to work, but will need to represent the invention's design of solving the problem.
- Planning will make building easier and a more rewarding experience.
- Any materials used to create your invention prototype, whether found, borrowed, recycled, reused, and/or purchased (\$25 or less overall), should be recorded in Step 5 of your *Inventor's Guide*.
- Get help from adults at home when collecting materials and assembling your model.
- Building the invention prototype will be done at home.

Show:

"How to Make a Cardboard Prototype" [2.02 minutes]

https://www.youtube.com/watch?v=k_9Q-KDSb9o

Ask:

What are some take-aways you will apply to building your prototype invention?

Tell:

Planning, building and creating the prototype (model) is the 5th step in the invention process.

PROCEDURE

1. Teacher supports students with *Step 5 of Invention Process* from *Inventor's Guide: My Invention Story*.
2. Students individually or in teams review their design for the invention prototype in *Inventor's Guide* **L-I** Page 11 or **L-II** Page 11a.
3. Review *Inventor's Guide* **L-I** Page 12 or **L-II** Page 12a. Allow Q&A time.
4. Brainstorm: Individual students or teams plan by drawing or writing key ideas, in a sequence, for building their prototypes.
 - a. Teams should divide work so that each member is putting forth effort and everyone is participating.
5. Once home, share step-by-step instructions with parents before gathering materials and creating inventions.
 - a. Get help from people outside of school with skills and abilities to assist.
 - b. Incorporate research when possible.
 - c. Ask questions throughout the building process.
 - d. Make changes often and as needed.
 - e. Spend some time trying out the prototype as you build.
 - f. Clean up as you build. Keep *Inventor's Guide* and prototype in a safe place.
6. Have FUN planning, collecting and building your invention model!
7. Educator should register INTENT to participate in WNYiC @ wnyic.zfairs.com during open registration dates.
8. Inventors initial lower right-hand corner of respective pages in *Inventor's Guide*.

SUMMATION

TRUE or FALSE: Teacher makes statements about today's lesson to check for understanding. Students infer as either true or false. If false, students correct statements with valid details.

e.g. Planning is an important part of the building process of your invention. [True]

e.g. Stick to the steps and materials brainstormed in class when building at home. [False; Change things often and as needed to make an invention prototype solve the problem the way you want.]

HOMWORK

Inventor's Guide **L-I** Page 12 or **L-II** Page 12a.: Share & modify notes from class for the step-by-step plan for building invention prototype. Spend some time trying out the prototype as you're creating. Make changes to your design plan or to step-by-step instructions, and record in Step 5. NOTE: There will be another step for the formal testing of prototypes. Talk with your parents about the project and how they can support the project at home.

EXTENSION

Reach out to an expert in your community, and share your prototype invention with that professional. Analyze your model with an AI solution. How does feedback from an expert compare/contrast to AI software?

COORDINATES

From The Henry Ford inHub/Archive of American Innovation, 15 videos of young inventors' prototypes are inspired by ELA, Math, Art, Music, P.E., Science, and Social Studies: <https://www.weareteachers.com/invention-videos-for-kids/>

NYS NGLS LINKS

ELA:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/nys-next-generation-ela-standards.pdf>

Math:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/nys-next-generation-mathematics-p-12-standards.pdf>

Science:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/p-12-science-learning-standards.pdf>



L-I and L-II

WNYiC Lesson Plan: Step 6

TESTING ~ Test and Redesign Invention Solution

Teacher/Parent _____

Date(s) _____

AIM

Students will be able to apply Edward deBono's Six Thinking Hats to modify their original design and materials based on testing in order to develop a successful invention; value the importance of testing and redesigning; test and redesign their prototype at home; *Step 6 of Invention Process* from *Inventor's Guide*.

TIME MANAGEMENT

Whole Class, Individual and Teams, 2 Sessions, 40 minutes/lesson + Unlimited Home Hours

MATERIALS

SmartBoard (SB)

Pencils/Paper

Student iPads/Tablets

Inventor's Guide: My Invention Story (copies or download)

AT HOME: Invention Prototype

MOTIVATION

Display and Tell: Lesson Objective with students.

Show:

"It's All About Prototypes (There's Got To Be a Better Way - E 3)" [4.47 minutes]

<https://www.youtube.com/watch?v=8KVGDQJJzAU>

Ask:

In what ways can testing and redesigning make your invention prototype better?

Tell:

Testing and redesigning the solution/prototype/model is the 6th step in the invention process.

PROCEDURE

1. Teacher supports students with *Step 6 of Invention Process* from *Inventor's Guide: My Invention Story*.
2. Review *Inventor's Guide* L-I Page 12 or L-II Page 13. Allow Q&A time.

3. Introduce **Edward deBono's Six Thinking Hats** in order to apply different perspectives (Hats) to improve and change an invention:



The White Hat:
calls for information known or needed.
"The facts, just the facts."



The Yellow Hat:
symbolizes brightness and optimism. You can explore the positives and probe for value and benefit



The Black Hat:
signifies caution and critical thinking - do not overuse! Why something may not work



The Green Hat:
focuses on creativity, possibilities, alternatives and new ideas. It is an opportunity to express new concepts and new perceptions - lateral thinking could be used here



The Blue Hat:
is used to manage the thinking process. It ensures that the 'Six Thinking Hats' guidelines are observed.



The Red Hat:
signifies feelings, hunches and intuition - the place where emotions are placed without explanation

4. Individual inventors or teams discuss and evaluate DeBono's Thinking Hats by looking at their invention from different points of view using the Hats. When they test their invention at home, they can anticipate making changes for an improved prototype: *Inventor's Guide* **L-I** Page 12 or **L-II** Page 13.
5. Inventors should repeat the testing and redesigning process at home until satisfied with how their invention solves their problem (Red Hat).
6. Inventors initial lower right-hand corner of respective pages in *Inventor's Guide*.

SUMMATION

REFLECT: In notes, *Inventor's Guide*, tablet, or aloud, finish this sentence starter: "It's okay to make changes to my invention prototype when testing because..."

HOMEWORK

Inventor's Guide **L-I** Page 12 or **L-II** Page 13.

Test, redesign and retest invention at home. Apply DeBono's Hats until you feel good about your invention!

L-I and **L-II** review resource: GLOSSARY OF WORDS Pages 18-20.

EXTENSION

Develop invention prototype and take it to market:

Innovation 101 Ep 6: Prototyping & Testing - Social Enterprises [4.23 minutes]

<https://www.youtube.com/watch?v=MKIKVe9CF-Y>

COORDINATES

ELA, Math, Art, Music, P.E, Science, Social Studies:

Apply Edward deBono's Six Thinking Hats across curricula and lessons.

<https://www.youtube.com/watch?v=UZ8vF8HRWE4>

NYS NGLS LINKS

ELA:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/nys-next-generation-ela-standards.pdf>

Math:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/nys-next-generation-mathematics-p-12-standards.pdf>

Science:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/p-12-science-learning-standards.pdf>



L-I and L-II

WNYiC Lesson Plan: Step 7

COMMUNICATION ~ Share Problem, Solution and Invention Process

Teacher/Parent _____

Date(s) _____

AIM

Students will be able to communicate their presentation both visually and orally to share their invention ideas: create a name and design an informative tri-fold display board, including but not limited to the problem, solution, invention process, support (people and resources), materials, and research. Students will decide visuals, original layout, and elements to best present their invention; *Step 7 of Invention Process* from *Inventor's Guide*.

TIME MANAGEMENT

Whole Class, Individual and Teams,
Multi-Session (Teacher determines amount of sessions needed.),
40 minutes/lesson + Unlimited Home Hours

MATERIALS

SmartBoard (SB)

Pencils/Paper

Student iPads/Tablets

Inventor's Guide: My Invention Story (copies or download)

Tri-fold Board

FROM HOME: Materials to create tri-fold display board (found, repurposed, borrowed, recycled, reused, and/or purchased)

MOTIVATION

Display and Tell: Lesson Objective with students.

SESSION 1

Tell:

Just like a product we buy in stores or online, it's important that your invention has a catchy, short, memorable, and easy-to-say-and-recall name. It should also describe your invention in some way. Know your audience.

Ask:

In notes or on your tablet, independently or in teams, brainstorm names of products you like. Think why you like these names or why they're easy to remember.

Share:

Students share their list of product names. Students can show 'silent jazz hands' (waving both hands by the shoulders/face silently) for applause and recognition of a familiar product names, e.g. Kit Kat, Google, Band-Aid

Tell:

Communicating your problem, its solution and your research as an inventor is the 7th step in the invention process.

SESSION 2

Tell:

You'll need to design and make a display board for your invention to share with others at school, home and perhaps at the WNY and/or National Invention Convention.

Ask:

What makes buying a product visually appealing? What catches your eye? (color, size, shape, texture, easy to read fonts/lettering/, logo, pictures/photos, etc.)

Share:

Product Appraisal - Individual students, pairs or teams search their tablet in order to select a product on a favorite online shopping site, like amazon. They explain the characteristics or attributes that make the product look desirable to buy. Discuss what is attractive and what is not. Recommend improvements/changes.

SESSION 3

Tell:

At home, you will be making your own display board to present your invention. Together as we read the Requirements for a quality tri-fold display board and prototype, you may highlight, circle or underline key words and ideas.

Work Backwards:

For older students, share the Scoring Rubric form the WNYiC or National Invention Convention website for presenting a quality tri-fold display board and prototype.

PROCEDURE

1. Teacher supports students with *Step 7 of Invention Process* from *Inventor's Guide: My Invention Story*.
2. SESSION 1: *Inventor's Guide* **L-I** Page 14 or **L-II** Page 14a.
Allow Q&A time.
3. Individual inventors, pairs or teams think creatively and critically to come up with a name for their invention. *Inventor's Guide* **L-I** Page 14 or **L-II** Page 14a. May be revised at home.

4. SESSION 2: *Inventor's Guide* L-I and L-II Page 15. Allow time to rewrite the invention's name. Students reflect and write &/or draw highlights that come to mind that represent the beginning, middle and end of their invention process. Focus on ways in which to show these highlights on the tri-fold display board. Revisit at home.

5. SESSION 3: *Inventor's Guide* L-I and L-II Pages 16 and 17.

Allow time for Q&A.

- Be original and creative with your presentation for the design of your tri-fold display and prototype. All work will be done at home.
- Check-out Resources and Guidelines for more information @ <https://wnyinventionconvention.org/>
- Teachers should provide students guidelines to help manage their time and the project's final preparations by scheduling check-ins during independent working periods.
- Get support and feedback from family and friends to show display board plans when developing tri-fold and prototype. Make any changes along the way.
- Educators may show any video in COORDINATES for visual and written ideas for tri-fold display.
- Note: ONLY qualified inventors from the regional WNY Invention Convention competing at the National Invention Convention need to include the WNYiC *Inventor's Guide* - hardcopy (parts or whole), used throughout the *7-step invention process*, tri-fold display and 2-6 min. (Gr. K-2) or 4-6 min. (Gr. 3-8) informative video. SEE Official Rules @ <https://inhub.thehenryford.org/>
- Have FUN!

6. Inventors initial lower right-hand corner of respective pages in *Inventor's Guide*.

SUMMATION

BEST PRACTICE: Students verbally recommend to teacher and peers one (1) "best" technique or procedure for communicating their tri-fold in the areas of visuals, layout, and elements of the invention process. Piggybacking on others' ideas is welcome.

HOMEWORK

SESSION 1: *Inventor's Guide* L-I Page 14 or L-II Page 14a. Share the invention's name with family and friends. Rework until you feel good about it!

SESSION 2: *Inventor's Guide* L-I and L-II Page 15. Reflect on plan and design for layout of tri-fold display board to highlight and represent your prototype invention. Gather materials (tri-fold display board, colored paper, markers, glue, tape, invention process information, research data, photos, etc.). Think originality and creativity!

SESSION 3: *Inventor's Guide* L-I and L-II Page 15, 16 and 17. Create layout for tri-fold display board with materials and parent's help. Pay attention to requirements of content and visual appearance while being original and creative. Make changes as needed. Remember: prototype (model) will be displayed with tri-fold. Have fun!

EXTENSION

Students investigate marketing and communication elements in order to develop a 2 minute skit to secure a patent on their invention. Use the grade appropriate in-depth curriculum @ <https://cainventionconvention.org/educators/> . Students share their invention ideas and persuade others to patent their product. They present to an audience of their choice and evaluate their comfort level with public speaking. Students record skits on iPad/tablet to share on classroom SmartBoard with teacher's help or at home with family members.

COORDINATES

ELA: Editing Your Writing <https://www.youtube.com/watch?v=izENvJJY6Hg>

Math: Sequence of Events and Transitional Words for Invention Process
https://www.youtube.com/watch?v=4AMptAmS_xM

Art: How to Design, Create and Layout a Poster Project
<https://www.youtube.com/watch?v=FRwFrsp5s>

Science: Setting-up Display Board for Science Fair
<https://www.youtube.com/watch?v=4KVTLT6QeTE>

NYS NGLS LINKS

ELA:
<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/nys-next-generation-ela-standards.pdf>

Math:
<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/nys-next-generation-mathematics-p-12-standards.pdf>

Science:
<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/p-12-science-learning-standards.pdf>



L-I and L-II

WNYiC Lesson Plan: CULMINATION School/Home Invention Convention

Teacher/Parent _____

Date(s) _____

AIM

Students will be able to present, compete and share (visually & orally) their invention prototype and tri-fold display at a School/Home Invention Convention; educators evaluate in order to judge, score and select “advanced” inventors for the regional WNY Invention Convention; culminate the *7-Step Invention Process* of the *Inventor’s Guide: My Invention Story*.

TIME MANAGEMENT

Whole Class/School, Individual and Team Inventors,
Multi-Session, Unlimited Hours

MATERIALS

SmartBoard (SB)
Pencils/Paper
Student iPads/Tablets
Inventor’s Guide: My Invention Story (copies or download)
Prototypes (Models)
Tri-fold Display Boards
Rubric Scoring Sheets for Judges
Variety of Judges from School/Home
Area for Showcasing Inventions and Tri-folds
Display Tables with Grade Level Signs/Labels
Excel File for Record of Student Inventors
Certificate of Recognition (Teacher-made or Purchased)

MOTIVATION

Display and Tell: Lesson Objective with students.

PROCEDURE

1. Teacher supports students with a culmination of the *Invention Process* from *Inventor’s Guide: My Invention Story*. School/Home Invention Convention.
2. Educators set up a safe and secure area with tables for viewing, scoring and judging inventors’ tri-fold displays and prototypes (models). Label tables in the viewing area according to grade levels, if necessary.

3. Accept only complete displays and models for evaluation.
4. Educators can make an Excel spreadsheet to facilitate the volume of students for judging, including but not limited to these areas: Invention Convention Title & Year, Student Name, Grade/Levels/Room #s, Individual or Team, Invention Name, Overall Rating (Advanced, Intermediate, Novice), and Comments.
5. Designate ample time for students to present and share their invention prototype and tri-fold display at their School/Home Invention Convention; compete for local recognition and ultimately the Regional event.
6. Educators judge, score and choose “advanced” inventors who earn the highest scores for the Regional competition.

SUMMATION

Produce “Certificates of Recognition” for those students who participated in the invention process from introduction to culmination. Inventors who earned the highest scores mainly in the “advanced” range at their School/Home Invention Convention will work with teachers and parents toward competing at the regional WNY Invention Convention. Refer to the website for important registration dates, guidelines and awards: www.wnyinventionconvention.org.

HOMEWORK

Students, teachers and parents alike celebrate the entrepreneurial journey as an inventor, mentor and creative problem solver. Time for pats on the back!

EXTENSION

- Invite the school to have other grade levels, classmates and parents walk-to, view and talk with student inventors about their invention process. Peers can vote for their favorite inventions in selected categories (e.g. most creative, best prototype/display board, most practical, best global impact/“green” friendly...) Award certificates as honored.
- Showcase students work by securing local news stations, papers &/or blog sites to cover the story of this STEM project.
- Teachers and/or students write an article about the School/Home Invention Convention, its inventors and innovations to share with friends, family and the community. Include details about problems and solutions, as well as the potential to share inventions on the Regional and National levels.

NYS NGLS LINKS

ELA:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/nys-next-generation-ela-standards.pdf>

Math:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/nys-next-generation-mathematics-p-12-standards.pdf>

Science:

<https://www.nysed.gov/sites/default/files/programs/curriculum-instruction/p-12-science-learning-standards.pdf>



L-I

and

L-II

(WNYiC) SCORING RUBRIC for

School/Home Inventions & RESOURCES

- I. School/Home-based invention conventions may use the suggested **rubric** for judging student inventors. Individuals or teams with highest scores that earn points primarily in the **advanced** range should be selected for the regional Western New York Invention Convention.

NOTE: School/Home/WNY scoring will not include the *Inventor's Guide* nor a video.

| Category/Skill | Advanced: 3 | Intermediate: 2 | Novice: 1 |
|-------------------|---|---|--|
| Invention Process | Above and beyond identification and understanding of the problem and solution through creative & critical thinking. Much evidence of perseverance, improvements and research to support the pros & cons of the solution on society and/or environment. Altruistic and empathetic. | Identification and understanding of the problem and solution through creative & critical thinking. Some evidence of perseverance, improvements and research to support the pros & cons of the solution on society and/or environment. Shows some empathy. | Minimal identification and understanding of the problem and solution through creative & critical thinking. Lacks evidence of perseverance, improvements and research to support the pros & cons of the solution on society and/or environment. Inadequate empathy. |
| Originality | Invention is significantly better, different and/or unique from existing solutions in addressing the problem. | Invention is somewhat better or different from existing solutions in addressing the problem. | Invention is similar to existing solutions with few or no improvements in addressing the problem. |
| Display Board | Contains all essential content to support the inventor's presentation of the invention process. Strong visual appeal and excellent writing conventions. Well organized and communicated. Clean, colorful, and eye-catching. | Contains some content to support the inventor's presentation of the invention process. Good visual appeal and average writing conventions. Moderately organized and communicated. Somewhat clean, colorful and eye-catching. | Contains little content to support the inventor's presentation of the invention process. Fair visual appeal and poor writing conventions. Somewhat organized yet poorly communicated. Minimally clean, colorful and eye-catching. |
| Prototype (Model) | Brilliant! Supports a | Somewhat supports | Does not support a usable |

| Category/Skill | Advanced: 3 | Intermediate: 2 | Novice: 1 |
|--------------------------|---|--|---|
| | valuable & usable solution for solving the problem; working or non-working model. Assistance (appropriate to grade level) designing, building & testing are acceptable; the student has driven the process. | a usable solution for solving the problem; working or non-working model. Assistance (appropriate to grade level) designing, building & testing are acceptable; the student has driven the process. | solution for solving the problem; working or non-working model. Assistance designing, building & testing are inappropriate to grade level; someone other than the student has driven the process. |
| Research & Documentation | Quality documentation of research & materials related to the topic, originality and potential market. | Some documentation of research & materials related to the topic, originality and potential market. | Poor documentation of research & materials related to the topic, originality and potential market. |
| Invention Impact | Invention makes life easier, better, and with minimal adverse effects on the environment and/or society. High market potential and user-value. | Invention makes life marginally easier, better, and with some adverse effects on the environment and/or society. Average market potential and user-value. | Invention falls short of making life easier, better, and with adverse effects on the environment and/or society. Low market potential and user-value. |

II. While the WNY Invention Convention uses a similar rubric and areas to judge/score student inventors as the Invention Convention US Nationals*, only the US Nationals will include the *Inventor's Guide* (Logbook*) and a video*:

- Invention Process
 - Identifying & Understanding
 - Ideating
 - Designing & Building
 - Testing & Refining
- Invention Impact
 - Market Research
 - Environmental & Societal Impact
 - Originality
- Inventor Communication
 - Logbook* (invention process, research & documentation, analysis)
 - Display Board (content, visual appeal)
 - Prototype/Model
 - Video Presentation* (Gr. K-2, 2-6 min. and Gr. 3-8, 4-6 min.)
 - Live Presentation (judge and peer Q&A during event)

III. *For more details about rubric judging/scoring at the 2023 US Nationals, see the following website:

https://inhub.thehenryford.org/docs/default-source/icw-documents/ic_23_497550-ic_icusn-23-rubric-and-supporting-materials07885a26-bce1-4874-bf40-0816d4a0841f.pdf?Status=Master&sfvrsn=2945fb0e_3

IV. **RESOURCES**

Western New York Invention Convention (all information):

www.wnyinventionconvention.org

WNYiC Registration Page:

<http://wnyic.zfairs.com/>

WNYiC Questions/Problems:

diane@wnykidsinvent.org

info@wnykidsinvent.org

WNYiC on Facebook:

WNYInventionConvention

Henry Ford Museum (Invention Convention US Nationals)

<https://inhub.thehenryford.org/icw/competitions/us-nationals-landing>

US Patent Office (games, trivia, events, videos, and links to other sites for kids)

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

University of New Hampshire (Young Inventors' Program with YIP Curricula Gr. K-12)

<https://www.unh.edu/leitzel-center/young-inventors-program>

California Invention Convention (Teacher materials)

<https://cainventionconvention.org/educators/>

Michigan Invention Convention (STEM Program Overview for Educators & Administrators)

https://stem-innovation.wayne.edu/icm/icm_program_overview_2021.pdf

Kid InventorsTell All (Why kids love to invent)

<http://video.newyorker.com/watch/kid-inventors-tell-all>