BUILD A CITY

EDUCATOR GUIDE

CARDBOARD ENGINEERING

What can your students create using cardboard, masking tape and various tools? Students are invited to imagine what they want in their city and build it!

They are encouraged to think about where they would live, play, move, and explore. What does our city need? Will they add a skyscraper, apartment complex, or restaurant? Will they create a vehicle from scratch and put it to the test on our ramp? What will they build to help them play and explore in a city park? They can add to an existing mural, tape their creations to the wall, or even build their own playground equipment. We encourage them to have fun making whatever objects they can dream up!

ACADEMIC STANDARDS

This exhibit and related program experiences connect with the following Indiana Academic Standards and may connect with additional classroom curriculum.

- **English:** K.SL.2.1, 1.SL.2.1, K.sl.2.3, 1.SL.2.3, 6.SL.1, 7.SL.1, 8.SL.1, 9-10.SL.1, 11-12.SL.1, 6.SL.2.1, 7.SL.2.1, 8.SL.2.Q, 9-10. SL.2.1, 11-12.SL.2.1
- **Science:** K.PS.2, K-2.E.1, K-2.E.2, 3-5.E.2, 6-8.E.1,
- **History:** 1.3.4, 1.4.1, 2.3.8.,

PLAN YOUR FIELD TRIP

Before the field trip

- If possible, visit the exhibit before your field trip. Experiencing the exhibit first and knowing your students, you will be able to better prepare your students to get the most out of their visit.
- This exhibit encourages guests to be curious and creative as they build and create. While there are prompts, there are no directions on what students must or should create. This freedom can be exciting for some students and challenging for others. Either as a whole class, in small groups, or individually, have students brainstorm what they think is needed in a city or park, or for transportation.
- Consider what you want your students to accomplish during their time in the exhibit. Will they work in small groups or by themselves to create something? Will they bring their creations back to school or stay at the museum? If students are bringing creations back with them, it is helpful to give them a size limit, such as it must fit on one hand. Remind students of your decision before you leave for your field trip.
- For additional pre-field trip planning tips and tricks, visit www.indianamuseum.org/field-trips

During the field trip

- As this exhibit encourages creativity and making, it may be hard for some students to leave. It will be helpful to let chaperones know how much time they should spend in the exhibit. We recommend at least 20-30 minutes. While in the exhibit, encourage chaperones to give them a countdown for how much time they have left to build.
- Let chaperones know if students can bring their creations back to school or if they have to stay at the museum.
- Encourage students to treat the space as they would their classroom. This includes returning materials to where they belong, recycling cardboard, and throwing away used tape.

Tips for Chaperones

- Students must be accompanied by a chaperone at all times, regardless of grade level.
- You will serve as a first line of support for the students, and they will follow your lead.
- Remind students of appropriate field trip behavior: walking feet, inside voices, share the space, and stick with the group.
- It is okay to not know the answer! If you are asked a question you are not sure how to answer, tell them you will find out together, or write it down for when they return to the classroom. A museum team member in a blue polo shirt can also help at any time.

After the field trip

- Review with the students their experience in the exhibit. What was fun? What was challenging? They were limited to cardboard and tape. What other materials would they want to use? How would that have changed what they built?

EDUCATOR RESOURCES

Below are resources and activities to assist in extending the learning in your classroom:

Library Book List Recommendations

- STEM Books for Children and Teens - **https://guides.library.upenn.edu/communityhealth/stembooks**
- Books for Curious Minds and Budding Engineers - **https://www.ucl.ac.uk/engineering/collaborate/schools-engagement/books-curious-minds-and-budding-engineers**
- Cardboard Engineering with boxes and tubes - **https://menlopark.bibliocommons.com/list/share/1952445839/1986949464?page=1**

Non-Fiction Books

- *Cardboard Box Engineering* by Jonathan Adolph
- *Real Engineering Experiments: 25+ Exciting STEAM Activities for Kids* by Anthony Tegtmeyer
- *Awesome Construction Activities for Kids* by Akyiaa Morrison, PE
- *Out of the Box: 25 Cardboard Engineering Projects for Makers* by Jemma Westing
- *Fascinating Engineering Book for Kids: 500 Dynamic Facts* by Dr. Jacie Maslyk
- *How to Build a City* by Isabel Otter
- *The Science of Buildings: The Sky-scraping Story of Structures* by Alex Woolf
- *Big Book of Building: Duct Tape, Paper, Cardboard, and Recycling Projects to Blast Away Boredom* by Marne Ventura
- *Wild Buildings and Bridges: Architecture Inspired by Nature* by Etta Kanner
- *Engineering for Teens: A Beginner's Book for Aspiring Engineers* by Pamela McCauley, PhD

Fiction Books

- *Be a Maker* by Katey Howes
- *Cardboard Kingdom* by Chad Sell
- *The Cardboard Piano* by Lynne Rae Perkins
- *Cardboard* by Doug TenNapel
- *Secret Engineer: How Emily Roebling Built the Brooklyn Bridge* by Rachel Dougherty
- *Jabari Tries* by Gaia Cornwall
- *Rube Goldberg's Simple Normal Humdrum School Day* by Jennifer George
- *Gus's Garage* by Leo Timmers
- *The Little Red Fort* by Brenda Maier
- *Engineering Stories: Realistic Fiction in STEM* by Kenneth R. Hardman

Books in the exhibit's resource area:

- *What to do with a Box* by Jane Yolen
- *Urban Animals* by Isabel Hill
- *Made by Maxine* by Ruth Spiro
- *Cityscape: Where Science and Art Meet* by April Sayre
- *Not a Box* by Antoinette Portis
- *Boxitects* by Kim Smith
- *How Cities Work* by Lonely Planet Kids, Jen Feroze, and James Gulliver Hancock

Websites:

- Cardboard Crafts and Cardboard Projects for kids - https://leftbraincraftbrain.com/cardboard-crafts-and-cardboard-projects-for-kids/
- Engineering projects to prepare for high school - https://www.teachingexpertise.com/classroom-ideas/8th-grade-engineering-projects/
- EPA Recycle City - https://www3.epa.gov/recyclecity/
- Help Harry! Engineering design challenge - https://theteacherstudio.com/engineering-inquiry-and-cooperative/
- NSF Engineering Classroom Resources - https://www.nsf.gov/news/classroom/engineering.jsp
- Teacher tips for teaching STEM with cardboard - https://www.teachtci.com/blog/teaching-stem-with-cardboard/

PBS Design Squad

- Design Squad Global - https://pbskids.org/designsquad/parentseducators
- For students - https://pbskids.org/designsquad/
- For teachers - https://indiana.pbslearningmedia.org/collection/design-squad/

PBS SciGirls

- For students - https://pbskids.org/scigirls/
- For teachers - https://indiana.pbslearningmedia.org/collection/scigirls/

PBS Fetch

- For students - https://pbskids.org/fetch/
- For teachers - https://indiana.pbslearningmedia.org/collection/fetch/