DCM Exhibitions – Staff Training Materials

Patents Pending (PART A)

Patents Pending is an environment devoted to experimentation, curiosity, invention, problem-solving and tinkering. It's a lively, eclectic laboratory atmosphere where visitors encounter design and engineering challenges, and then work to create and test their ideas. Using large-scale testing stations, visitors evaluate the performance and durability of their inventions. Some stations, such as Drop Zone, Air Towers or Quake Proof, pose specific design problems for visitors to address with materials available at work tables. *Can you create something that will withstand a 14-foot drop? A sudden blast of air? An earthquake?* Others, such as Contraption Challenge, combine construction and testing as visitors manipulate open-ended, mechanical cause and effect. The wide range of inventive opportunities engages both kids and adults in the eye-opening process of trial and error.

Target Audiences:

Children ages 6-12 + adults (families), school groups (1^{st} – 7^{th} grade)

Education & Experience Goals:

- Visitors engage with the process of invention while responding to a wide range of inventive challenges. Challenges are 1) open-ended (have multiple points of entry and support multiple outcomes) and 2) designed to appeal to different interests and learning styles.
- Visitors are active learners. They use critical thinking and problem-solving skills as they design "solutions" at exhibit components. (Visitors utilize the engineering design process: define the problem, research the issue, specify requirements, create alternative solutions, choose the best solution, build prototype, test and redesign.)
- Visitors are self-directed. They may choose from a variety activities that are accessible and intuitive.
- Visitors connect inventive challenges and related information to scientific phenomena (like gravity or air flow) and real-world applications.
- Visitors work individually or collaborate with friends or family members. Activities support both approaches.
- Visitors draw inspiration from a variety of materials with which to invent, create, tinker, build and assemble.
- Visitors discuss and reflect on their inventions with friends, family members or teachers. The experience launches conversations beyond the Museum.
- Staff supports and extends the visitor experience by facilitating educational interactions at individual components and by leading demonstrations and presentations.

Key Takeaway Messages:

- **Embrace trial and error.** Revise an approach or design based on observations.
- **Feel free to fail.** Failure is often a very important step in the inventive process. (Try, try again!)
- **Work together.** Two (or more) heads can be better than one when it comes to solving problems creatively. Talk with your "colleagues" about different ideas and then try them out.

Appendix A

Background Information:

Experimentation & Inventions

An invention comes about when a new machine or device is developed that makes people's lives easier or better. An invention is distinct from a discovery, which is simply finding something that was previously unknown in nature. People have been inventing since the days of early humans – creating ways of making fire, the wheel and axle, the pulley, the saw, and so on. Two of the greatest periods of innovation in history were the Renaissance, when a heightened interest in art, science, and invention spread across Europe, and the Industrial Revolution, which led to the modern factory system.

Prior to the 20th century, inventing often was solitary work. Inventors used their own money and worked privately on projects. The modern invention process, however, is mostly undertaken by large corporations and universities. It concentrates on technological research, discovery and innovation. Researchers from a variety of disciplines work together using the scientific process – including experimentation – in their efforts.

Source:

Compton's by Britannica, Britannica Online for Kids
http://kids.britannica.com/comptons/article-9275080/invention

Idea-to-Patent Process

A patent, issued in the United States by the U.S. Patent and Trademark Office, gives an inventor exclusive rights that protect his or her invention for 20 years. Once someone holds a patent, no one else can legally make, use or sell the invention in the U.S. without the patent holder's permission. With this protection in the marketplace, inventors are more likely to make money, which then can fund their future exploration and inventions. So, patents fuel the research and innovation processes.

The first step toward legally patenting an invention is to document one's idea in an "inventor's journal" and have the entry signed by a witness. This journal can be any bound notebook with sequential, numbered pages that can't be removed or reinserted. Secondly, an inventor should research the idea to make sure a) a patent doesn't already exist for it, and b) that there is a market for it. The inventor's next step is to create a prototype, followed by filing a patent with the U.S. Patent and Trademark Office with the guidance of a patent attorney.

Sources:

United States Patent & Trademark Office
https://www.uspto.gov/patents-getting-started/patent-process-overview#step1

Entrepreneur.com, "Five Steps for Turning Your Idea into a Product"
http://www.entrepreneur.com/article/77962#

Engineering & Design

Engineers conceptualize, design, create, and build devices or processes that solve problems. To do so, they apply mathematical, scientific and technical principles, making the physical forces of nature and properties of matter useful to humans. Most engineering problems are complex, and many industrial engineering tasks require that engineers with different types of technical expertise collaborate for solutions. Engineers typically specialize in one of a number of fields, for example, aerospace, biomedical, chemical, civil, computer, electrical, environmental, or mechanical.

Source:

Compton's by Britannica, Britannica Online for Kids
http://kids.britannica.com/comptons/article-9274181/engineering

STEM Learning

STEM (**S**cience, **T**echnology, **E**ngineering and **M**athematics) Learning refers to the initiative by the U.S. National Science Board (NSB) and educational leaders to encourage improvements in STEM education in the United States. The NSB and others argue that deficiencies in these areas have implications for the competitiveness of the U.S. workforce, the country's economic success, and even national security. The group's initial report and recommendations were made before the U.S. Congress in 2007, and have had a major impact on the direction of current U.S. education reform efforts. (Exhibitions like *Patents Pending* provide hands-on learning opportunities for children and families in science, technology, engineering and mathematics.)

Source:

NSF - STEM Education Data
https://nsf.gov/nsb/sei/edTool/

Live Science - What is STEM?
https://www.livescience.com/43296-what-is-stem-education.html

Resources:

Experimentation & Inventions

http://www.aas-world.org/YIP/
Young Inventors Program, Academy of Applied Science

http://pienetwork.org/
Playful Invention & Exploration

http://www.loc.gov/rr/print/list/picamer/paExperiments.html
Library of Congress, Experiments & Inventions

http://lemelson.mit.edu/resources/inventor-handbook
Inventor's Handbook

Idea-to-Patent Process

https://www.uspto.gov/patents-getting-started/patent-process-overview#step1
United States Patent & Trademark Office

http://www.entrepreneur.com/article/77962#
Entrepreneur.com, "Five Steps for Turning Your Idea into a Product"

Engineering & Design

http://www.theworks.org/fb/teachers/engineering_design_process.html
The Works, A Hands-on Technology Museum in Minneapolis, Engineering & Design Process

http://www.discovere.org/discover-engineering
Discover Engineering

http://pbskids.org/designsquad/parentseducators/
PBS Kids, Design Squad Nation

STEM Learning

http://www.stemedcoalition.org/
STEM Education Coalition

https://unctv.pbslearningmedia.org/collection/stemalive
PBS Teachers, STEM Education Resource Center