STEM/STEAM Pathways to Authentic Problem Solving

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TODAY’S INVENTORS + REAL LIFE STEAM INVESTIGATIONS = TOMORROW’S INNOVATORS
I have rights as a creator

My ideas have value

They are my intellectual property

With the power of my imagination, I can make a unique mark on the world

And help others trace my ideas back to me as the source

I can even bring my idea to market and build a business around it!

STEAM + invention + intellectual property + entrepreneurship = innovation
The mission of the National Inventors Hall of Fame® is recognizing inventors and invention, promoting creativity and advancing the spirit of innovation and entrepreneurship.
EDUCATION WITH
World-Changing Inventors

NATIONAL INVENTORS HALL OF FAME®

INNOVATION ECOSYSTEM

Camp Invention®
K-6th

Invention Playground®
PK-5th

Leaders-in-Training
7th-9th

Leadership Intern
High School/College

Invention Project®
4th-9th

Invention Club®
1st-6th

STEM Maker® Lab®
1st-6th

College Invention Competition®

Professional Development Education

Entrepreneurship

Collaboration

Intellectual Property

Creativity

Inspiration

ST EL M INN VATION

FORCE

Radia Perlman
Robust Network Routing and Bridging
INDUCTED 2014

George Alcorn
X-Ray Spectrometer
INDUCTED 2015

Jaap Haartsen
Bluetooth® Wireless Technology
INDUCTED 2015

Stan Honey
Sports Broadcast Graphic Enhancements
INDUCTED 2018

Frances Ligler
Portable Optical Biosensors
INDUCTED 2017

Sumita Mitra
Polymeric Dental Materials
INDUCTED 2018
GOOGLE ARTS & CULTURE’S “ONCE UPON A TRY” EXHIBIT

• The largest online exhibition about inventions and discoveries
• Includes more than 110 institutions from 23 countries
• Celebrates science, technology and ingenuity worldwide
• Brings the NIHF Museum to life through powerful Inductee stories and honorary exhibits

bit.ly/VirtualNIHF Museum
ARE YOU READY FOR A CHALLENGE?
~Two – Three per group~

DESIGN

BUILD

POWER YOUR OWN ROBOT
CREATURE CIRCUITS

HOW TO POWER A MOTOR

- black wire
- object (e.g., cork)
- rubber band
- red wire
- axle

CREATURE DESIGN

- BLACK WIRE
- RED WIRE
- HOT GLUE
- CORK
- MOTOR
- BATTERY
- RUBBER BAND
- FOAM BLOCK
- TOOTHPICKS
- MASKING TAPE
Circuits contain a power source, wires and at least one load.

Electricity is created when energy is passed from one atom to another through a change in charges.

Batteries have a positive and negative terminal.

Motors convert electromagnetic energy into mechanical energy.
STEM IN THE CREATURE CIRCUIT

• Movement (physics): the corks are secured to the motor axles so that when the axles spin, the motion causes the creatures to wiggle.

• Balance: the position of the toothpicks causes the creature to be off balance, when the motor spins.

• Counterbalance: unbalanced corks and toothpicks will cause creatures to wiggle better.
THE INVENTION PROCESS EMPOWERS STUDENTS TO:

- Become more empathetic
- Work harder
- Engage in iterative thinking
- Embrace criticism
- View learning as authentic
- Learn how to market their work
- Become brave
DESIGN THINKING

A process that employs a designer’s mindset and tools in order to meet people’s needs with what is technologically possible and has potential consumer value.

Solution-focused, not problem focused

An important part of design thinking is observing people and how they use objects, products, and processes.

Ex) Apple, Nike, Coca-Cola, others?
Design Thinking: Lessons for the Classroom

- The Design Thinking Process
- While design thinking has its roots in the innovation/design sector, the process itself can be used anywhere. Indeed, it is a great tool for teaching 21st century skills, as participants must solve problems by finding and sorting through information, collaborating with others, and iterating their solutions based on real world, authentic experience and feedback...
Design Thinking is a Process and a Mindset

• Engineers, businesses, social entrepreneurs and other innovators have used design methods and processes for decades to create new solutions for many different types of challenges. But Design Thinking isn't just about specific steps to follow in order to innovate -- thinking like a designer can transform the way you approach the world when imagining and creating new solutions: it's about being aware of the world around us, believing that we play a role in shaping that world, and taking action toward a more desirable future. Design Thinking gives us confidence in our creative abilities and a process to take action through when faced with a difficult challenge.
INVENTOR TIP: “You never know where inspiration can come from: a conversation with a friend, the way a bird lands on a branch, a family member’s complaint about an existing product, could spark a new idea.” Kristina Johnson
CLARIFY

- Are there existing inventions you may want to include in your invention?
- Does your idea improve on an invention?
- Consider licensing them.
- Make sure it is different enough.
- Do you know enough about the person or people you want to help?
- Has your idea already been invented?
- Use empathy to make new discoveries.
- Keep brainstorming.
- Do you need to give credit for the inspiration of your idea?
- Cite prior art.
SKETCH

Are you using the process of sketching as a brainstorming tool?

Don't overthink them.

Take some risks.

Are you quickly getting your ideas out?

Are you jotting notes?

Use pictures, symbols, numbers, and words.

Are you keeping it fairly simple?

Curb the details.

Are you keeping open to how the idea is changing form?

Let the pencil lead the way.

Are you trusting the process?

Know that you cannot do this wrong.
HAVE YOU TRIED ADAPTING YOUR Prototype?

Apply discoveries from reflection, feedback, and testing.

HAVE YOU TRIED ASKING FOR OTHERS’ Feedback?

Ask them what they see.

HAVE YOU TRIED APPLYING AN EXTRA DOSE OF IMAGINATION?

Stretch your mind.

HAVE YOU TRIED USING A VARIETY OF MATERIALS?

Put them to the test.

HAVE YOU TRIED TESTING IT OUT ALONG THE WAY?

Gain insights as you build.
WHAT IS THE HOOK THAT WILL PULL IN YOUR AUDIENCE?
DRAW THEM IN

WHAT IS THE KEY DATA YOU WILL SHARE?
BOIL IT DOWN

WHAT IS THE SHORT STORY YOU WILL TELL?
MAKE A CONNECTION

WHAT ARE THE MOST UNIQUE FEATURES?
TELL THE DIFFERENCE

WHAT ARE THE VISUALS YOU WILL USE?
LET THEM SEE YOUR VISION

IS THERE A CALL-TO-ACTION FOR YOUR AUDIENCE?
TELL THEM WHAT TO DO NEXT

PITCH
Let’s check in with our Designers?

❖ Key take a way from your experience.
❖ What skills are embodied in this activity?
❖ How did this experience promote critical and creative thinking?
❖ What connection can be made to the classroom?
REAL LIFE CHALLENGES + REAL LIFE ROLE MODELS = STUDENT ENGAGEMENT
Connectivity

“I believe that inventing is the core creativity of humanity. **We are all in this together** and we all invent to help other people. So encourage your peers, encourage your children, encourage yourself to join a great team ... the **invention team**.”

Bill Warner
2019 Inductee | Digital Nonlinear Editing System
EXPOSURE THAT IS RELATABLE
WHY IS EXPOSURE TO INNOVATION AND PATENT LITERACY IMPORTANT FOR YOUR STUDENTS?
WE ARE AN INTELLECTUAL PROPERTY ECONOMY

- 230 Year Old Patent System
- STEM Career Growth +12% by 2022
- 9 of the Top 10 World Brands are U.S. Brands
- 45 Million IP-intensive Industry Jobs
“Failure is not a verdict; it is an opportunity to smile at the fact that you are a little smarter now.”

~ Steve Sasson, NMTI Laureate
Inventor of the digital camera
TRANSFORM LEARNING AND EMPOWER STUDENTS

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