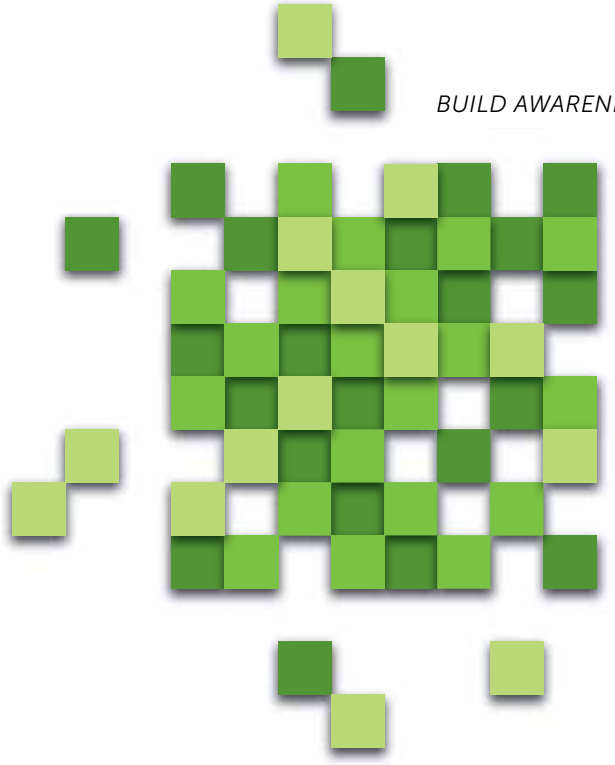
2017 EDUCATOR AND VOLUNTEER RESOURCE GUIDE

BRIDGE

GRADES 3-12



BUILD AWARENESS. BUILD KNOWLEDGE. BUILD COMMUNITY.

DESIGN LAB

LEARN AND BUILD

AFC ARCHITECTURAL FOUNDATION OF CINCINNATI

www.architecturecincy.org

AIA Cincinnati
A Chapter of The American Institute of Architects

WELCOME

DESIGN LAB MISSION

The Architectural Foundation of Cincinnati, in association with AIA Cincinnati, offers **DESIGN LAB** to community schools to broaden and deepen student awareness and understanding of our built environment.

We do this by:

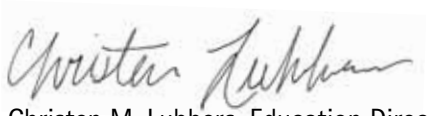
- Creating thematic annual educational programs aligned with state learning standards, implemented through an active partnership between educators and professionals in the built environment.
- Offering appropriate grade level content, lesson plans and learning goals.
- Providing educators with a useful and imaginative tool to help meet educational goals in a variety of academic and enrichment subject areas.

DEAR EDUCATORS AND VOLUNTEERS,

Welcome to **Design LAB: Learn And Build**! The Architectural Foundation of Cincinnati, in association with AIA Cincinnati, is pleased to offer this hands-on, project-based learning experience to our community's schools and students. With the generous gift of your time and talent, over 100 classrooms and 1,900 students will be able to participate in this creative and unique educational program for 2016.

For over 20 years, **Design LAB: Learn And Build** (formerly ABC) has aimed to assist K-12 students in learning about how they can plan, communicate and thoughtfully build their environments. As students design and model their projects, they also build an awareness, knowledge and confidence about themselves, their ideas and how they might like to engage as citizens of the world.

As always, we welcome your input, insights and suggestions about how to improve and strengthen **Design LAB** in partnership with you, the educational and professional communities. With your support and a multidisciplinary curriculum, students will gain an appreciation of their built environment, and the interactive role they can have in shaping it. Please feel free to contact us anytime with your comments and questions. **Thank you for your participation!**



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IMPORTANT INFORMATION FOR EDUCATORS

THANK YOU FOR PARTICIPATING IN DESIGN LAB! We hope that this experience will be a great one for you and your classroom. This page contains some tips and information to make sure that it is the awesome experience that it should be.

TAKE FULL ADVANTAGE OF THE TIME YOU HAVE WITH YOUR VOLUNTEER IN THE CLASSROOM. They have a depth of knowledge and exposure to the built environment that can bring this program to life in the classroom. However, these volunteers do have a career and likely cannot be in your classroom each time you work on Design LAB. They are also not educators and for some, this may be their first foray into a classroom environment.

MAKE YOUR GOALS AND EXPECTATIONS FOR YOUR CLASSROOM'S PARTICIPATION IN DESIGN LAB CLEAR TO BOTH THE STUDENTS AND VOLUNTEERS. This project is yours to direct and your volunteer is an assistant and a knowledge resource. They also give students a look into a potential career path, one of the many perks of this program. Be sure to ask them about their profession (or program in school, for our wonderful student volunteers) and allow them to talk to the students about what their days look like and about real-world challenges/solutions.

MAINTAIN GREAT COMMUNICATION WITH YOUR VOLUNTEER. Collaborate on a plan for the program and remain flexible. You will likely need to make adjustments, but going in with a plan is a pro move. Support your volunteer with any unfamiliar classroom circumstances and lead the process to implement the best ways of reaching achievement goals for your students.

LESSON PLANS AND ACTIVITIES This guide contains foundational education about the built environment, instructions on how to implement a constructive and fun critique/presentation, as well as suggested activities pertaining to the annual challenge. The initial presentations and activities are necessary for a successful program and we do highly encourage the critiques/presentations as part of the learning process. However, **the entirety of this guide is yours to use as a resource,** do not feel like you have to use every page. **Pick what works best for your class and your students** and feel free to add your own activities or lessons as you see fit.

LEARNING OUTCOMES We ask educators to conduct a pre and post assessment with their students and return them to our office (electronically or by mail). The data we collect from these helps us improve the program and support fundraising efforts. While our program is extremely versatile, there are key learning components that will be covered in the initial presentations and these cover a foundational understanding of the built environment.

The learning that occurs during this program that we can test for is limited. The growth that occurs is usually based around teamwork, creativity, confidence, and an array of other great outcomes that cannot be tested, but are applicable in the real world. What we are testing for are foundational aspects that are very important to modeling and building. Do let your students discover through tinkering and fumbling through their model builds. **This program is truly about the process, try not to focus on the end result.**

ABOVE ALL, HAVE FUN! This can become frustrating for students as they build their models. Laugh at and learn from failures and highlight the growth that occurs from rebuilding. That is what the built environment is all about!

If you have any questions or need assistance during the program for any reason, please contact us at **EdDir@architecturecincy.org** or 513.421.4469. We want to know how the program is going in your classroom and if there is anything we can do to help.

IMPORTANT INFORMATION FOR VOLUNTEERS

THANK YOU FOR PARTICIPATING IN DESIGN LAB! We want to make sure that you go into this program prepared so that it is a great experience for you, your educator, and your students. Please read this page carefully, as it will provide information and advice that will help you make the most of your time with Design LAB.

THE CULTURE OF CLASSROOMS WILL VARY BASED ON THE SCHOOL TYPES AND LOCATIONS. Talk your teacher to understand the classroom dynamics and to understand the best way to communicate with the students. Keep in mind that the more challenging the classroom, the more you and the students will gain from the experience. Remember to be patient with your students. The model build can be frustrating for some and with students having different levels of exposure to the information that is presented to them, some of them may find it difficult. Each student will benefit from your willingness to share your passion and creativity, even if it does not always seem that way. It is not essential for a third grader to completely understand scale, it is essential that they use their creativity and have fun while taking a closer look at the built environment.

TIMING. You are an extremely valuable resource for the classroom, but your time there is limited. Your creativity, expertise, and passion is all of great use to your classroom; so be mindful of effective ways to leverage the time you have available to your students.

STAY FLEXIBLE WHEN PLANS CHANGE. Things don't always go per the plan, especially when it comes to building models. If there are any differences in visions or goals for the classroom, this is something you should speak to your educator about.

LEARN FROM YOUR STUDENTS. Don't look at this as a one-sided relationship. You can gain just as much from this experience as the students can, be open to it. Acknowledge their innovative thinking and lack of inhibition, realize how keyed in they are to the problems facing their communities and the creative responses they have for solutions. Understand how much they have to offer the world and treat them accordingly.

ABOVE ALL, HAVE FUN! Don't get caught up if students are having a hard time grasping certain aspects of this project. If you are having fun, they will likely be having fun as well and the learning will occur naturally throughout the course of the program. Laugh through the "trying" phase with them. Encourage them to keep going. Sharing your enthusiasm is contagious and will inspire students to express theirs as well. Design LAB is possibly their first in-depth exposure to built environment concepts, and it has proven potential to elevate career aspirations.

If your students are bringing their projects to Cincinnati's Public Library exhibit at the end of the program or entering into the Bridge Break Competition, try to make it there to **celebrate with them**. You were part of the team, too!

If you have any questions or need assistance during the program for any reason, please contact us at **EdDir@architecturecincy.org** or 513.421.4469. We want to know how the program is going in your classroom and if there is anything we can do to help.

ACKNOWLEDGEMENTS

Design LAB is only possible thanks to the generous, energetic and thoughtful work of **all participating educators and classroom volunteers**. Your work in the classroom with students broadens their horizons and hones their skills in important ways no textbook ever could.

We also thank our sponsors and program volunteers, who contribute the treasure and time needed to implement Design LAB.

Graphic Design: *Janice Radlove*

PROGRAM OVERVIEW

CALENDAR

IN-CLASS WORK TIME

DECEMBER 2016 | TEAMS ASSIGNED & FIRST CLASSROOM VISIT

Educators and classroom volunteers will receive an e-mail with their assignment information. You are responsible for coordinating the date and time for initial presentations and return visits. Plan a first classroom visit in the first two weeks of December, prior to holiday break.
See "FIRST CLASSROOM VISIT" and drawing activity for suggestions.

JANUARY 3, 2017 | PROJECT KICK-OFF

The classroom PowerPoint and all Program Materials will be posted on Dropbox and on the AFC website. All participating educators and classroom volunteers will receive an electronic invitation to access program materials. If you do not receive an invitation, email **eddir@architecturecincy.org**

JANUARY 3 - APRIL 28, 2017 | RESEARCH, DESIGN & CREATION PERIOD

See the Design Challenge and **week-by-week** timeline for a breakdown of suggested benchmarks and order of activities for the completion of projects.

PRESENTATION SCHEDULE

SATURDAY, APRIL 29, 2017 | DESIGN LAB EXHIBIT: MODEL DROP OFF

Time: 9:00am–12:00pm
Location: Public Library Of Cincinnati and Hamilton County, Main Branch
800 Vine Street, Cincinnati 45202
See DESIGN FAIR EXHIBITION & REQUIREMENTS for directions and drop-off details.

APRIL 30, 2017 | BRIDGE BREAK

Time: TBD
Location: TBD
Students who are participating in **BRIDGE BREAK** can bring their bridge models to our **BRIDGE BREAK** competition to see how their bridges weigh against their components when tested for strength.

APRIL 29 – MAY 6, 2017 | DESIGN LAB EXHIBIT WEEK

Time: During normal Library hours, www.cincinnatilibrary.org/info/hours.asp
Location: Public Library of Cincinnati and Hamilton County, Main Branch 800 Vine St., Cincinnati 45202
Social Media Exhibit will be up on Design LAB's Facebook. Vote for your favorite project by "Liking" it by May 4th.

MAY 2, 2017 | DESIGN FAIR JURY REVIEW

See the DESIGN FAIR EXHIBITION & COMPETITION REQUIREMENTS for jury award categories.

MAY 6, 2017 | DESIGN LAB CLOSING RECEPTION & PROJECT PICK-UP

See the DESIGN FAIR EXHIBITION & COMPETITION REQUIREMENTS for jury award categories.
Location: Public Library Of Cincinnati and Hamilton County, Main Branch
800 Vine Street, Cincinnati 45202
Time: 10:00am–1:00pm

10:00am-12:00pm	Students Present & Discuss Their Work / Last Chance to View Exhibit
12:00pm–1:00pm	DESIGN LAB Fair Awards Presentation
1:00pm–2:00pm	Project Pick-Up / Removal
10:00am–2:00pm	**Project Check-out** & Certificates Pick-up

Educators or assigned classroom parent to pick up certificates for your class.

PLEASE NOTE: **ALL PROJECTS MUST BE SIGNED OUT FROM MAIN LIBRARY EXHIBITION SPACE NO LATER THAN 2:00pm SATURDAY, MAY 7th. PROJECTS REMAINING AFTER 2:00pm WILL BE DISCARDED.**

JUNE 2017 | EDUCATOR & VOLUNTEER APPRECIATION PARTY

Details Forthcoming

PROJECT TIMELINE

SUGGESTED WEEK-BY-WEEK TIMELINE

The following schedule is based on a classroom working on the project for one 45-60 minute class period per week. You may choose for students to participate more frequently and distribute information, activities and worksheets for review/completion outside of class. Other than assessments, this outline schedule is not mandatory, and is intended to help guide your class through the design process. Adjust at your discretion and include holidays, Spring Break and possible snow days in your overall Work Plan. Remind students to keep a folder with information and images to prepare their tri-fold project display. *Thank you!*

MONTH/WEEK		PROJECT PHASE	SUGGESTED ACTIVITIES
DECEMBER		Intro Visit | Getting Acquainted	Activity, Materials Reminder, Pre-Assessments
JANUARY			
Week 1	DISCOVER	Project Introduction	Intro Presentation, Q&A
Week 2	DISCOVER	Client & Site Phase	Client & Site Presentation, Selections
Week 3	INTERPRET	Design Concepts & Inspiration	Structures & Spatial Awareness
Week 4	INTERPRET	Understanding Sustainability	Sustainability and LEED Presentation
FEBRUARY			
Week 5	IDEATE	Design Planning	Drawing to Scale
Week 6	IDEATE	Design Planning	Plan, Section, & Elevation
Week 7	EXPERIMENT	Design Planning	Develop Plans
Week 8	EVALUATE	Presentations	Student Presentations & Critiques
MARCH			
Week 9	EVALUATE	Work Week	Modeling Exercise, Model Bases/Layout
Week 10	EVOLVE	Work Week	Model Build
Week 11	EVOLVE	Work Week	Model Build
Week 12	EVOLVE	Work Week	Model Build
APRIL			
Week 13	EVOLVE	Work Week	Mid-Project Presentations
Week 14	EVOLVE	Work Week	Refine Models
Week 15	EVOLVE	Work Week	Finalize
Week 16	EVOLVE	Presentation	Final Class Presentation, Post Assessments

CONCEPTS

DRAWINGS

MODELS & TRI-FOLDS

DESIGN THINKING & THE DESIGN PROCESS

WHAT IS DESIGN THINKING? Design Thinking is a mindset. It's the confidence that everyone can be part of creating a more desirable future, and a process to take action when faced with a difficult challenge. That way of thinking, acting, and innovating is well needed in education.

THE DESIGN PROCESS The design process is what puts Design Thinking into action. It's a structured approach to generating and developing ideas.

THE 5 PHASES OF THE DESIGN PROCESS

1. **DISCOVERY** **Discovery means opening up to new opportunities, and getting inspired to create new ideas.** Discovery builds a solid foundation for your ideas. Creating meaningful solutions for students, parents, teachers, colleagues and administrators begins with a deep understanding for their needs. With good preparation, this can be eye-opening and will give you a better understanding of your design challenge.
   - **Understand the Challenge** – Uncover your challenge to understand how it impacts the community you chose as your client or even a more global community.
   - **Prepare Research** – Look into the challenge and research the community you are focusing on improving, how will this challenge address their needs?
   - **Gather Inspiration** - How have others used similar challenges to improve communities? Collect images and stories, anything that can inspire your project.
2. **INTERPRETATION** **Interpretation transforms your stories into meaningful insights.** Observations, field visits, or just a simple conversation can be great inspiration—finding meaning and turning these into actionable opportunities for design can be a challenge. It involves storytelling, as well as sorting and condensing thoughts until you've found a compelling point of view and clear direction for ideation.
   - **Tell Stories** – Synthesize your discovery by creating inspirational stories that captures your learnings.
   - **Search for Meaning** - Look for themes that appear, explore the meaning of your findings, and define insights.
   - **Frame Opportunities** – Experiment with various visualization methods such as charts and diagrams to present your learnings. Turn your ideas into brainstorming "how might we" questions that will be used in the next phase, Ideation.

DESIGN THINKING & THE DESIGN PROCESS

THE 5 PHASES OF THE DESIGN PROCESS

(CONTINUED)

3. **IDEATION** **Ideation means generating lots of ideas.** Brainstorming encourages you to think expansively and without constraints. It's often the wild ideas that spark visionary thoughts. With preparation and a clear set of rules, a brainstorm session can yield a multitude of fresh ideas.

   - **Generate Ideas** - Establish and follow rules for brainstorming in your group, engage in brainstorming sessions, and then select ideas that have the greatest potential. Be sure to keep your notes and even take pictures of the process as they will be valuable later on for your presentation. Freely conceptualize with words, diagrams, sketches, drawings...choose methods that best help you describe your ideas.
   - **Refine Details** – Start with a reality check to determine which ideas support your goals for the challenge, which ideas have potential barriers, and which ideas can be evolved. As you narrow your ideas, capture them in a more structured format such as a mini-poster that would include the following:
     - Title of your idea
     - Summary of your idea in a single sentence
     - Description of how your idea would work
     - Explain the features and benefits
     - List challenges and questions

4. **EXPERIMENTATION** **Experimentation brings your ideas to life.** Drawing and building prototypes means making ideas tangible. Spontaneous learning occurs while drawing and building, and sharing ideas with other people. Even with early and rough prototypes, you can receive a direct response from an idea.

   - **Make Prototypes** – Prototypes enable you to share your ideas with other people and discuss how to further define it. You can prototype just about anything through drawing, modeling, role-playing, storyboards, diagrams, advertisements, etc.
   - **Get Feedback** - Present your prototype to an audience to get valuable feedback which you can use to modify and improve your idea.

5. **EVOLUTION** **Evolution is the development of your concept over time.** It involves planning next steps, communicating the idea to people who can help you realize it, and documenting the process. Change often happens over time, and reminders of even subtle signs of progress are important.

   - **Track Learnings** – As your concept evolves, you can begin to measure its impact. Define a set of criteria for success to help guide and evaluate the development and progress of your idea. Be sure to document your progress, discuss the impact of your ideas and celebrate the progress you have made.
   - **Move Forward** – When your idea has evolved into a solid concept, it's time to plan for the next steps. Create an overview of the project and determine a final timeline. Identify the tasks that need to be completed and decide who will be responsible for completing them. Invite input from people outside of your design team to help, and build collaborative working relationships with each other and other teams.

Adapted from 'Design Thinking for Educators', www.designthinkingforeducators.com, IDEO

FIRST CLASSROOM VISIT

GETTING ACQUAINTED

Prior to the first visit with the class, we strongly recommend that educators and volunteers schedule a meeting without the students. We recommend having this in the classroom, outside of classroom hours, so the volunteer knows where to go and has seen the classroom before the program begins. We recommend doing this some time in December, before the first official classroom visit.

It is recommended that educators and volunteers schedule an introductory classroom visit in December prior to the students' winter holiday. Volunteers, spend time during your first visit introducing yourself and getting to know the students you'll be working with.

Consider questions, discussions, and activities to get students thinking critically about the built environment. Some students have never really stopped to consider what goes into creating the environments and spaces that they occupy every day. Spend a few minutes helping them to think critically about ideas such as:

- The factors that are important in the design of a new structure or space.
- Which systems make up a building and what they are designed to do (this is a great place to make a comparison to the body – the building envelope is the shell, the structure is the skeleton, HVAC is the respiratory system, etc.)
- Spaces they like or don't like in buildings (e.g. their school), and why.

See next page, 'DESIGN THINKING ACTIVITY' for a suggested, fun warm-up to get students thinking about the built environment and the project ahead

IMPORTANT: MODEL MATERIALS REMINDER!

Encourage students to begin collecting modeling materials while they are home for the holiday break. Boxes and other unique packaging materials are plentiful during this time, and can easily be rescued from the garbage or recycling bins. Remind students that objects such as LEGO's, action figures, Matchbox cars, or other toys that they would not want to lose are not recommended for this project – but challenge them to think creatively about what kinds of other interesting materials can be reclaimed for future use in their models.

DESIGN THINKING ACTIVITY

The first official classroom visit is meant to introduce the volunteer to the classroom and get students excited about the program. This activity is meant to do just that! If both parts of this activity are not possible for your classroom, elaborate on the brainstorming or try to have them sketch different versions of bridges.

BRAINSTORMING

DURATION: 5 - 10 Minutes
ACTIVITY: Ask students what they think of when they think of "BRIDGE" and write it on the board. If they don't start thinking past our common ideas of what a bridge are, push them to think more abstractly or about how bridges can be used to help animals or for walking, etc. Bring up the different uses of the word bridge: used in music, card games, etc.

DESIGN THINKING ACTIVITY

BRIDGE BREAK

DURATION: 40 - 50 Minutes

MATERIALS NEEDED:

EACH GROUP:

- (15) Uncooked spaghetti
- (25) Medium & small sized marshmallows
- Measuring stick or ruler

ENTIRE CLASS CAN SHARE:

- Small paper cup
- 200-300 pennies (for weights)
- Two desks placed 10" apart to support each side of bridges

INSTRUCTIONS:

1. Use your discretion to decide how many students you want in each group (2-4 is suggested).
2. Pass out marshmallows and spaghetti to each group. Let them know they are working as groups of engineers to build the strongest bridge ever made from spaghetti.
3. Their bridge must span the "river" between the desks, which is 10 inches. If their bridge is only 10 inches in length, will it work? Let them figure out how long it needs to be.
4. The rules are that they can only use spaghetti & marshmallows to try to build the strongest bridge.
5. To test the strength of their final bridge, you can place the cup on top of the bridge and add pennies. How many pennies does it take to break it? Whose bridge can withstand the most pennies?
6. If your volunteer has the ability to address ways in which each bridge could have been improved, have them talk about that as each group's bridge breaks.
7. Congratulate your students on the successful completion of a Bridge Break! Ensure them that they will have better understanding of this before they embark on their model building.

*NOTE: the students will probably have no idea what they are doing and that is kind of the point. They will be learning this stuff during the program! So allow them to fumble around, it is just to get them thinking about how bridges are actually made and get them excited to build one after they have some foundational knowledge of how to do so (and maybe even encourage them to pay attention during those classes).

OPTIONAL ADDITIONS: Have one wall of the room assigned "triangles" and the other side assigned "squares". Ask students which they think is more stable, triangles or squares, and have them go to the wall they believe is correct. They can only make these shapes to create their bridge.

Have the students make predictions about how many pennies their bridge can hold before testing them.

For older grades, try to push them by placing the desks 20 inches apart.

THE DESIGN CHALLENGE:

BRIDGE

THE CHALLENGE

OVERVIEW & PROJECT REQUIREMENTS

THE CHALLENGE IS TO UNDERSTAND THE CLIENT'S NEEDS AND DESIGN ACCORDINGLY.

This means understanding WHO you are building this bridge for and WHY it needs to be built. HOW will your bridge improve upon the landscape or community in which it exists?

RULES OF THE ROAD

Projects may be developed in teams or individually. We recommend teams of four students. This limit ensures that each student will have ample opportunity to contribute to the design process, drawing, and model-building.

1. Models should offer real-world solutions to the design challenge. Embrace innovation and build a BRIDGE that could actually be built to address a real-world problem we are facing today.

2. Make sure you are thinking about the natural environment both in your design and in how you build your model. See if you can reimagine old/used/thrown-away items and only use these to build your model.

3. To enter your project into the Design Exhibit, you must have a completed tri-fold board unique to your project as well as a 3D model spanning no more than 2'x2'. Adults may assist, but the work must be designed and completed by students. There will be ONE project submitted from each class. Refer to the model rubric for details on judging.

HAVE EACH TEAM KEEP A FOLDER containing the Design Ideas Form(s) and all additional research, sketches, concept images, photographs, etc. for the project, and use to prepare the tri-fold panel.

CONCEPTS: DISCOVERY & INTERPRETATION

Throughout the first 4 weeks of the program, use the powerpoints to guide you through the groundwork. This will involve a lot of basic principles to provide a very solid base understanding of the concepts before the students begin their models. Identify your client(s) as soon as possible to facilitate development. See the 'Client Phase', 'Site Phase', and 'Design Inspiration Phase' to start your planning. Refer to supplemental activities and handouts to build on to the program if preferred.

DRAWINGS: IDEATION & EXPERIMENTATION

Use these three weeks to develop ideas into drawings, plans, and elevations. If your students are ready for it, this is a great time to introduce them to scale.

Have students define desired qualities/uses of their bridge: type, size, height, length, shape, color, material, etc.

STUDENT CRITIQUE

On week 8, or before students move on to building their models, have each team present their ideas to their classmates. This should include their client, site, specifics of their design (bridge type, materials, size, color, etc.), and any photos or sketches they have. Have their peers give them feedback, ideas, and constructive criticism.

MODELS & TRI-FOLDS

Time to BUILD! On average, classrooms spend about 50% of the project time for building. Students seem to look forward to this the most, but the foundational work that occurs before it is so important. Teachers who have tried to skip past that step in the past have learned how regrettable it can be.

For scale, create a few pipe cleaners (or a similar, cheap material) models to help figure out sizing for your model. They could be in the shape of people if it is a walkable bridge, animals if the bridge is made for them, cars if the bridge is made for vehicles, or a different creative client your students may have come up with. Refer to the modeling section of this guide for more tips, tricks, and ideas for building the model.

TAKE PHOTOS!

Please take photos and send them to us.

We love to see what the students are up to and use photos to show off the students' work. If there are students whose photos we cannot show publically, just let us know and we will ensure they are not made public. We love to post photos on social media and use them for marketing as well as fundraising for the program.

WEEK ONE

INTRODUCTION TO DESIGN LAB: **BRIDGE**

LEARNING OUTCOMES:

- Students will more fully understand what Design LAB is and what they will be doing during the course of the program. They will be given a chance to ask questions if they are unsure of anything.
- Students will have a better understanding of different types of bridges and how they impact the world around them.

MATERIALS NEEDED:

- Digital Presentation 1
- Notebooks
- Pencils

This lesson is meant to give students a cohesive understanding of what they will be doing throughout the program. If they haven't completed their pre-test yet, they must do that before going any further with this lesson.

Present the introductory information found in the Powerpoint which is located at www.architecturecincy.org/programs/design-lab/edu-res/

If time allows at the end of the lesson, students will be instructed at the end of the Powerpoint to journal how they are feeling about the project ahead and any initial ideas they have for it. Feel free to have this as an open class discussion or a personal reflection time.

VOCABULARY

Bridge - a structure carrying a pathway or roadway over a depression or obstacle; a time, place, or means of connection or transition

Built Environment - the man-made surroundings that provide the setting for human activity, ranging in scale from buildings and parks or green space to neighborhoods and cities that can often include their supporting infrastructure, such as water supply or energy networks

Design Process - an approach for breaking down a large project into manageable chunks.

Architects, engineers, scientists, and other thinkers use the design process to solve a variety of problems.

Compression - Objects get pressed/crushed

Tension - Objects get pulled

WEEK TWO

BRIDGE: TYPES & CLIENT / SITE SELECTION

LEARNING OUTCOMES

- Students will understand what a client is in regards to the built environment and the process that goes into selecting your **client**.
- Students will understand what a site is in regards to the built environment and the process that goes into selecting your **site**.

MATERIALS NEEDED

- Digital Presentation 2
- Notebooks
- Pencils

This phase will be heavy on research and decision making. Ensure that your students are doing enough research to make good decisions on where to place their bridge and which bridge type to choose. In this section, teams should be forming and by the end of this class period, teams should be set if they were not already.

VOCABULARY

Client - a person or organization using the services of a professional person or company

Site - an area of ground on which a town, building, or monument is constructed

BRIDGE: CLIENT PHASE

WHO IS THE CLIENT?

- This is who the bridge will be made for. The answer could be a community, maybe visitors to a certain location, or even a species who would benefit from using the bridge.
- This does not need to be only one answer – your bridge could serve multiple populations (as the Brent Spence serves residents of the Cincinnati area, travelers who are driving I-71/75 and truckers who need this bridge to get goods from one place to another.)

There are infinite options for clients. They can be realistic or imagined

BRIDGE: TYPES & CLIENT / SITE SELECTION

BRIDGE: SITE SELECTION

WHERE WILL THE BRIDGE BE LOCATED?

- Fictional or Actual Location
- This should be based on what problems your bridge seeks to solve
- Research your client to best place your bridge

STARTER QUESTIONS

- Who is your client(s)?
- How will your client(s) use the structure you create?
- How will your structure impact your client(s)?
- What function(s) does your structure have?
- Try to think of one thing that will make your structure amazing - this can be related to its function or its aesthetics.
- How can this structure be built sustainably or influence a sustainable action?

GATHER INFORMATION

- Collect photos from the internet, magazines, or from home that have many different types of bridges on them.
- Research the many ways in which bridges can improve the world and stories of how this has occurred.
- Research who or what could benefit from a bridge being built.

ANALYZE INFORMATION

- Once you have gathered this research, select your client and decide what kind of bridge would best meet their needs (is it a pedestrian bridge, one that connects trees, one that spans a long river?).
- Write or illustrate a story about how your bridge will meet the needs of your client.

BRIDGE: TYPES & CLIENT / SITE SELECTION

STEP 1: SELECT SITE

- Your site can be anywhere in the world, or even an imagined place. For realistic locations, use:
  - Google Earth: www.google.com/earth/
  - CAGIS (Cincinnati Area Geographic Information System): http://cagisonline.hamilton-co.org/cagisonline/index.html
  - LINK-GIS (Northern KY Geographic Information System): www.linkgis.org/lghome
  - Your local County Auditor's Office or Website e.g.: www.hamiltoncountyauditor.org
  - Physical maps also work great for this.
- Measuring tools to get an idea of how big your bridge will be, such as: Measuring tape (100 foot or 25 foot), meter/yard sticks, trundle wheels. Arm spans and feet lengths also come in handy! (especially for younger students)

STEP 2: ANALYZE & DOCUMENT THE SITE

ANALYZE THE SITE

What is the site like? Discuss the impact of building on a particular site. Students should think about features they want to add as well as existing conditions.

Natural Conditions

- Topography - Is the site flat? gently sloping? steep?
- Vegetation – Are there existing plants (trees, grass, bushes, gardens)?
- Climate – Is the site sunny or shady? Where does the sun rise and set?
- Geology/Hydrology – What is the ground like? Wet, dry, rocky, sandy?
- Wildlife – Are there animals that live where the site is? Deer? Birds?
- Natural features – Waterfall, stream, hill, valley, etc.

Built Environment

- Land use – study the adjacent built structures, if any exist.
- Traffic/transit –autos, people. Are there sidewalks, roads or paved areas? Is there a bus stop nearby?
- Utilities – Do you see telephone poles, electrical wires, manholes, gas meters?
- **H**istoric – Is it in a neighborhood made up of buildings that are old?

DOCUMENT THE SITE

- Take/find photos of the site.
- Draw a map so you can indicate features of the site while you walk around
- DRAW: show the shape of the existing site on drawing paper. Use the compass to mark North on your drawing. Note the time of day and the position of the sun. Measure and mark where the main features of the site are located, including natural features and the built environment.

To measure: Students can determine the length of their paces and use that to approximate dimensions and distances, or use tape measures, yardsticks, or trundle wheels.

Older students will be able to use the mathematical concept of similarity, using a yardstick and its shadow, a ruler held at arm's length, or a mirror on the ground. Here are a couple of YouTube videos about finding the heights of things:

www.youtube.com/watch?v=8-Vv-fAsuaY
www.youtube.com/watch?v=F6fltSqlmFM

Younger students could count bricks and multiply by the height of a single brick or create other strategies. Let students brainstorm ideas.

2017 BRIDGE
SITE & CLIENT
WORKSHEET

Name(s): _____ Grade: _____

_____ Teacher _____

PROGRAMMING: Describe the purpose and location of your bridge. Remember that it can be a metaphor.

Who is / are your client(s)? _____

**Note: your client(s) does not have to be the same as your traffic. For example, if World Wildlife Foundation (WWF) wants a bridge built to help Bison cross roadways, your traffic would be Bison and your client would be WWF.*

What are your client's/clients' **needs**? _____

_____

Our bridge is **located in** _____ *(a city, the suburbs, a rural area, a park, a forest, etc.)*

The bridge **crosses over** _____ *(valley, river, etc. if a real place, say where.)*

Who / What will travel across the bridge _____

Describe the **terrain** *(hilly, flat, rocky)* _____

How **long** is your span? _____

Will your bridge **need support** in the middle? yes no maybe

How wide does your bridge need to be to serve its traffic? _____

RESEARCH

1) Find several examples of your selected bridge type(s). You could search the internet, find bridges in your community to take photos of, or use books from the library.

2 Sketch a view of your bridge from above (plan view) (7-12th graders, your plans should be to scale). THEN, each team member should draw their ideas for what the bridge would look like from the side (elevation view). Decide with your team if you'll use one idea or a combination of several designs.

3) Find images of the materials your bridge will be made of, the kinds of traffic that will use the bridge, photos of the location (if it's a real place) or photos of places LIKE the fictional location you are creating. Don't forget images of bridges at night and in the daytime! Share your ideas with your team.

STEP 3: DECIDE ON A SCALE

What scale shall we use for the model?

- How big is the structure? Determine the area required for the bridge.
- How much space do we need around the bridge?
- Calculate the scale of the site for the model.
- The maximum model display space is 24" x 24".
  Listed below are the sizes of site that will fit in that space based on which drawing scale the team uses:
  - Drawing scale is 1/4"=1'-0". Largest site is 96' x 96'.
  - Drawing scale is 1/8"=1'-0". Largest site is 192' x 192'.
  - Drawing scale is 1/16"=1'-0". Largest site is 384' x 384'.
  - Drawing scale is 1/32"=1'-0". Largest site is 768' x 786'.

NOTE: Scale is not required, but is highly recommended as part of the learning and design process, especially for grades 6 – 12.

COLLECT EVERYTHING

Each team should keep a folder containing all items gathered about the site including: sketches, photos, images, nearby building types, maps, internet searches, etc. to use for their presentations to the class and their tri-fold if their project is selected to go to the library.

WEEK THREE

STRUCTURES & SPATIAL AWARENESS

LEARNING OUTCOMES

- **Students will know different types of structures and understand the forces that they are built to withstand.**
- **Students will understand how they relate to the space they occupy and how different structures and natural elements exist in a space.**

MATERIALS NEEDED

- Digital Presentation 3
- Notebooks
- Pencils
- Open Space

This will be a lesson full of exploration. To do both of the lessons fully, you may need two class periods. If you do not have time to do both, pick a couple of items from each lesson. It is important to get the students out of their seat and actually FEELING how structures work with the different loads they are dealt. Feeling how compression and tension work will be important to help them understand how their bridges should be built.

VOCABULARY

Structure - parts or elements of a built object and how they are combined and organized to hold the object together and keep its shape

Loads - natural forces that work against structures (gravity, weight, movement, vibrations, weather events, movement of the earth)

Spatial - how objects fit together in a space

STRUCTURES

Basic structural elements are used in various combinations to make up the built environment. Look around your school, community or neighborhood and see which elements you can find and identify how the loads placed upon them are transferred to the **ground**.

The structural elements to the right visually describe each element and how it reacts to **gravity** loads placed upon it. Looking at these diagrams, try to act out the structural elements with your classmates and see what it feels like when different loads are placed upon you.

TENSION:

A pulling, stretching, and expanding action

COMPRESSION:

A pressing, pushing, squeezing, and compacting action

STRUCTURE	DEFINITION	EXAMPLE	LOAD	ACT IT OUT
COLUMN	A vertical linear element used to support a beam, floor, or roof			
BEAM	A horizontal linear element spanning across an opening, supported at both ends			
WALL	A vertical planar element that separates two spaces			
SLAB	A horizontal planar element that separates two spaces			
CANTILEVER	A horizontal structural element supported only at one end			
FRAME	A rectangular arrangement of linear structural elements			
TRUSS	A 2-dimensional triangular arrangement of linear structural elements			
SPACEFRAME	A 3-dimensional triangular arrangement of linear structural elements			
ARCH	A curving or pointed element that spans across an opening			
VAULT	A series of parallel curved or pointed arches			
DOME	A series of curved or pointed arches on a round or many-sides base			
FOUNDATION	Anchors a building by transferring the loads acting upon the building into the ground			

Source Credit: Architecture In Education, The Foundation for Architecture, Philadelphia.

SPATIAL AWARENESS

NOTE: This is a good activity to lead with volunteer(s).

The intent of this activity is to help students begin to understand how their bodies relate to spaces of different sizes and types, and the functionality and feelings associated with each different spatial experience. This exploration will assist students in understanding how the specificity of space relates to the functions and activities associated with learning.

MATERIALS NEEDED:

- Ability to explore the school grounds – inside and possibly outside. Access to various spaces around the school.
- (Optional) 100 foot measuring tape or 25 foot measuring tape, grid paper, and clipboard. For this optional portion of the activity, students will measure the spaces and record responses to the questions below.

DURATION: 30-45 minutes

OBJECTIVES– Students will:

- Relate purpose and activity to space size and type – recognizing which spaces are more appropriate for specific purposes and how rooms and spaces are designed with specific intent.
- Understand their own bodies as they relate to the size and nature of different spaces.

ACTIVITY:

Select two to three of the spaces listed below (or others appropriate to your school) to visit with your students. Try to provide a range of spaces from small to large, and a variety of uses.

- Classroom
- Closet or small office (less than 8' x 8' in size)
- Gymnasium or cafeteria
- School office
- Athletic field
- Under a tree – or at the edge of a wooded area
- Outside, against a tall, blank wall (preferably no windows)
- Corridor or hallway
- Playground

(Optional) Measure the first space – students should draw and record the space size on their grid paper. Calculate the area in square feet.

Begin in the first space by having the students stand shoulder-to-shoulder in one corner of the room.

(Optional) Measure the space that this tight cluster of students occupies and record the square footage as the minimum required to pack everyone in.

- While in this configuration, ask the students what they see, what they hear, and how they feel.
- Ask the students to carry on conversations with their neighbor – and also with the teacher and volunteer from this tight configuration. What do they notice about the ease / difficulty of communicating this way?

Ask the students to spread out – at arm's length apart so that they can just turn in circles without touching. Repeat the exploration questions above.

In the larger spaces, work through one or two more cycles of spreading farther apart, and then checking how the students perceive the space they are in. Pay particular attention to how easy or difficult it may be to learn and communicate in this space. What is the appropriate people-density for the space that you are exploring? Would this type of space be appropriate as a learning environment? For what types of learning? (Be creative here – push students to think beyond the traditional uses of each of these spaces.)

Try to repeat these steps in each room or space you've selected. Help the students note the similarities and differences in their responses to each space.

DISCUSSION: We use different spaces in different ways. Typically, the places you'll visit during this activity have been designed with a very specific use in mind. Consider additional questions such as:

- How many people usually use a space this size? Would you call this a public or private space?
- What is this space used for? Is the space too big, too small, or just right for its use? Could it be used for more than one purpose?
- How many people could be in this space before it no longer works for the users? (Test this, if you can.)
- What is the light like in this space? Do the activities here need lots of light or just a little? Is there daylight? What would the room be like with / without sunshine or views to the outside?
- Can people outside the building see into this space? What do you see during the daytime? During the nighttime? What does this transparency (or lack of transparency) do to the privacy of the space?
- How easy or difficult would it be to learn in this space? What types of learning might be most appropriate to be carried out here?

WEEK FOUR

SUSTAINABILITY IN THE BUILT ENVIRONMENT

LEARNING OUTCOMES

- **Students will understand what sustainability means to the built environment and different ways to build a sustainable building.**
- **Students will learn about alternative ways in which the built environment can help the natural environment.**

MATERIALS NEEDED

- Digital Presentation 4
- Notebooks
- Pencils

This is one of the most important lessons, but there is also a lot of information to cover. Depending on the age and level of your students, some of it may seem daunting. Choose the sections that will relate and resonate with your students the best.

One fun way to go through this information is to do an "audit" on the school as you are going through each item. Grade your school on how it does in each of these categories. The accompanying powerpoint will also help bring some of these concepts to life for the students.

VOCABULARY

Sustainability - ability to continue a defined behavior indefinitely

Renewable - relating to a natural resource, such as solar energy, water, or wood, that is never used up or that can be replaced by new growth indefinitely

Organic - of, relating to, or derived from living matter

Pervious - allowing water to pass through; permeable

Solar Power - power obtained by harnessing the energy of the sun's rays

SUSTAINABILITY IN THE BUILT ENVIRONMENT

INTRODUCTION TO SUSTAINABLE BUILDING

A "Green Structure" does not mean the structure is colored green. A "green" way of creating structures means that you respect and try to understand nature in every way that you can. It means that you work with nature and not against it. Nature is older, wiser and stronger than any person or structure. To keep nature happy, healthy and friendly, choose to be considerate in the following ways:

1. RESPECT THE EARTH. Place structures onto the land and among the plants, trees, and streams so that natural beauty stays in place. Protect parks, farms, fields and natural landscapes whenever you can. Don't put things into the ground that could be destructive, such as chemicals and other man-made objects that will harm the soil, plants and animals.

2. RESPECT THE WATER. Save as much clean water as you can for important things like drinking, washing and irrigating. Collect rainwater from the roofs of structures so it can be used for other needs in the structure or garden instead of letting it wash away the topsoil or be put into underground pipes that take it far away. Where needed for pathways or parking areas, cover the ground with materials that still let the rainwater soak in and feed the plants and trees.

3. RESPECT THE AIR. Create structures that don't need a lot of energy to make them comfortable and warm. Most of the electricity that comes from power plants is made from burning coal which pollutes the air. Structures that are better insulated against the cold in winter and better ventilated with natural breezes in the summer will need less energy for heating and air conditioning. This helps the air inside and outside of the structure.

4. RESPECT THE SUN

Let the sun help light the inside of your structures instead of using lots of electric lights. To collect heat and light for winter face the structure to the south. You can use this side to have the most windows. For summer, you can use an overhang to block the sun when you don't want additional heat. If the summer sun heats up the side of the structure too much, plant big leafy shade trees to block the sun's rays. The sun and trees work well together. In the fall, these trees will drop their leaves to let the sun warm up the structure in the winter time. Make roofs, sidewalks and driveways with light colors so the summer sun will not make them too hot.

5. RESPECT THE WIND. Put structures on the land in places that protect them from cold wind in the winter. Plant evergreen trees on the side of the structure where they can block the winter winds. Try to let the breezes get into or around the structure in the warmer months of the year to help cool things off. **TIP**: Do an online search for prevailing winds in the Cincinnati area.

6. RESPECT MATERIALS & RESOURCES. When we buy materials that are made or sourced close to a project, we invest in our local economy and reduce transportation costs and expended energy. Less miles to travel also reduces the amount of carbon emissions from trucks and semis. Whenever possible, reduce, reuse and recycle materials and resources.

7. RESPECT TREES & OTHER LIVING THINGS.

Try to make structures fit into the landscape without removing many trees, plants and other living things. All of nature's creatures need to have places to live and people can't live well without them. Trees help create the air that people and animals need to breathe.

8. AND OF COURSE, RESPECT PEOPLE.

Structures are made for people to use and live in. Make buildings bright, comfortable and safe. Make them out of things that help people stay healthy. Make them strong and long lasting because people spend lots of money and use lots of resources to build them. And, probably one of the most important things is to make them beautiful for people and for Mother Nature.

— Joel Elliott Stout, AIA, Committee On The Environment, November17, 2000 (adapted)

SUSTAINABILITY IN THE BUILT ENVIRONMENT

THE 5 BIG IDEAS OF SUSTAINABLE BUILDING

Adapted from the 2006 National Building Museum exhibition principles, *"The Green House: New Directions in Sustainable Design."*

NOTE: Some of these ideas, especially in #2 through #5 are advanced and intended for real world implementation. Suggested "Big Ideas" that students may want to consider for their design are highlighted in ***BOLD.***

1. USE NATURAL ENERGY (SUN, WIND, WATER) TO POWER YOUR BUILDING.

Most of us currently rely on oil, coal, natural gas, and other fossil fuels to heat and cool our buildings. These resources pollute the environment and are in limited supply. A good alternative is to maximize the use of the **renewable resources** like sun, wind, and heat from the earth through either active or passive strategies.

PASSIVE STRATEGIES MIGHT INCLUDE:

- Design and **orient** the building to minimize summer afternoon solar heat gain and optimize winter solar heat gain. In the northern hemisphere, this means orienting the long sides of the building to face south and north, and creating roof overhangs and landscaping that shade the east, south, and west sides of the building. Minimize windows on the north to prevent heat loss, and maximize them on the south to increase solar heat gain in the winter
- Choose **colors and materials** to reflect sun where you want to prevent heat gain, or absorb sun where you want warmth. Darker colors attract and absorb heat. Lighter colors reflect heat.
- Strategically **plant** shade trees and shrubs around your building. In summer, well-placed plants and **deciduous** trees help keep the building cool by blocking the sun (south and west), while bare branches in winter let the sunlight through to warm the building and spaces inside.

ACTIVE STRATEGIES MIGHT INCLUDE USING:

- **Solar hot water** heaters on your roof use the sun's energy directly to heat water for your building. You can also use a solar batch water heater for pre-heating water.
- **Photovoltaic panels** (solar panels) also known as 'PV Panels' transform the sun's heat into electrical energy.
- Small scale **wind turbines**, which can be mounted on your roof or near your building to generate electricity.

2. MAKE SURE THE AIR INSIDE YOUR BUILDING IS HEALTHY AND CLEAN.

Americans spend up to 90% of their time indoors where air quality can contain more pollution than the air outdoors. Pollutants range from toxins, such as asbestos and formaldehyde found in building materials, to allergens such as mold, mildew, fungus, bacteria, and dust mites. The negative effects of these pollutants may cause health problems upon initial exposure or even many years later.

THE 5 BIG IDEAS OF SUSTAINABLE BUILDING

(CONTINUED)

These are some measures that can be taken to improve indoor air quality:

- Choose ventilation systems that remove dirt, dust, moisture, humidity, and pollutants.
- Seal off garages and maintenance areas from the building to eliminate fumes from cars and other equipment.
- Choose fabric and paints identified as "low VOC." Low Volatile Organic Compound materials have reduced toxic properties, limit off-gassing and keep chemical smells to a minimum.
- Test your building for toxins that influence air quality with a do-it-yourself kit or hire a specialist.
- **Create plenty of circulation of fresh air throughout your building by using fans and opening windows. Proper air movement in a building helps to exhaust harmful gases like carbon dioxide and carbon monoxide. It also removes water vapors that can cause harmful mold to grow in a building.**
- **Keep plants in your building to help remove carbon dioxide and harmful toxins from the air.**

3. CONSIDER THE GEOGRAPHY AND CLIMATE OF THE LAND AND SITE WHERE YOU BUILD.

You can create a sustainable building by using the land your building sits on wisely, and by considering the impact of the building on the surrounding environment.

Some ways you can affect how wisely land is used on your building site include:

- **Design a smaller, more compact building. Rather than building a wide, low building, consider one which is taller, has a smaller footprint, and takes up less land.**
- Choose a site that is located near public transportation, community services, jobs, shopping, and recreation to save fuel and money.
- Choose a neighborhood where buildings are clustered closer together, leaving more open space for residents to enjoy, and helping to preserve the natural landscape.
- **Adopt smart gardening and landscaping practices, like using organic pesticides and composts, as well as native plants that do not require extensive irrigation systems.**
- **Use "pervious" materials rather than paving for patios and walks. Paved surfaces can cause storm water runoff, not allowing water to be absorbed into the earth. This can result in the contamination of local water sources. Pervious materials allow water to seep slowly into the ground.**

4. CREATE A BUILDING THAT CONSERVES RESOURCES AND IS ENERGY-EFFICIENT.

The roof, walls, windows, and doors of a building create a building "envelope" that protects occupants from weather and intruders, including pests, noise, and dirt. It also controls the entry of sunlight and, most importantly, helps maintain indoor thermal comfort.

Maintaining a constant level of comfort can waste energy and be expensive, but can be done efficiently and economically by the following means:

- **Create a building envelope with more durable and energy-efficient materials that reduce drafts, balance room temperatures, control moisture, and save on heating and cooling costs.**
- Seal any gaps or cracks where moisture can get in, and heat or cooling can leak out.
- Install insulation. Insulation materials vary, but the purpose is the same: slow the transfer of heat between your building and the outside world.

THE 5 BIG IDEAS OF SUSTAINABLE BUILDING

(CONTINUED)

- Use high-efficiency appliances such as those that have earned the United States' Department of Energy's Energy Star rating.
- **Design a smaller, more compact building, which uses less energy.**
- **Design and orient the building to minimize solar heat gain in the summer, and optimize / capture solar heat gain in the winter. See 'PASSIVE STRATEGIES' in Big Idea #1.**

5. CAREFULLY CHOOSE CONSTRUCTION MATERIALS AND USE ONES THAT ARE RENEWABLE, REUSABLE, AND DURABLE.

When selecting products and materials to use in a building, look for ones that:

- **Are quickly renewable, that are easily replaced by new growth or cannot be used up.**
- **Are reusable, that are reused from a previous construction project or that can be reused for future projects. (For example, brick from an old school can be reused to create a façade for a new project.)**
- **Are durable, that are not easily damaged and can withstand the weather and climate of the site.**
- **Require low levels of energy to extract, process, and be transported. Choose local materials if possible.**
- **Have low levels of environmental impact; for example those that do not off-gas toxic materials.**

WEEK FIVE

DRAWING TO SCALE

LEARNING OUTCOMES

- **Students will understand scale as it is used in the industry and how they can utilize it in building their model.**

MATERIALS NEEDED

- Digital Presentation 5
- Notebooks
- Pencils
- Drafting paper, if available *(they can also create their own)*
- Masking Tape
- Flat Ruler
- Pipe Cleaners

This is another section that can seem ambitious for some teachers. This is a good one to do with the volunteer. Start with the scale figure activity. Take it step by step with your students and understand that they may have a difficult time with it. Understanding this section will make a huge difference when they go to build their models, but it is not the end all - be all of the program.

Again, if you can't cover it all, try to pick out the activities that you feel are most useful for your students. You know them the best, you know what they are capable of and what is too advanced. Let them leave their comfort zone, but this section should not be creating unnecessary stress for any student.

VOCABULARY

Scale - The ratio of a distance on a map to the corresponding actual distance; the ratio of a linear dimension of a model to the same dimension of a full-scale original

DRAWING TO SCALE

USING ARCHITECTURAL AND ENGINEERING SCALES

An architect's or engineer's scale is a specialized ruler designed to facilitate the drafting and measuring of drawings such as floor plans and orthographic projections (three-dimensional objects represented in two dimensions). Because the scale of such drawings are smaller than life-size, an architect's or engineer's scale features multiple units of length and proportional length increments. Scales may be flat, with 4 scales, or have a symmetric 3-lobed cross-section, with 6 scales.

In the United States, architectural scales are marked as a ratio of 'x' inches per foot, typically written as x" = 1'-0". For example, one-quarter inch measured from a drawing with a scale of "one-quarter inch per foot" or 1/4" = 1'-0" is equivalent to one foot in the real world (a scale of 1:48). Another example, one inch measured from a drawing with a scale of "one inch per foot" is equivalent to one foot in the real world or 1" = 1'-0" (a scale of 1:12).

If you do not have architectural scales, the students can create their own by placing masking tape over a flat ruler, and marking off the increments to create a scale to use for measuring. Following are instructions on how to make a 1/4" = 1'-0" architectural scale *(you can adjust for other scales, 1'8"=1'-0", etc.)*:

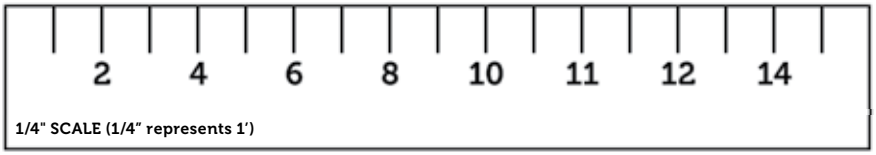
MATERIALS NEEDED:

- Flat ruler (plastic, metal, etc.)
- Masking tape
- Sharp pencil or fine-point pen for marking

1. Place masking tape over the length of a flat ruler that has 16 markings per inch.
2. Starting at zero "0", for every 4 markings (or 1/4"), create a new mark that will represent 1'-0".
3. Going back to zero "0" and from left to right, number each new mark that you made sequentially so that each one represents one foot. You should have 4 'feet' per inch. If you mark all the way to 12", you will have 48 'feet'.
4. It should look something like this (not shown to scale):

5. Now you're ready to use the architectural scale you just created for your project!

You can also create a paper scale and photocopy for student use:

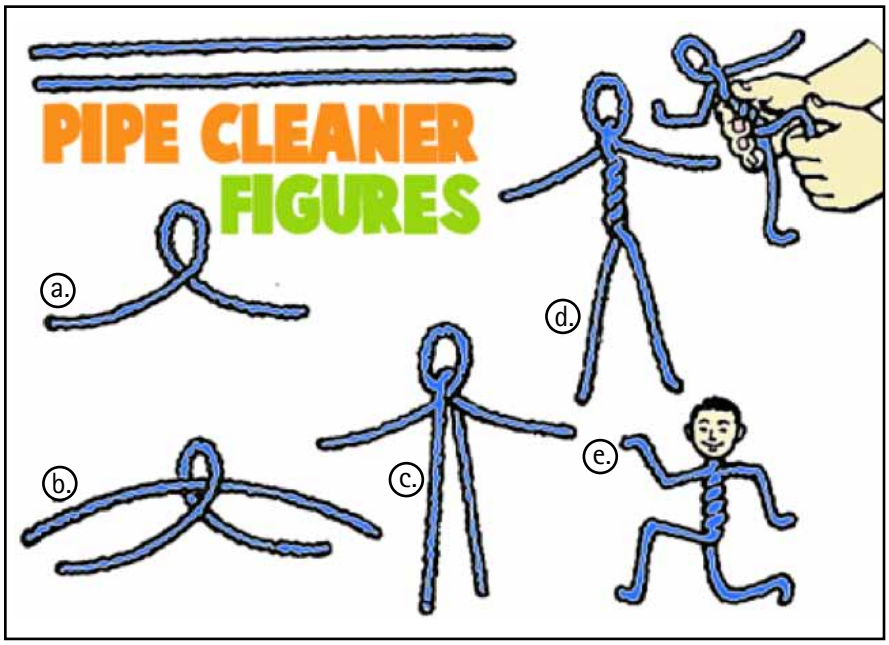


In SCALE, this straight edge is 16 feet long. Each mark represents 1 foot.

For more printable scales, go to www.printablerulers.net
Select 'Architect Scale 12-inch Ruler'. Requires legal-sized, 8.5" x 14", paper.

SCALE FIGURE ACTIVITY

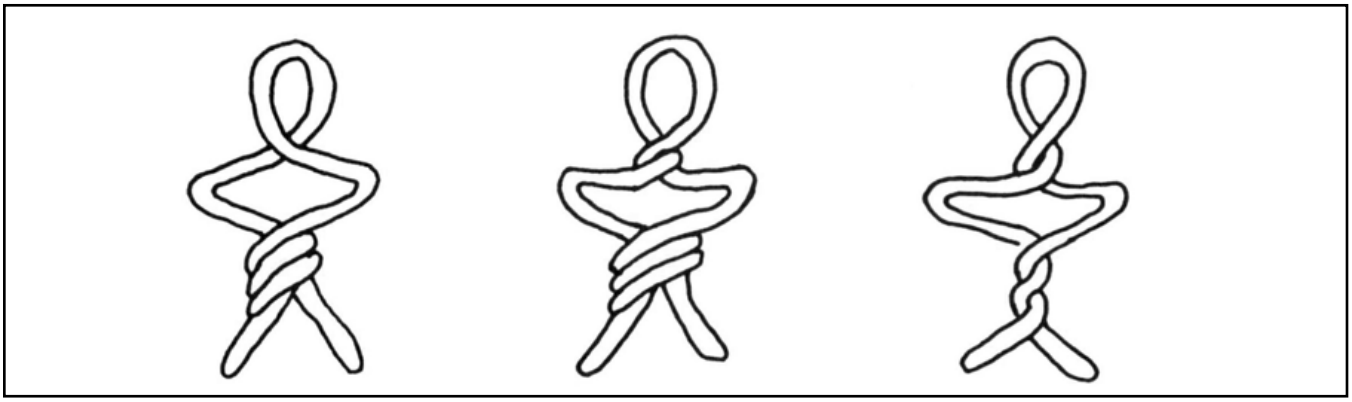
In this activity, students create a figure than can be kept and used as a scaled object for drawings and models. If you do not have pipe cleaners, you can also create a "flat" scale figure from paper, cardstock or other material.



OPTION 1: To make these figures, you will need 2 pipe cleaners, face cut-outs (optional), and glue (optional). Carefully follow the illustrations shown at the right to make the pipe-cleaner figures. Go from illustration a. to e. Glue faces to heads of figures (optional). Have each student twist two pipe cleaners as shown above to resemble a human figure. Students should measure and cut their figures, estimating how tall a house would need to be to fit the figure's scale. When making a drawing or model, use the figure to make adjustments as necessary to be sure that the figure fits.

OPTION 2: Give each student one pipe cleaner to be cut and twisted to resemble a human figure. Students should measure their figures and estimate how tall a space would be to fit the figure's scale; they can make a drawing of their learning space, adjusting it as necessary to be sure that the figure "fits" (doorway, steps, windows, ceilings, walls, etc.) This figure can be kept and used as a scale determinant for further drawings and constructions.
From 'Architecture in Education: A Resource of Imaginative Ideas and Tested Activities' by the Center for Architecture, Philadelphia, PA.

NOTE: A 6'-0" tall person at 1/4"=1'-0" scale would be 1 1/2" tall. A 4'-0" tall person at 1/4"=1'-0" scale would be 1" tall.



DRAWING TO SCALE

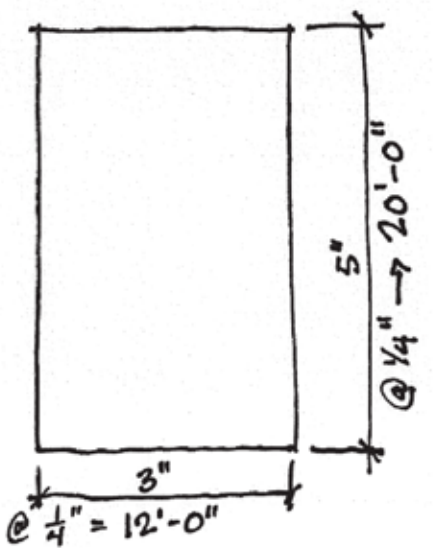
DRAWING ACTIVITY

Scale can be a tricky concept to get across, but this multi-part activity will help you and your students to understand and be able to create scaled drawings & models.

MATERIALS

- Architectural Scales / Rulers
- Each Student: standard 12" ruler, blank piece of paper - Lined or Graph paper work well too.

Copy the sketch below onto the board, large enough for students to read:



PART 1: INTRODUCING DIMENSIONS

Verbal Introduction: Architectural and engineering drawings show how big things need to be, so they're labeled with the dimensions of all the parts so the builder can build it. *(an example from your volunteer would be helpful to have on hand)*
This is how dimensions are written on a drawing.

Walk through the parts of the dimension notation in the drawing you copied onto the board.

PART 2: INTRODUCING THE CONCEPT OF SCALE

Verbal Introduction: What does it mean when we say that drawing is "to scale"? Since we can't draw a building as big as it really is (your school building won't fit on even a large piece of paper!), we 'shrink' it down so it fits into a manageable picture, but we still need to be able to measure it as we work on the design. So, we shrink it down by using a ruler in a new way: an inch or a fraction of an inch represents one foot of length.

This can be done with a regular ruler (with a bit of mental math); architects usually use something called an ARCHITECTURAL SCALE. *== pass around your scales ==* It's a special kind of ruler that is marked so that when you read 1, 2, 3, etc., instead of inches, they are actually 'feet', just shrunken down like a dollhouse or matchbox car. The smaller the fraction of an inch that is used to equal a foot, the smaller the "scale" of the drawing.

Another example of something 'scaled down' are model train sets. They're labeled differently, (O, H, HO, G, N, etc.), but each of those 'scale' designations represents a fractional scale, so that if you get parts from different places, getting the same scale makes sure they will all fit together.

1. Ask students to use the ruler to draw a rectangle in the middle of the page that is 3 inches wide and 5 inches tall.
2. Have students measure the box they drew using the 1/4" edge of the Architectural Scale, and have them write down the dimensions in feet and inches. (for younger students, do this larger on the board with them, so they can see and copy). The box will measure 12'-0" wide, and 20'-0" tall at 1/4"=1'-0" scale. Ask students to check out how big the box is at other scales. How big is it at 1/8"=1'-0" or 3"=1'-0"?

DRAWING TO SCALE

DRAWING ACTIVITY

PART 3: DRAWING YOURSELF TO SCALE

MATERIALS:

K-6

- Roll-paper (or large sheets) for making full-size outline tracings of kids

K-12

- Architectural Scales
- Standard 12" Ruler
- Tape Measure
- Each Student: DRAWING TO SCALE STUDENT HANDOUT (next page), and Pencil

K-6

1. Create full-size outlines of each student on roll paper. Arms should be down to the sides. Feet should be flexed, with the soles of the shoes at the bottom edge. Before they get up, draw horizontal lines at the ankle, knee, wrist, elbow, shoulder, chin, eyes, and top of head, similar to the Student Handout. Have them write their names on their outline's 'shirt'.

2. Hang the tracings on the wall with the "feet" on the floor. (point out now they now have "elevations" of themselves at "full-scale" meaning the drawing is the same size they are. It's a really BIG drawing! Ask, "Can you draw the school building or your house at "full scale"?

K-12 *(6th grade and up could start here)*

3. Have students pair off and measure themselves (or their full-size elevations) to fill out the DRAWING TO SCALE STUDENT HANDOUT. As they work, check to see that they are writing the dimensions with proper notation (from "Part 1: Introducing Dimensions" activity).

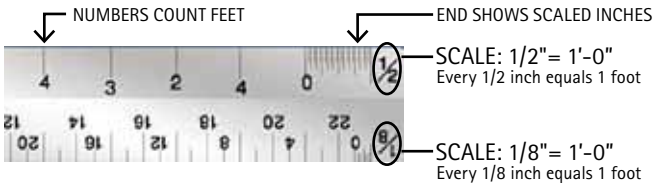
4. Once the dimensions are filled out, have them draw themselves in the graph paper section of the handout, using the 1/4" side of the architectural scale. You may need to walk through the scale translation of a few dimensions of yourself or students on the board to show the process.

DRAW YOUR CLIENT TO SCALE

When students research their client, have them find or estimate their client's height(s) and draw their client to scale next to them on the DRAWING TO SCALE STUDENT HANDOUT. A scaled, cutout figure of their client will be helpful when they start building their models. You can also have them create a Pipe Cleaner Scale Figure (see 'Scale Figure Activity').

PART 4: HOW BIG IS BIG ENOUGH?

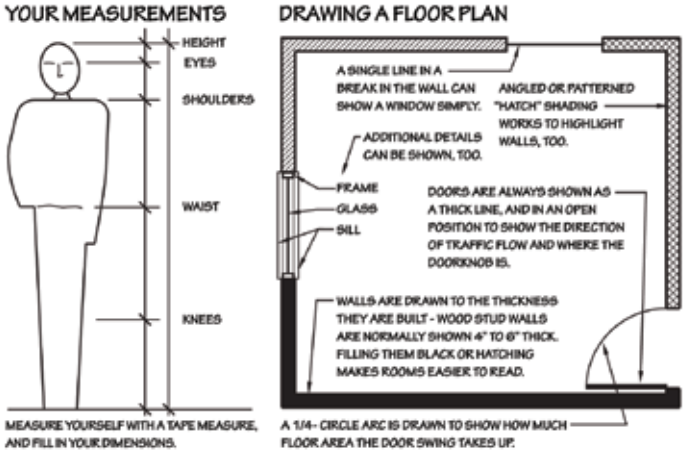
Have students measure and evaluate a few spaces that they use for studying different subjects. How much space do you really need for these activities? Green design utilizes the concept of efficiency, not just in regards to energy, but also in materials. Smaller structures use less material. How small of a space could someone learn in? Can some rooms be used for more than one purpose? Why or why not? TIP: Send students on a web quest for examples of small, efficient learning spaces.

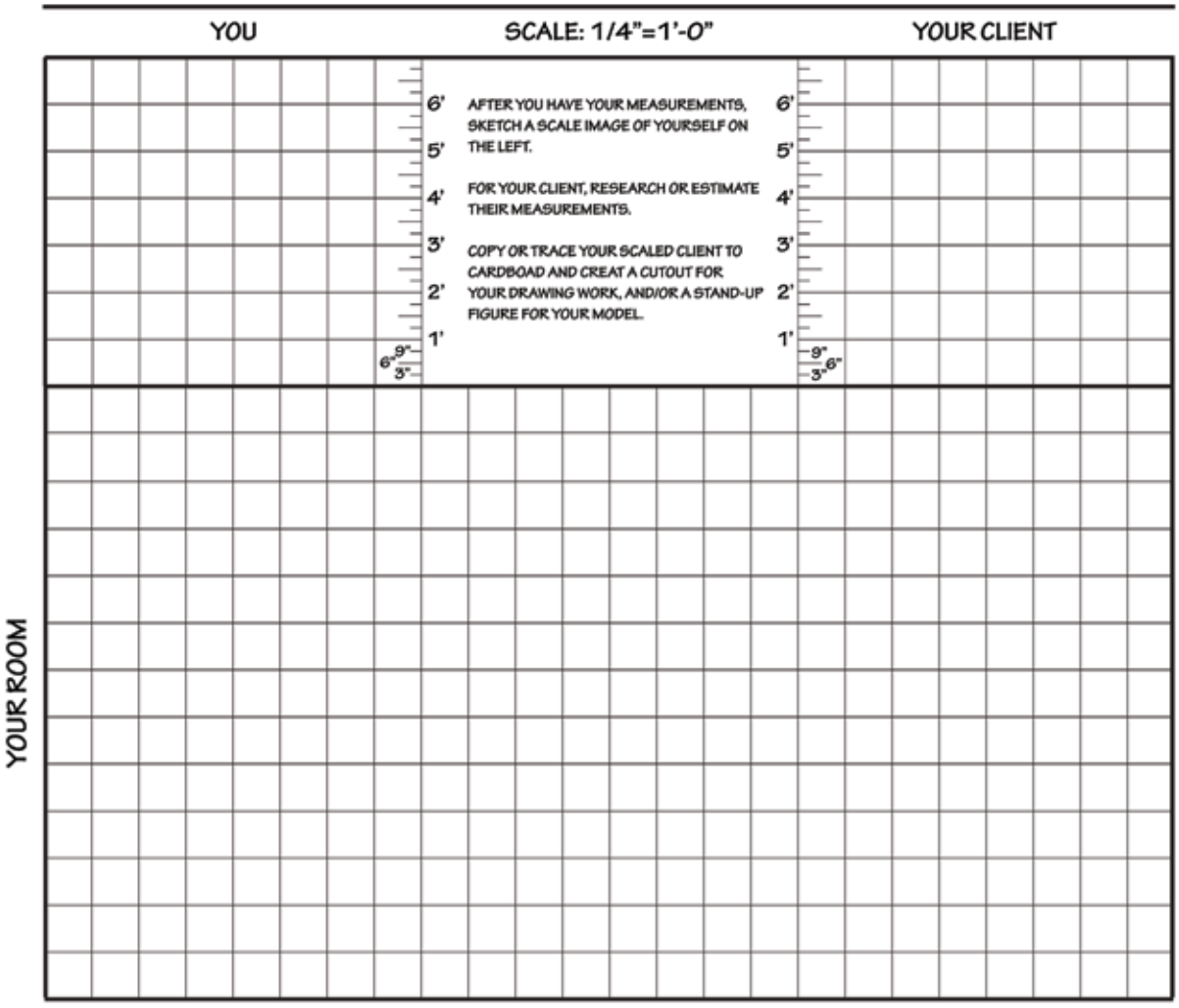


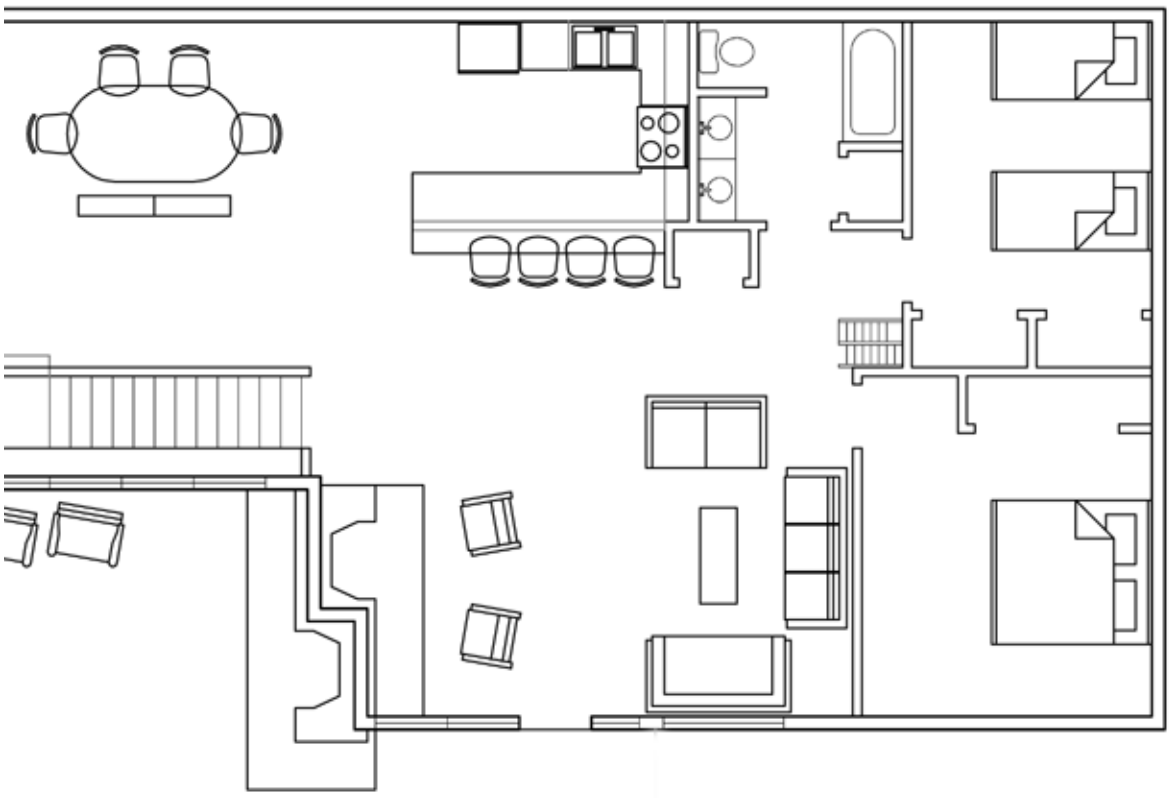
DRAWING TO SCALE

STUDENT HANDOUT

1. Have students measure their classroom, or bedroom at home, and draw a floor plan and the elevation of a wall with a window in it.
2. Evaluation — Have students write about their space. Is your room comfortable for the activities you do in it? Would it be too big or too small for other activities? Why?

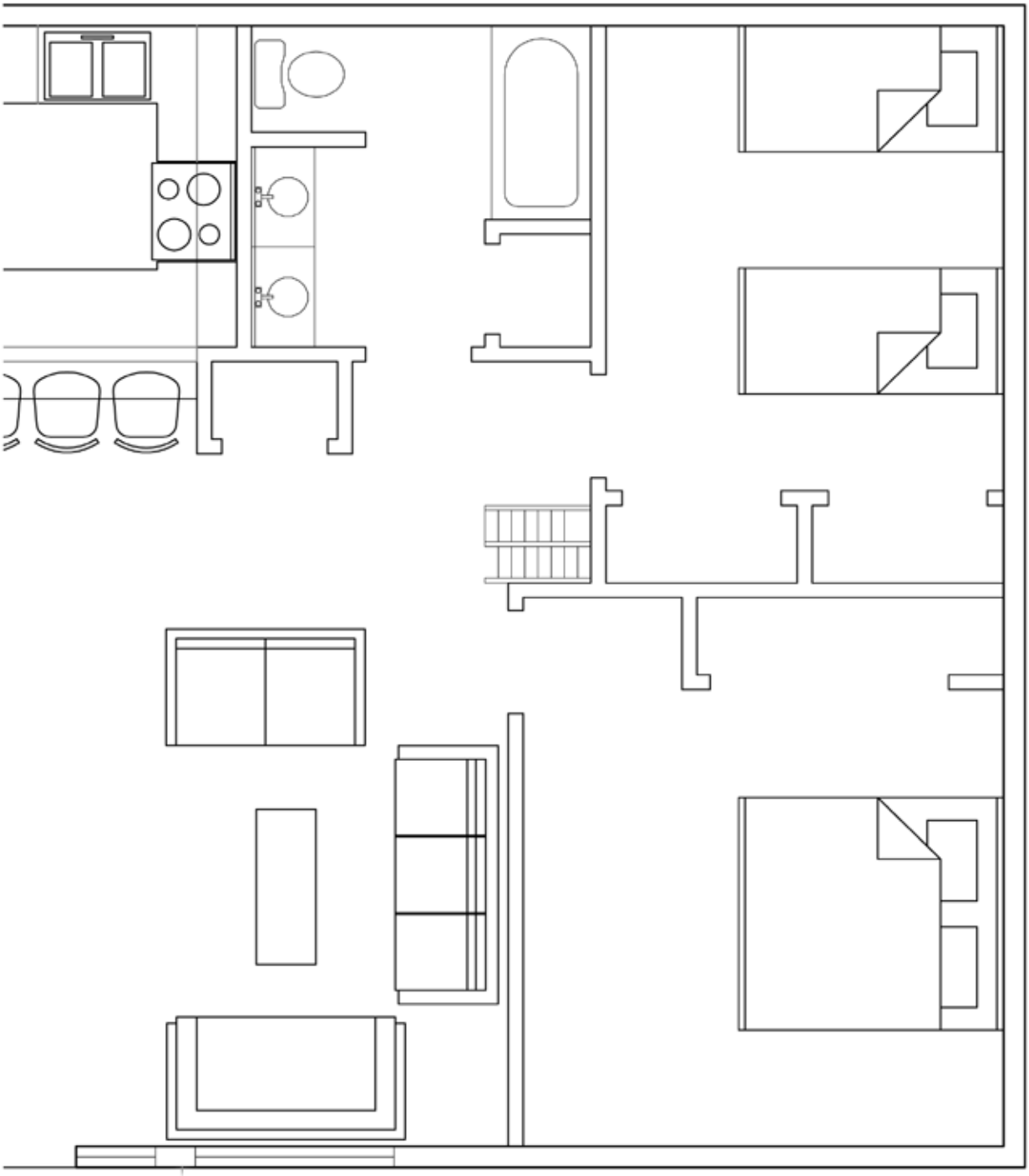


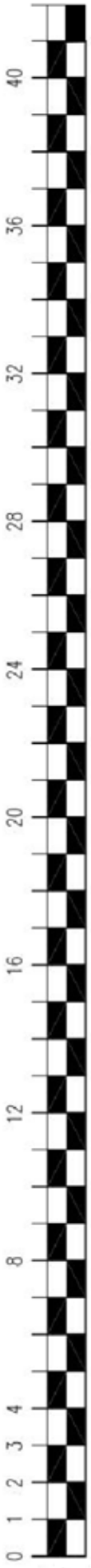




FLOOR PLAN EXAMPLE

SCALE: 1/8"=1'-0"





FLOOR PLAN EXAMPLE: SAME PLAN AT **DIFFERENT** SCALE

SCALE: 1/4"=1'-0"

WEEK SIX

PLAN, SECTION & ELEVATION

DRAWING ACTIVITY

LEARNING OUTCOMES

- **Students will draw a plan, a section, and an elevation to understand how this applies to the built environment.**

MATERIALS for each team or table of students:

- **3 green peppers**
- **a cutting board**
- **a knife** *(you can also pre-cut the peppers and hand them out one at a time as you go through the activity)*

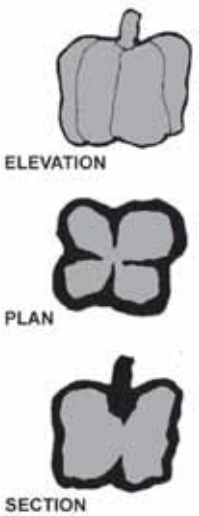
MATERIALS for each student:

- **a pencil**
- **a blank sheet of paper oriented horizontally and creased in thirds**
  When their papers are named & folded, walk through the instructions:

NOTE: The activities in this section are designed for you to conduct with your class. Directions to you, the teacher, are in italics. These would also be appropriate for your volunteer's return visits. Ask your volunteer to bring in any examples of drawings or models from their work or classes.

Architects, Contractors and Designers use three main kinds of drawings to show what designs look like and how they are built. These are the PLAN, the ELEVATION, and the SECTION.

Introduce this to students and write the words, "plan" "section" and "elevation" across the board, leaving room for you to sketch the pepper beneath each word along with them.



DRAWING ACTIVITY INSTRUCTIONS:

1. Set the first **uncut** pepper on the desk or table in front of you. Crouch down and look at it with your eyes level with the **side** of it. What you see is the ELEVATION of the pepper. Draw what you see in the **first** section of the paper. An **elevation** is a drawing of the **side** of a building, and is a direct, **perpendicular** view to what you are seeing and drawing.

2. Slice the second green pepper in half **horizontally**. What you see when you look **down** into the bottom is the PLAN of the pepper. Draw what you see in the **top half of the middle section** of the paper. When you draw the plan of a building, you are showing a horizontal "slice" at approximately four feet above the floor. When you look directly **down** at the top of the **un-cut** pepper, what you see is the "ROOF PLAN". Draw the roof plan of the pepper **below the floor plan**.

Try to orient the shape of the pepper the same way for both drawings. On the **Floor Plan**, shade in the thickness of the "walls". This shading is called "poche".

3. Slice the third green pepper in half **vertically**. When you look at the cut side of either half, you see a SECTION view of the pepper. Sections show **vertical** relationships between spaces in a building, and the walls beyond the "cut line" can be drawn in elevation within the section. Just like the plan, it's a "slice" through the object– shade in the thickness of the walls, roof and floor like you did for the walls on the plan.

WEEK SEVEN

2017 BRIDGE DESIGN IDEAS FORM

STUDENT HANDOUT

Name(s): _____ Grade: _____

_____ Teacher _____

Have you changed your mind about your bridge since we did the activity about site and client selection? Refine your ideas or switch them up if you'd like - this is the time to finalize your plan for your model.

ORGANIZING & DESIGNING: Describe your bridge in each of the following areas. If needed, use a separate piece of paper for each.

SIZE: What dimensions do your bridge need to be? (Think: width, length, height) _____

_____

SHAPE: Which bridge type will you use? Bridge Types: Circle one or more types to incorporate in your design.)

Beam Arch Truss Suspension Cable-stayed Other

What other shapes will be used to make your bridge? _____

LOCATION: Where is your bridge? (indoors vs. outdoors; rural vs. urban vs. natural; what is it over) _____

_____

ORIENTATION: What direction does your bridge go in? How does it relate to its surroundings? _____

_____

TREATMENT: What will your bridge be made of? How do those materials impact your bridge? (Think: aesthetically pleasing, structurally sound, helpful to the environment) _____

_____

What materials would your bridge be made of if it were **actually built**? _____

GREEN DESIGN SOLUTIONS: *Note: Select those that apply to your design.*

SITE (How does your bridge protect & work with the natural environment?) _____

_____

WATER (Does your bridge collect, use and protect water wisely?) _____

_____

ENERGY (Does your bridge **produce** energy? Does your bridge **use** energy? How do you **conserve** energy?) _____

_____

MATERIALS & RESOURCES (Are your materials, safe, efficient, recycled, recyclable, produced locally?) _____

_____

ENVIRONMENTAL QUALITY (How does your bridge benefit the environment?) _____

_____

SUSTAINABILITY: (How is your bridge going to last for many years?) _____

_____

PEER PRESENTATION: Use the above questions to form a presentation about your project for your class. This can be verbal, use a Powerpoint, or even use an image board to relate your ideas to your classmates.

WEEK EIGHT

PEER PRESENTATIONS

This process is at the core of how professionals work and evaluate.

DURATION

5 minute presentation + 5–10 minute discussion.

PREPARATION

Talk to the class about 'feedback' and 'criticism'. Do a little role-playing to show helpful versus negative criticism. Encourage students to each offer some critique or idea for at least one of the presentations. This is a process in which everyone is on the same team, so being helpful to one another and assisting in the refinement of ideas is the goal.

Make sure each student has access to or has seen the evaluation rubric (found on the following page) to give their peers feedback that is aligned with the project expectations.

THE PRESENTATION

With your classroom volunteer, and the class in attendance, each team presents their Image Board/PowerPoint/Verbal Presentation in 5-minutes or less. Students, teacher and volunteer offer suggestions, likes and dislikes to the team. One or more team members doing the presentation takes notes on the feedback for use.

When their presentation is complete, design teams re-group with theirfeedback and make any adjustments as necessary, recording major shifts on the Design Ideas form.

EVALUATION RUBRIC

COMPREHENSIVE CONSTRUCTOR AWARD

Research, documentation, design, and presentation

	★	★★	★★★	★★★★	★★★★★
Precision, Accuracy, and Attention to Detail	Few if any aspects of the project and tri-fold presentation demonstrate precision, accuracy, and attention to detail.	Some aspects of the project and tri-fold presentation demonstrate some precision, some accuracy, and some attention to detail.	Most aspects of the project and tri-fold presentation demonstrate some precision, some accuracy, and some attention to detail.	All aspects of the project and tri-fold presentation demonstrate precision, accuracy, and attention to detail.	All aspects of the project and tri-fold presentation demonstrate precision, accuracy, and attention to detail, and exceed some areas of expectations.
Meeting the Needs of the Chosen Client and Site	No evidence of research, documentation or design to demonstrate the project meets the needs of the client and site.	Some evidence of research, documentation or design to demonstrate the project meets the needs of the client or of the site.	Some evidence of research, documentation and design to demonstrate the project meets the needs of the client and of the site.	Evidence of research and documentation presented on the tri-fold clearly explain the needs of the chosen client and of the site. The project design and model attempt to accurately represent the ideas.	Evidence of research and documentation presented on the tri-fold clearly explain the needs of the chosen client and of the site. The project design and the model demonstrate an accurate representation of the ideas.
Representing the Design Process and Real-World Solutions	No evidence of the Design Process or a design that could be built in the real world.	Some evidence of the Design Process indicated on the Tri-fold presentation and/ or a design that could be built in the real world.	Evidence of the Design Process is demonstrated on the tri-fold presentation and the design, selected materials and model represent a real-world solution.	The Design Process is presented clearly on the tri-fold presentation as it applies to the development of the project design and model. The design and model clearly represent a real-world design solution.	The Design Process is well documented and clearly presented on the tri-fold, and includes evidence of critical and creative thinking. The Design includes clear explanations of the selected materials for the design which focus on the features and benefits of the materials.

EVALUATION RUBRIC

INSPIRED INNOVATOR AWARD

Originality and excellence in inventive design thinking

	★	★ ★	★ ★ ★	★ ★ ★ ★	★ ★ ★ ★ ★
Creativity & Innovation	The design concept and/or model materials reflect limited creativity or innovation.	The design concept and/or model materials reflect some creativity or innovation.	The design concept and model materials reflect creativity and innovation.	The presentation, design concept, model, and materials used reflect creativity and innovation.	Explanation of the inspiration behind the presentation, design concept, model, and materials used all strongly reflect creativity and innovation, and include an innovation
Collaboration	No evidence of collaboration is presented.	Some visual evidence of collaboration is presented on the tri-fold and/or model.	Some evidence of effective collaboration is presented on the tri-fold and/or model.	Deliberate evidence of effective collaboration is presented on the trifold and/or model for at least one step of the design process.	Clear and deliberate evidence of effective collaboration is presented on the tri-fold and/or model for multiple steps of the design process.
Originality	No evidence of originality is present in the concept design, model materials or model.	Some evidence of originality is present in the concept design, model materials and/or model.	Evidence of originality is present in the concept design, model materials, and in the model.	Project is unique in most aspects of concept design, model materials, model, and presentation approach.	Project is clearly unique in all aspects of concept design, model materials, model, and presentation approach.

EVALUATION RUBRIC

SUSTAINABILITY SURVEYOR

Awareness of design's environmental impact, use of sustainable materials and solutions

	★	★★	★★★	★★★★	★★★★★
Responsibly Sourced Materials & Systems	Project does not attempt to include responsibly sourced materials and/or systems.	Project attempts to include responsibly sourced materials and/or systems.	Project effectively utilizes at least one responsibly sourced material or system.	Project effectively utilizes multiple types of responsibly sourced materials and/or systems.	Project effectively utilizes multiple types of responsibly sourced materials and/or systems and includes a rationale for each selection.
Sustainable Design Solutions	Project does not integrate a sustainable design solution.	Project attempts to integrate a sustainable design solution.	Project effectively integrates one sustainable design solution.	Project effectively integrates multiple sustainable design solutions.	Project effectively integrates multiple sustainable design solutions and clearly provides reasoning for the selections.
Impact on the Environment	Project does not address environmental impact of the design or materials.	Project attempts to address environmental impact of the design and attempts to utilize sustainable materials for the solution.	Project addresses at least one environmental impact of the design and utilizes sustainable materials for the solution.	Project addresses multiple environmental impacts of the design and utilizes sustainable materials for various solutions.	Project effectively integrates multiple sustainable design solutions and clearly provides reasoning for the selections.

MODELING

INFORMATION, TIPS, & RESOURCES

REMINDER: Your model base is 2'-0" x 2'-0" (24" x 24").

If selected SCALE is:		
	1/32" = 1'-0", largest site is **768' x 768'**	**1/16" = 1'-0"**, largest site is **384' x 384'**
	1/8" = 1'-0", largest site is **192' x 192'**	**1/4" = 1'-0"**, largest site is **96' x 96'**

GENERAL TIPS:

Valuable items such as dolls, building system toys (Legos, Tinker Toys, etc.), matchbox cars, dollhouse furniture, etc. are **STRONGLY DISCOURAGED** for projects that will be submitted for exhibition. While every effort will be made to keep projects safe, it is a highly trafficked public space and we cannot guarantee safety.

Hot glue is a favorite for the speed it allows when putting together projects. Please be aware that some plastics such as polystyrene give off fumes when in contact with hot glue. Always work in a well-ventilated area and use caution with 'found' materials and hot glue.

White Glues such as Tacky-glue and Sobo (there are other 'craft' glues too) dry a little faster and are more viscous than Elmer's, so they stick better to what you're working on. With all typical white school and craft glues, tight connections and a "less is more" ethic work best for both speed of construction and the overall strength of the model.

Play-Doh Or Clay allows students to show multiple designs in a short span of time and they can make edits to their first drafts without scrapping their initial model completely. To get a quick grasp of what shape they want their building to look like, give the students an equal amount of clay or Play-Doh to shape ideas they have for a building.

MODELING ACTIVITY: COLLECTING MODELING MATERIALS

As soon as possible, begin to collect the following: cardboard, construction paper, card-stock, thin-cardboard boxes of all shapes, cereal boxes, plastic cups, emptied (cleaned & dried) soda bottles, straws, sticks, rocks, formed plastic pieces from packaging, and any kind of clean packaging discards that do not have food or toxic residue.

OPTIONS

- Designate a team of students to develop a flier to print and send home in backpacks asking for materials.
- Have all students create a designated collection box at home, and ask their parents to bring materials home from the office.
- Place COLLECTION BINS around the school - Library, Office, Teacher's Lounge, Parent Center, Cafeteria, etc.
- Have students prepare a presentation to the teaching staff about the project and the materials they are looking for as the start of having the collection bins around the school.

MODEL REFERENCES

There are many websites that you can search for references of other models that were designed and mocked-up by professionals; this will give you an idea where to start when making your own 3D models. These websites also show examples of well designed buildings and spaces if you wish to research other structures of learning. These include but are not limited to:

Arch Daily - http://www.archdaily.com
Architectural Digest - http://architecturaldigest.com
Design Boom - http://www.designboom.com
Dezeen - htpp://www.dezeen.com
Pinterest - http://www.pinterest.com
You Tube - http://www.youtube.com

3D MODELING

SketchUp 3D Digital Modeling:
http://www.sketchup.com/3Dfor/k12-education SketchUp® is a user-friendly 3D modeling program made available online for FREE (limited edition). In previous years, several classes have utilized this visualization tool successfully. A little time on the tutorials provided on SketchUp web pages can get students ready to build their models in cyber-space, and even upload them to the 3D Warehouse site for all to see! If you are uploading models, please use "DLAB2016" in the front of the file names so they stay together.

NOTE: Ask your volunteer for suggested tips for model making. Younger students will require assistance with the cutting and hot-gluing materials option. Invite older students, siblings and/or parents to help assemble, if possible. If additional time is needed outside of class to finish, lunchtime, recess and "Pizza Night" or "Super Saturday" events can be great community gatherings to complete projects.

WEEK 16

MINI DESIGN LAB EXHIBIT

Due to the library taking on exhibit pieces from the Cincinnati Museum Center as they undergo renovations, we are limited this year to one project per classroom at the Design LAB Exhibit*. This has created an opportunity for classes to decide which project will represent them at the exhibit. This can be done on a small scale (ie. in a classroom during class time) or a large scale, if you want to make it a school-wide event or even invite parents. This is up to the teacher's discretion, as they will be the ones implementing it.

Students should be the ones deciding which project will move on the exhibit, but the teacher can determine how the voting process will work. They can use a rubric sheet (on the following page) to judge the projects in a similar way that the judges at the exhibit will during the Jury Review Night. This team will get the tri-fold board to prepare for the Design LAB Exhibit. Make sure students understand that the winning team will be representing their entire class at the library's exhibit, so they will want to send the best project there, not necessarily their best friend's project.

Have fun with this aspect of the project and give your students a chance to celebrate all of their hard work!

We are actively searching for an alternative location for the Design LAB Exhibit for the 2018 program. The Public Library of Cincinnati has been a wonderful partner to us, but with the ongoing growth of the program, we are outgrowing the space they can provide us regardless of the renovations at the Cincinnati Museum Center.

ARCHITECTURE AND DESIGN VOCABULARY

BUILT ENVIRONMENT: Human-made surroundings, such as buildings, structures, parks, streets, and bridges

CARDINAL DIRECTION, CARDINAL POINT: One of the four principal compass points: North, East, South and West also designated by N, E, S and W

CLIENT: A person or group that uses professional advice or services, for example from an accountant, architect, engineer, etc.

CROSS SECTION: A view into the inside of something made by a plane cutting through it

CONSERVE: To preserve and/or use the earth and resources in such a way as to avoid waste

DESIGN PROCESS: To create for a particular purpose or effect, usually in an arrangement of parts / details.

DURABLE: Products that are long-lasting and require little maintenance

ECOLOGY: The study of the relationships of organisms to one another and to their physical surroundings.

ECOSYSTEM: A community of organisms (plants, animals, microbes) in conjunction with the nonliving components of their environment

ENERGY SMART: Meeting your energy needs cost effectively and with the least impact on the environment

ENVELOPE: The skin of a building— including the windows, doors, walls, foundation, basement slab, ceilings, roof and insulation— that separates the interior of a building from the outdoor environment

ENVIRONMENTAL IMPACT: The effect of materials on the environmental quality inside your home and to the outdoor environment and atmosphere

FOOTPRINT: Land area taken up by a building

FOSSIL FUELS: Carbon-rich deposits in the earth, such as petroleum (oil), coal, or natural gas, derived from the remains of ancient plants and animals and used for fuel; non-renewable energy

"GREEN": Making environmentally friendly choices that use our natural resources for present needs without depleting those resources for future generations

INSULATION: A material that prevents or reduces the passage, transfer or leakage of heat, electricity or sound

LEARNING SPACE: the product of a design process created from the relationships between forms of space and style of learning.

LOCAL (MATERIALS): Materials extracted/manufactured/ produced within 500 miles of building site

MODEL: A three-dimensional representation of a person, thing or proposed structure of a smaller scale than the original

NATURAL RESOURCE: A material or supply such as timber, fresh water, or a mineral deposit, occurring in nature and with the potential for human use

PROGRAM: A list of types of spaces needed for a project and their associated areas, usually in square feet (area)

RECYCLE: To use again, especially to reprocess

REGION: An area with similar characteristics that separates it from other areas. Regions might be defined by criteria like common culture or language; climate; economic activity; or political connections. Regions have extremely fluid definitions that might be as small as a neighborhood or as large as a continent

RENEWABLE: Natural materials that can be rapidly replaced in the environment, such as fast-growing trees and agricultural products

RENEWABLE ENERGY: Energy derived from sources that do not deplete natural resources; examples include solar, wind, and geothermal energy from the Earth's core

REUSABLE: Products that can be used again or recycled once they are no longer needed or operable for their original purpose

RURAL AREA: An area of very little development, often characterized by agricultural uses or undeveloped land

SCALE: 1. The ratio of a distance on a map to the corresponding actual distance. 2. The ratio of a linear dimension of a model to the same dimension of a full-scale original

SHAPE: The form of an object or its external boundary / outline

SITE, BUILDING SITE: A place or area where something is, was or will be built

SKETCH: A rough drawing that can express an idea

STORY, STORIES: A floor or level(s) of a building

STRUCTURES: Elements of a built object that are combined and organized to hold the object together and keep its shape.

SUBURBAN AREA: A developed area located outside the denser urban center characterized by a separation of uses and within commuting distance

SUSTAINABILITY: Meeting the needs of the present without depleting resources or harming natural cycles for future generations; another way to say "green"

TWO-DIMENSIONAL (2-D): A shape that only has two dimensions and no thickness (x, y)

THREE-DIMENSIONAL (3-D): An object that has height, width and depth (x, y, z)

URBAN AREA: An area of dense or closely placed development, often associated with a street plan made up of blocks, and mixed uses; a city

WATERPROOF: Designed to prevent water from entering or passing through; impervious to water

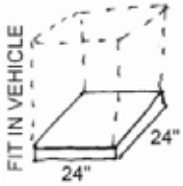
DESIGN LAB EXHIBIT AND COMPETITION

REQUIREMENTS

DESIGN LAB EXHIBIT

DESIGN LAB EXHIBIT & REQUIREMENTS

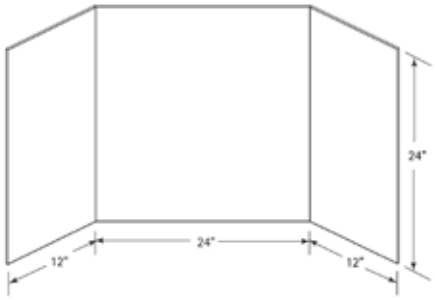
A Design LAB Exhibit will be held to showcase student work. In addition to a display of their three-dimensional models and tri-fold panels, the Design LAB Exhibit will offer students and volunteers the chance to talk with visitors about the entire planning and design process.



DESIGN LAB EXHIBIT ENTRIES

Each classroom may participate in the Design LAB Exhibit by creating both a:

- 3-dimensional tabletop architectural model not to exceed 24" x 24" (base)
- 24"h x 48"w Tri-fold panel (provided by AFC)
- Each class will submit the project that the students vote to send to the exhibit



ONE (1) TRI-FOLD BOARD WILL BE PROVIDED FOR EACH CLASSROOM

The tri-fold display gives students the opportunity to describe and illustrate the work they do leading up to the design and build of their model. Please have students collect and keep evidence of their Design Thinking in action. This evidence will help to tell the story of how they utilized the phases of the Design Process -- Discovery, Interpretation, Ideation, Experimentation, & Evolution to complete the challenge. As you determine which project will be selected for the Design LAB Exhibit, the student teams can use the tri-fold display to tell the story of their journey.

REQUIRED: DESIGN LAB EXHIBIT ENTRY LABELS

- Entry Label 1 (one half): Securely fixed to underside of the tri-fold
- Entry Label 2 (other half): Turn in at the time of drop-off on April 30, 2016
- Project Description: Title of model and description needs to be on the front of the tri-fold somewhere.

ALL PROJECTS MUST BE LABELED AT THE TIME OF SUBMISSION. PLEASE USE ENTRY LABELS PROVIDED IN THIS PACKET.

PROJECT SUBMISSION

INFO & REQUIREMENTS

DESIGN LAB EXHIBIT FORMAT: Models and tri-fold displays will be viewed primarily from one side, lined up side-by-side along a table and back-to-back with other projects. Model and tri-fold orientation and any labeling of elements should take this into consideration.

TEXT & LABELING: Students should strive to communicate as much as possible about their designs through graphic representation. Information may be written or typed on the tri-fold boards, and should be legible, neat and organized. Any labeling of individual features on models should be discreet and not distract from the presentation.

STURDINESS: Submitted entries should be well-constructed and able to be moved without fear of destruction. Models and tri-folds will be shifted and re-arranged as needed after drop-off. While every effort is made to protect submitted projects, we cannot take responsibility for any accidental breakage of models. A "fix-it" station will be available upon arrival with supplies for emergency repairs.

SCALE: Scale is strongly encouraged for 6th – 12th grade projects. Projects in the K-2 and 3–5 with at least some element of scale is also encouraged (but not required). Neatly and discreetly label drawings & models with the scale designation, e.g. Scale: 1/4" = 1'-0". More than one scale may be used for the tri-fold presentation. The **Project Description sheet** should be part of the tri-fold panel design. Layout of presentation boards should take this into consideration.

CREATIVE WRITING: The **Project Description** is your students' chance to describe to the jurors and exhibit visitors how they approached the Learning Spaces challenge, their green design solutions, and tell the how and why of their designs. Using the information and ideas recorded on the **Design Ideas Form** and any additional records, have them write a project description summary; include important, descriptive language that will highlight ideas and help the jury visualize a trip to the designed Learning Space. Use the **Project Description** sheet provided at the end of this guide.

JURY REVIEW: The Jury will be made up of professionals from local architecture, construction, design, education and engineering communities. A team of approximately 3-4 jurors will be assigned for each of the three award categories. Jury members will consult one another for the Juror's Choice Award.

PRIZES: Students & educators selected for award categories will receive a prize and ribbon/certificate. Afterward, a photo of their model, their names, school name, educator name, and project title will be listed on the AFC web page.

RECEPTION & AWARDS: We kindly ask that projects be left in-place for the duration of the reception to give students an opportunity to present their work, and everyone a chance to see all the projects. Often, this is the only occasion students have to see the work of others.Afterward, all projects are to be removed from the exhibition space by 2:00pm.

PROJECT COLLECTION: Projects will be checked in on Saturday, April 29 (use Design LAB Exhibit Entry Labels at the end of this guide) and checked-out on May 6th. Educators: If you cannot be at the awards reception on May 6th, please designate a parent to collect your class' project. We do not want to toss student work, but must dispose of projects that remain uncollected after 2:00 pm.

CERTIFICATES: Educators may pick up their blank Certificates of Participation for all students who complete a Design LAB project at the drop-off on April 29, 2017 or, at the time of the awards reception on May 6th, at the Main Branch Library. If pick-up is not possible, please contact AFC for other arrangements. A digital version of the Certificates will also be available.

DESIGN LAB EXHIBIT

RECOGNITION

All Design LAB Exhibit entries will be reviewed and evaluated by our Fair Jury Panel, local professionals and educators in the built environment. The jury panel will review entries in these grade categories: (K-2,) (3-5), (6-8) and(9-12). In the case of multi-grade groups, projects will be placed according to the highest grade level represented.

Awarded entries will be recognized at the Design LAB Exhibit Program on **Saturday, May 6, 2017**. Three recognition awards will be given in each of the four grade categories to the participating students and their teachers.

ENTRIES WILL BE REVIEWED FOR THESE ELEMENTS:

- comprehensive, thorough and innovative ideas
- real world design solution success in meeting needs of client
- sustainable materials and green building solutions

AWARD CATEGORIES

INSPIRED INNOVATOR: *Project is unique and represents excellence in inventive design thinking*

- The learning space prompts the viewer to think, and reflects the designers' ability to creatively collaborate and express their work
- The space is energizing, inspiring, and motivating to promote learning and foster chosen activities
- The design concept and materials clearly demonstrate an innovative response including size, shape, orientation, treatment and functionality

COMPREHENSIVE CONSTRUCTOR: *Project represents a well-researched, well-documented, and comprehensive design, which appropriately addresses client needs.*

- The tri-fold and model tell the story of the entire design process and were created with precision, accuracy and attention to detail
- The learning space could be built in the real world using the presented design and selected materials for a real world client
- The project demonstrates a thorough understanding of the chosen site and client needs, while expressing a developed design solution

SUSTAINABILITY SURVEYOR: *Project strongly exhibits an awareness of the design's environmental impact and utilizes sustainable materials and solutions*

- The learning space design utilizes responsibly sourced materials and systems
- The space clearly and effectively incorporates sustainable design solutions, such as natural lighting, solar or wind power, water catchment or green roofing
- The project strongly demonstrates how the learning space design limits its impact on the environment

JURORS' CHOICE: *Jurors are invited to give the Jurors' Choice Award to outstanding project(s) in each grade category.*

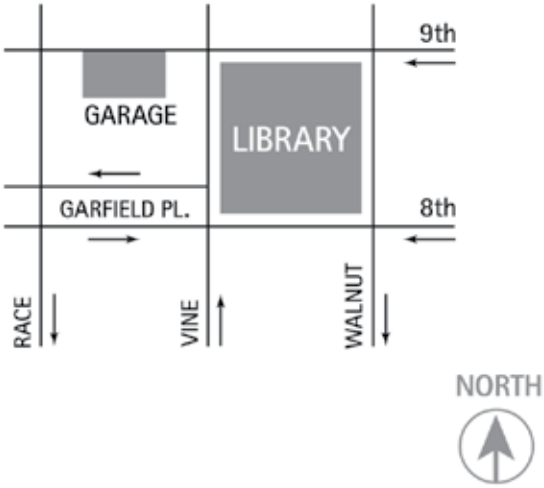
PEOPLE'S CHOICE: *A ballot box will be provided during Design Fair Exhibit Week for the general public to vote on a favorite design.*

SOCIAL BUTTERFLY: *The models who do not make it to the library will be displayed on a social media page where people can "vote" for them. The project with the most votes will win this award and it can be displayed at the library on the day of the awards ceremony.*

DESIGN LAB EXHIBIT

APRIL 29 - MAY 6, 2017

PUBLIC LIBRARY OF CINCINNATI AND HAMILTON COUNTY, MAIN BRANCH
800 VINE STREET, CINCINNATI, OH 45202



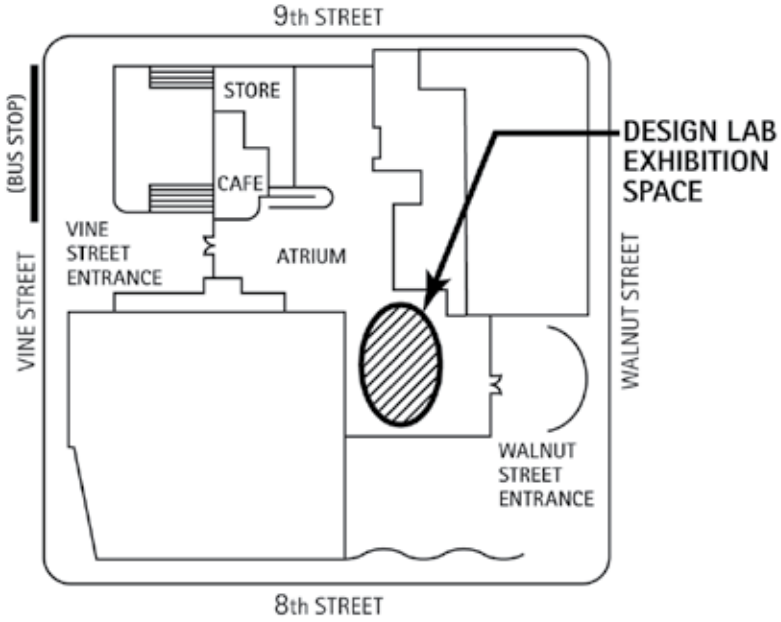


EXHIBIT DROP-OFF

- Between 9:00am to 12:00pm on Saturday, April 29, 2017 *(Volunteers will be available to assist)*
- South building of the Main Public Library, Downtown Cincinnati.

PARKING

- METERED PARKING available on Vine, Walnut, 8th and Garfield Place.
- GARFIELD GARAGE (public) 13 W. 9th St., 45202 (on 9th Street between Vine and Race Streets).
  RATES:
  0-1 Hour: $1.00
  1-2 Hours: $2.00
  2-3 Hours: $3.00
  3-4 Hours: $4.00
  4-5 Hours: $5.00
  5+ Hours: $6.00 (Daily Max.)

WHAT TO BRING

- Models
- Tri-fold panels **(WITH Entry Label)**
- Extra Entry Label to Check-in

DESIGN FAIR ENTRY LABEL

IMPORTANT: Complete and affix label on model BEFORE dropping off at Main library and BRING EXTRA COPY for check-in

School _____ Teacher _____

Project Title _____

Student Designer / Design Team:

Name _____ Grade _____

Name _____ Grade _____

Name _____ Grade _____

Name _____ Grade _____

Name _____ Grade _____

Name _____ Grade _____

Classroom Volunteer Name(s) & Company / Organization:

_____

Client _____ Location / Site _____

DESIGN FAIR ENTRY LABEL

IMPORTANT: Complete and affix label on model BEFORE dropping off at Main library and BRING EXTRA COPY for check-in

School _____ Teacher _____

Project Title _____

Student Designer / Design Team:

Name _____ Grade _____

Name _____ Grade _____

Name _____ Grade _____

Name _____ Grade _____

Name _____ Grade _____

Name _____ Grade _____

Classroom Volunteer Name(s) & Company / Organization:

_____

Client _____ Location / Site _____