# COOPER HEWITT

## *TOOLS: EXTENDING OUR REACH*

## TEACHER RESOURCE PACKET

Smithsonian Design Museum

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Smithsonian Design Museum

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January 2015

Dear Educator,

Thank you for registering for Design Field Trips! This exciting 90-minute program is designed to present Cooper Hewitt, Smithsonian Design Museum's compelling content to your class(es) through an interactive exhibition tour and hands-on workshop.

You have selected to focus your Design Field Trip on *Tools: Extending Our Reach*, an exhibition that features 175 objects from Cooper Hewitt and nine other Smithsonian collections, spanning 1.85 million years of tools use and design. With the guidance of a Design Educator, your students will explore the various ways that tools extend humanity's ability to do everything from completing daily tasks to to printing parts from a 3D printer in space! During the workshop, students will design tools for survival.

This packet also provides several resources on how to how prepare for your museum visit and what to do after, including pre-visit activities and post-visit ideas to continue integrating design thinking connections into your classroom.

We enjoy receiving feedback from teachers about their experience with the program. Within a month of your museum visit you will be emailed a brief survey. Thank you in advance for taking time to provide your feedback so that we can continue to offer a high-quality program for all K–12 schools.


Sincerely,

Kimberly Cisneros
School Programs Manager

James B. Reyes
Education Assistant

# COOPER HEWITT
## DESIGN K-12

# PREPARING FOR DESIGN FIELD TRIP

During your Design Field Trip, the Design Educator assigned to your group will need your support in helping students stay on task. You must remain with the group at all times with the Design Educator. Please review the following museum guidelines and share them with your chaperones and students.

## ARRIVAL & DEPARTURE
- Please arrive 10 minutes before your scheduled start time to check in; you will be greeted at the main entrance (91st Street between Fifth and Madison Avenues)
- Non-NYC teachers with a cash payment, please remit to the Admissions Desk
- Coat check will provide large bins to quickly store and retrieve coats and backpacks
- Please call your bus in advance to meet you in front of the main entrance, and exit through the main entrance.

## MUSEUM RULES AND POLICIES

- Please do not touch the objects or lean on the walls; view the objects at a safe distance
- Use only pencils for taking notes or sketching; pens are not permitted
- Food, drinks, and chewing gum are not permitted in the museum
- All items entering and leaving the museum are subject to inspection
- Please remain with your assigned group at all times
- Please leave all backpacks and large purses on the bus or at the coat check
- Photography without flash is welcomed; no tripods or selfie-sticks, please

## TAKE AN ACTIVE ROLE

### TEACHER & CHAPERONES
The classroom teacher and chaperones are essential to the success of a group's visit; they can enhance the success of the tour and the amount of learning that can take place by showing active interest in the works of art while supervising student behavior.

- Please ensure that you and your group of students (10 students or fewer per chaperone) stay together during your time in the museum (this includes the Shop)
- You and the group chaperones are responsible for keeping track of each student in your group, and for students' proper behavior (including their respect of museum rules and policies)
- If you have questions, ask a museum staff member for help

### STUDENTS
- Students will be encouraged to share their ideas and work in teams
- Students must stay with their chaperones at all times while in the museum and Shop
- Please do not allow students to touch anything unless signs, museum staff members, or designated volunteers let you know it's okay

# COOPER HEWITT
# DESIGN K-12

## FOR MORE INFORMATION

Please visit our website at www.cooperhewitt.org/education/school-programs

## DESIGN THINKING CONNECTIONS

The following pages include pre- and post-Design Field Trip activities. The pre-visit activities are suggestions for how to help your students prepare for their trip; they are designed to introduce your students to concepts that will be discussed during the program. The post-visit activities are suggestions on how to extend your students' thinking beyond the 90-minute program and reinforce your classroom curriculum. For teachers who would like additional ideas, we recommend our free Educator Resource Center (ERC) , which offers offering 400 design-focused lesson plans (available at: http://dx.cooperhewitt.org/lesson-plans/)

## PRE-VISIT ACTIVITIES

### DIGEST THE LANGUAGE | ALL GRADES

*SUBJECTS: English, Art, Science | DESIGN PROCESS: Getting Ideas*

*ACTIVITY TYPE: slideshow and discussion | 30 mins*

Prior to visiting the museum, it would be helpful to familiarize students with design vocabulary. Using our slideshow as a guide, introduce students to the idea that everything we see and touch was made by a designer for specific functions and users. Each slide presents vocabulary and guiding questions to help you lead a discussion around the selected examples. Afterwards, discuss objects in the classroom; examine what their purposes are, and interpret how they are intended to be used.

**GUIDING QUESTIONS**

- What do you think of when you hear the word "design?"
- Who are the users for each of these objects? What are their needs?
- What were the designers' solutions to those needs?

**VARIATIONS AND EXTENSIONS**

Take an informal or formal assessment and compare to final assessments after the post-visit activities.

**MATERIALS AND RESOURCES NEEDED**

If available, a projector and internet connection

Our "What is Design?" slideshow at www.cooperhewitt.org/education/school-programs

**VOCABULARY**

See Cooper Hewitt's design vocabulary on Page 12 of the Teacher Resource Packet

**STANDARDS**

Common Core

English Language Arts R.1, 7, 9; SL.1, 2, 4; L.4, 6

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## UNDERSTANDING TOOLS | GRADES K–5

*SUBJECTS: English, Science | DESIGN PROCESS: Testing and Evaluating*

*ACTIVITY TYPE: Discussion with touchable objects | 30 mins.*

Have your students bring in examples of objects that have some sort of function or purpose (e.g., hair comb, spoon, etc). Invite students to think like designers by analyzing the object and its intended use. The tools in our exhibition *Tools: Extending Our Reach*, have been separated into the following categories: Toolboxes, Make, Survive, Communicate, Work, Measure, and Observe. Have students sort their objects into these exhibition categories; some will only fit in one category, but other objects may fit in several. This activity will help students begin to understand the roles that objects play in our world.

### GUIDING QUESTIONS

- All of you brought in an object. Even though they all look different, they all fall under the category of "tools." Why do you think they all look so different?
- What does each part of your object do? What does this object do that another one can't?
- Is the object comfortable to hold/use/etc.? Do you think the person who designed this object wanted it to be comfortable?
- If you were to change something about this object to make it work better or make it easier to use, what would you change?
- In what ways is a smartphone or computer a toolbox?

### VARIATIONS AND EXTENSIONS

Instead of—or in addition to—looking at physical objects, students can list tools and functional objects that they use every day and then analyze and categorize them.

### MATERIALS AND RESOURCES NEEDED

Miscellaneous functional objects brought in by students, or found in the classroom

Artifact Analysis worksheet from National Archives

http://www.archives.gov/education/lessons/worksheets/artifact_analysis_worksheet.pdf

### VOCABULARY

Tool, user, function, design, designer, form, materials, needs, prototype, solution

### STANDARDS

Common Core

English Language Arts: R.1, 7

Learning Standards for New York State

Mathematics, Science, and Technology Standards 1, 4, 6, 7

# COOPER HEWITT
## DESIGN K-12

## INSPIRED BY CHEETAHS | GRADES 6–12

*SUBJECTS: English, Science | DESIGN PROCESS: Getting Ideas*

*ACTIVITY TYPE: Video clip and discussion | 45 mins.*

Sometimes, designers borrow ideas from nature. Show students the Smithsonian video clip "This Is Why You Can't Outrun a Cheetah" and have students analyze its body and movements. Then show an image of the Flex-Foot Cheetah® along with the animal. Have students compare and contrast the two. Read the article "A Personal Call to Prosthetic Invention" and discuss the object using design vocabulary to lead the discussion.

### GUIDING QUESTIONS

- What do you typically envision when you think of "prosthetic legs?" How is this product different?
- What is so special about how cheetahs run? How are their legs different from ours?
- How do the form and materials of the Flex-Foot influence its performance?
- Describe the relationship of the designer to the product. Why did he set out to make this?
- What changes did the designer make in his prototypes as he revised his design solution?
- How is the Flex-Foot ergonomic?
- What other animals would be ideal for inspiring athletic prosthetic designs?

### VARIATIONS AND EXTENSIONS

- Have your students think of and draw designs for prosthetic legs for other situations: swimming, horseback riding, skiing, dancing, a fancy occasion, snow conditions, etc.
- Debate the argument that the runners with prosthetic legs have an unfair advantage in races

### MATERIALS AND RESOURCES NEEDED

Pogash, Carol. "A Personal Call to a Prosthetic Invention." *The New York Times*.
http://www.nytimes.com/2008/07/02/sports/olympics/02cheetah.html?ref=sports&_r=0

Smithsonian video clip: "This Is Why You Can't Outrun A Cheetah"

http://www.smithsonianchannel.com/sc/web/video/titles/18351/this-is-why-you-cant-outrun-a-cheetah

http://historyexplorer.si.edu/PrimarySources.pdf

### VOCABULARY

Design, designer, design process, design solution, form, function, materials, needs, prototype, user, survival, ergonomics

### STANDARDS

Common Core

English Language Arts: R.1-3, 7, 9, 10; SL.1-3; W.6-8.7, 10

Learning Standards for New York State

Mathematics, Science, and Technology Standards 1, 6

English Language Arts Standards 1-3

Career Development and Occupational Studies Standard 1

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# POST-VISIT ACTIVITIES

## BACKPACK FACTORY | GRADES K–1

*SUBJECTS: Match, Science, Art | DESIGN PROCESS: Prototyping and Making*

*ACTIVITY TYPE: Design challenge | 45 mins.*

Now that your students have been familiarized with the design process, give them a chance to play designer! Begin by reviewing the parts of a backpack and the purpose of each part. If multiple types of bags are available, compare and contrast them. Discuss who the user is for different types of bags. Inform them that for the next 40 minutes, they are professional designers and their job is to turn a piece of paper into a backpack for a person the size of a doll! Show them how to roll, fold, cut, and tape paper into a basic structure to create their own backpack. Each bag must have a storage compartment and straps, but they may experiment with different ways to make them.

### GUIDING QUESTIONS

- How can you turn this two-dimensional surface into a three-dimensional form?
- What parts do you need to make a backpack? What extra features might you want to give your imaginary person?
- Do you have a specific doll or toy you'd like to make this bag for?
- What can your user carry in this bag?
- How does your bag fit your user's body?

### VARIATIONS AND EXTENSIONS

- Have a stand-in for a human, such as a figure made of pipe cleaners, an action figure, or a doll, and then test their designs on it
- Use a variety of materials to open up the possibilities, such as collected and clean recyclable items

### MATERIALS AND RESOURCES NEEDED

Paper, scissors, tape, clean recycled items

### VOCABULARY

Design, user, form, materials

### STANDARDS

Common Core

Mathematics: MP5, MP7

Learning Standards for New York State

The Arts Standards 1, 2

Career Development and Occupational Studies Standard 1

Mathematics Standards 1, 5, 7

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## SURVIVING THE SEASONS | GRADES 2–5

*SUBJECTS: Math, Science, English, Social Studies | DESIGN PROCESS: Defining Problems and Getting Ideas | ACTIVITY TYPE: Research and design challenge | 45 mins.*

During their visit to Cooper Hewitt, students learned about how different people adapted to different climates in order to survive. In native cultures, people used local materials to create various tools for survival, such as the snow goggles and gut-skin parka. For this activity, assign different climates and locales to students; they should design appropriate clothing and tools for specific challenges related to surviving in the different climates and locales, and include a brief description of what they designed. In their designs, students should only use materials that they would be able to find in that particular region.

### GUIDING QUESTIONS

- What resources are available in your assigned climate?
- What needs does your user have in that climate?
- What materials are your design made of?
- What is the function of your design?
- What could be improved about your design?

### VARIATIONS AND EXTENSIONS

Reverse the process: show an artifact (or image of an artifact) and have students determine its place of origin by analyzing the object.

### MATERIALS AND RESOURCES NEEDED

Information on climates or access to research tools

Drawing materials

### VOCABULARY

Materials, function, needs, survival, resource

### STANDARDS

Common Core

English Language Arts: R.1, 2, 4, 7; R.10; W.6-8.7, W.6-8.10

Learning Standards for New York State

Mathematics, Science, and Technology Standards 1, 6, 7

English Language Arts Standards 1, 2

Social Studies Standards 1, 2, 3

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## WHAT'S IN A PATENT? | GRADES 6–8

*SUBJECTS: English, Art, Science | DESIGN PROCESS: Defining Problems*

*ACTIVITY TYPE: Research and discussion | 45 mins.*

Patent drawings record innovations over time; by studying these primary sources, students can gain insight into the mind of the inventor. Provide students with examples of patent drawings so they can explore an object of interest. You can pre-select source images and have a discussion as a class, or you can direct students towards online or library resources for their own exploration. Upon finding patent drawings of interest, students should learn how to read them by completing an Artifact Analysis worksheet.

### GUIDING QUESTIONS

- What kind of information can you glean from this type of drawing?
- What kind of problem was this invention solving?
- Who was the user?
- Was this invention designed to improve an existing product?
- Is this invention something necessary to survive or is it a convenience?

### VARIATIONS AND EXTENSIONS

Have students create models based on a patent using basic classroom materials (paper, tape).

### MATERIALS AND RESOURCES NEEDED

- Docsteach.org: search documents for "patent"
- Smithsonian Industrial Drawings:
  http://www.sil.si.edu/exhibitions/doodles/cf/doodles_alt.cfm
- Artifact Analysis worksheet from National Archives at
  http://www.archives.gov/education/lessons/worksheets/artifact_analysis_worksheet.pdf
- Written artifact analysis worksheet
- http://www.archives.gov/education/lessons/worksheets/written_document_analysis_worksheet.pdf
- http://historyexplorer.si.edu/PrimarySources.pdf

### VOCABULARY

Primary source, patent, design process, prototype

### Standards

Common Core

English Language Arts: R.1,, 4, 7, 10; W.1, 2, 7, 9

Learning Standards for New York State

Mathematics, Science, and Technology Standards 1, 6, 7

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## DESIGN SOLUTIONS FOR LIVABLE CONDITIONS | GRADES 9–12

*SUBJECTS: English, Art, Science | DESIGN PROCESS: Defining Problems and Getting Ideas*

*ACTIVITY TYPE: Discussion and research | 45 mins.*

Human migration may have led us all over the planet, but our basic needs remain the same throughout space and time; we need food, shelter, clothing, and transportation. Because of our natural capacity to design, we've managed to survive and even thrive in a range of conditions, some of them pretty extreme. Our responses to the same need can be very different depending on where we are and what resources are available or they can be surprisingly similar. Choose or assign civilizations or regions for your students to research how people responded to their basic needs.

### GUIDING QUESTIONS

- How do climate and geography influence survival needs?
- How do human needs and available resources influence design solutions?
- How did people in different regions fulfill their needs for food, shelter, clothing, and transportation? How do the results compare or differ in different regions?
- What artifacts from these civilizations were designed as a means to survive?
- How did this item change over the years?
- What do we have in our present society that serves the same function as this? How is it the same or different?

### VARIATIONS AND EXTENSIONS

- Focus on one area as a class and report back final results for a well-rounded picture of a single culture
- Focus on one basic need and assign multiple areas to compare and contrast
- Compare one civilization of focus to your own environment and analyze similarities and differences. How have past solutions evolved?
- Connect lesson to a culture or era that you are already focusing on

### MATERIALS AND RESOURCES NEEDED

Artifact Analysis worksheet from National Archives

http://www.archives.gov/education/lessons/worksheets/artifact_analysis_worksheet.pdf

### VOCABULARY

Design, needs, resources, survival

### STANDARDS

Common Core

English Language Arts: R.1, 4, 7, 10; W.1, 2, 7, 9

Learning Standards for New York State

Social Studies Standards 2, 3

Mathematics, Science, and Technology Standard 6

# COOPER HEWITT DESIGN K-12

## VOCABULARY

| | |
|---|---|
| **Design** | To make an object that solves a problem |
| **Design Challenge** | A difficulty or challenge that can be solved through design |
| **Design Process** | The steps that you take to solve your challenge: |
| | 1. Defining problems |
| | 2. Getting ideas |
| | 3. Prototyping and making |
| | 4. Testing and evaluating |
| **Design Solution** | The way, idea, or answer to a design challenge or problem |
| **Designer** | A person who creates a new object, idea, or plan |
| **Empathy** | The ability to understand what another person is feeling without adopting that emotion as your own. |
| **Ergonomics** | The science of designing products to optimize them for human use. Human characteristics, such as height, weight, and proportions are considered, as well as information about human hearing, sight, temperature preferences, and so on |
| **Form** | The shape and structure of an object |
| **Function** | The way something works, or a purpose of an object |
| | *e.g., the function of a paper clip is to fasten things together* |
| **Materials** | The items you are using to represent your ideas |
| **Needs** | What the user must have in order to use the design successfully |
| **Patent** | A document granting ownership of the design of a product |
| **Primary source** | Original material with a direct connection to the period of study |
| **Prototype** | An original model on which something is patterned |
| **Solution** | The way, idea, or answer to a problem. There can be more than one |
| **Survival** | Staying alive, especially in the face of challenging conditions |
| **System** | A group of related parts that work together |
| **Team** | A group working together on a common goal or activity |
| **User** | A person who operates or experiences the design |
| **User-centered design** | An approach to design that considers the needs of the user throughout the design process |

For additional information please visit our website

**http://www.cooperhewitt.org/education/school-programs/**

Or contact us at **chtours2@si.edu**