Rice Architecture Mentorship

Recess Exercises

Rice Architecture Mentorship

Credits

©Rice Architecture, 2018

Exercises authored by:

David Rader Ana Escobar

With thanks to:

Jesús Vassallo Ian Searcy JP Jackson Keegan Hebert

Exercise Order

Paper Tower

This exercise is an introduction to the structural concepts of tension and compression. Students will investigate the structural properties of geometric modules. Once tested and evaluated, students will work in teams to use these modules to construct a paper tower.

Object House

This exercise is an introduction to the ways in which visual and verbal communication are utilized through the design of the built environment. Students will explore the concepts of visual and verbal communication by designing and producing conventional drawings for a conceptual house.

Spatial Planning

This exercise will challenge students to evaluate the quantitative and qualitative components of space. The focus on scale will build upon the previous exercises of structure and communication while allowing students to understand the ways in which architectural planning relates to real space.

18

Community City

Cities are made up of communities. In this exercise, students will work independently to develop a community plan, then aggregate their plans together to create a larger design for a city. Students will gain an understanding of the elements of the built environment which make up a community, and how communities are connected to form a city.

22

Learning Park

This exercise will focus on the environment. The environment encompasses everything around us, including built components, the global climate, the context of local conditions, and our immediate landscape. This exercise will allow students to design a small park with a solar classroom to consider how architecture may respond to the environment.

04

08

13

Exercise 1 Paper Tower

Summary

This exercise is an introduction to the structural concepts of tension and compression. Students will investigate the structural properties of geometric modules. Once evaluated, students will work in teams to use these modules to construct a paper tower.



Key Terms



Geometry diagrams

Arch	A curved structure that serves as a support
Column	A vertical supporting member
Compression	The application of pressure against an object
Gravity	The force which pulls things to the Earth
Horizontal	Parallel to the plane of the horizon
Load	A weight borne by structural members
Structure	Something that is constructed
Tension	A pulling force that pulls on a material
Vertical	Perpendicular to the plane of the horizon



Slit joint design

Exercise Organization

Time

Space requirements

One room with open space for students and facilitators to move around in. There should be tables for students to work on.

Facilitator requirements

1-2 facilitators per group of students. It is recommended that students work in groups of no more than five.

- Facilitators should review the lesson ahead of time and be familiar with the structural concepts discussed.

Materials

- Letter-sized, multi-colored paper (50 pages per group)
- Scotch tape (1 per group)
- Glue sticks (1 per group)
- Scissors

Preparation

Students will form teams of five. Facilitators will distribute the appropriate amount of materials as listed above to each group of students.



Paper tower, MJW Architecture

Part I: Modules

Key Terms

Horizontal

Vertical

Loads

Connections

Module Geometries



Cube

Cylinder



Prism

Students build modules



Modules are tested

Procedure

Summary

Part I will allow students to experiment with structural principles. Students will construct paper modules based on the geometry diagrams (left). Once the modules are complete, students will apply loads to the modules in vertical and horizontal orientations. The objective is to develop strategies which will be applied to the tower in Part II. Questions to consider: *What orientation are the modules strongest in? Will adding materials increase the strength of the module?*

Step 1

() 10 minutes

Students should construct structural modules with the paper provided.
 Have students experiment with joint techniques, including folding, cutting, splitting, and gluing.

- Structural shapes include cylinders, cubes, and triangular prisms

Step 2

 \bigcirc 5 minutes

- Students will test the shapes they've made by applying pressure (or loads) to the shapes in vertical and horizontal orientations.

- Students should pay attention to the points of failure of the modules they've constructed in each orientation as they relate to tensile and compressive forces.

Step 3

🛈 5 minutes

 Students will present their modules to their team. Each student should communicate the strategies explored to translate successful design decisions into the tower design.

- Facilitators will lead the group discussion.

Discuss

The desired outcome of Part I is to have students develop an understanding of the structural principles discussed. By constructing and testing the geometric modules, students will develop strategies for the design of the paper tower.

Part II: Tower

Key Terms

Module

- Vertical
- Forces
- Connection



Student tower example



Student tower example

Procedure

Summary

Students will appropriate the strategies explored in Part I to construct a paper tower. The tower will use the modules designed in Part I. Facilitators will work with each team to develop the tower. Students should work to achieve a maximum height in the alloted time. Care and attention should be given to joints, connections, and material assembly. Questions to consider: *How are the modules aggregated? What will the connections be between modules? Will reinforcement make the structure stronger?*

Step 1

() 10 minutes

 Each group will develop a plan for construction while utilizing the structural strategies explored in Phase I. Facilitators will assist with the communication and development of each plan.

- Students should address material efficiency and expression.

Step 2

🕚 30 minutes

- Working in groups, students will assemble the paper tower while taking care with joints and connections. Students should seek to build the tower as high as possible in the time alloted.



Students present their tower

Break-Out Discussion

At the end of the exercise, each team will present their tower to the larger group. These presentations should communicate why they selected each structural strategy, and how successful these strategies were in the tower's design. Questions to pose include: How were the modules incorporated into the assembly of the tower? How are the forces of tension and compression addressed? If the group had a chance to rebuild the tower, what would they have done differently? Where is the tower strongest, and where is it weakest?

Exercise 2 Object House

Summary

This exercise is an introduction to the ways in which visual and verbal communication is used through the design of the built environment. Students will explore the concepts of visual and verbal communication by designing and producing conventional drawings for a conceptual house.





Orange in Elevation View



Orange in Section View

Architectural Section



Architectural Floor Plan

Key Terms

Collage	An assemblage of many forms which create a whole
Context	The environment in which a building is located
Detail	Unique elements which form a building
Drawing	Technical means of describing a building
Elevation	An orthographic projection onto a vertical plane
Plan	An orthographic view from above
Section	A view created by an imaginary, vertical cutting plane
Sketch	A loose, non-measured method of communication
Technique	The means of carrying out a particular intention or idea

Exercise Organization

Time () 60 minutes

Space Requirements

One room with open space for students and facilitators to move around in. There should be tables for students to work on.

Facilitator Requirements

1-2 facilitators per group of students. It is recommended that students work in groups of no more than five.

- Facilitators should review the lesson ahead of time and be familiar with the structural concepts discussed.

Materials

- Letter-sized, multi-colored paper (students will select pages and colors)
- Writing utensils (colored pencils, crayons, pencils, pens, colored markers)

Preparation

Students will form teams of five. Facilitators will distribute the appropriate amount of materials as listed above to each group of students. One 3-dimensional object should be distributed to each group.



Part I: Graphic Communication

Key Terms

Elevation

Plan

Section

Technique

Conventional Drawing Types



Plan

Section



Elevation

Procedure

Summary

Facilitators will give each group a 3-dimensional object to reinterpret through the design of a house. Students will communicate their designs through conventional architectural drawings: plan, section, and elevation. Students should consider their choice of technique. Questions to consider: How will I communicate my idea about the house? Will I draw with colored pencils, or cut out shapes and glue them together? How will I arrange the rooms and spaces inside the house?

Step 1

5 minutes

Students should sit in groups, according to their teams. Facilitators
 will assign one object (see page 5) to each team. Students will work
 independently with the same object to develop personal designs for a house.

Step 2



- Facilitators should offer feedback on technique and process to help the student decide on their strategy for communication.

- Students should develop a technique based on the conventional drawing types (see left), but may be given the flexibility to modify the convention.

Step 3

() 20 minutes

Students will execute their technique to describe the design for the house.
Designs should include a kitchen, a living room, bedrooms, and a garage.
Students should also include the landscape around the house.

Final drawings should include one plan, one section, and one elevation.
 These may be composed on the same page or on separate pages.

Discuss

The desired outcome of Part I is for students to reinterpret the object through the design for a house, then use the conventional drawing types to communicate their design.



Student works on the house design



Blue foam object is reinterpreted

Part II: Verbal Communication

Key Terms

Elevation

Plan

Section

Technique

Conventional Drawing Types





Plan

Section



Elevation

Procedure

Summary:

Students will present their designs for the house to the larger group. Verbal communication is just as important as graphic communication, and students should work with facilitators to hone their technique for presentation. Questions to consider: What elements of my drawing should I point to in order to communicate an idea? Who is my audience? What are the most important elements of the design that I would like to tell others about?

Step 1

() 10 minutes

– Once the drawing for the house is complete, students will practice a verbal presentation of their work with the facilitators. Students should make bullet points for the items they would like to present to the larger group.

Step 2

() 20 minutes

- Students will present their designs to the larger group. Facilitators will select students to speak in order to maintain an orderly process.

 Students should be clear in their verbal presentations about the important features of the design.



Student verbally presents drawing



Student displays their drawing

Break-Out Discussion

There are many ways that architects communicate their ideas to those around them. The most common methods include graphic and verbal communication. Drawing conventions ensure that architects speak a "language" that those involved will understand. Architects also communicate through sketches, collage, and other non-conventional techniques to communicate ideas about architecture. Questions to pose include: *How did you use the conventional drawings to communicate your idea about the house? Were there ideas that the conventional drawings didn't communicate well?*

Catalog of Objects

Key Terms

Elevation

Plan

Section

Technique

Summary

This document contains drawings of the objects which students will use as the basis for the exercise. These funny objects will be assigned to each team and students will work to develop conventional drawings which describe their design for a house.



Object D

Object E



Object F

Exercise 3 Defining Space

Summary

This exercise will challenge students to evaluate the quantitative and qualitative components of space. The focus on scale will build upon the previous activities of structure and communication while allowing students to understand the ways in which architectural planning relates to real space.



Key Terms

Area	The 2-dimensional space taken up by a building (unit ²)
Dimensions	The real measurements in an architectural drawing
Plan	An orthographic view from above
Program	The statement of requirements for a building
Qualitative	A descriptor of the way a space feels or is experienced
Quantitative	A descriptor of space through numbers or measurement
Scale	The relative size of architectural elements and spaces
Space	The air between things; described by feeling or numbers
Volume	The 3-dimensional space taken up by a building (unit³)

Exercise Organization

Time () 60 minutes

Space Requirements

One large room with ample space and open floor area for students and facilitators to move around and work in. Tables are required for Part I.

Facilitator Requirements

1-2 facilitators per group of students. It is recommended that students work in groups of no more than five.

- Facilitators should review the lesson ahead of time and be familiar with the concepts discussed.

Materials

- Letter-sized, multi-colored paper (students will select pages and colors)
- Writing utensils (colored pencils, crayons, pencils, pens, colored markers)
- Painter's tape (1 roll per group)
- Measuring tape (1 per group)

Preparation

Students will form teams of five. Facilitators will distribute the appropriate amount of materials as listed above to each group of students. One roll of tape should be distributed to each group.



Space Defined by Area



Space Defined by Volume



Thinking Qualitatively



Thinking Quantitatively

Part I: Drawn Floor Plan

Key Terms

Dimensions

Program

Scale

Volume

Spatial Descriptors



Floor Plan

Procedure

Summary

Students will work together to design a floor plan for a shipping container house. While the exterior of the house should conform to the standard shipping container dimension (8'-0" x 19'-0"), creativity should be applied to the organization and layout of the interior spaces. Questions to consider: *How will the design affect the quantitative and qualitative components of the house? Where should entries, windows, and doors be located? How do spaces relate to each other?*

Step 1

() 2 minutes

- Students should sit in teams. Facilitators will introduce the program to each group (see page 5). Students should be given paper and writing utensils to graphically produce the design.

Step 2

🕚 5 minutes

- Working independently, students in each team will produce a sketch with their proposal for the house.

 Facilitators will lead a discussion within each group to synthesize the ideas from each student into a group design.

Step 3

() 10 minutes

 Working together, students will develop a synthesized floor plan. Spaces should be labeled. The floor plan should be produced at 1/2"= 1'0" scale.
 Facilitators will work closely with students to ensure accuracy.

- Once the scaled drawing is complete, students will move on to Part II.

Discuss

The desired outcome of Part I is for students to develop a scaled drawing which describes a space. This drawing will be used as a template in Phase II, as each group will use tape to mark out the components of the house on the floor at full scale.



Students work on the house design

Part II: Taped Floor Plan

Key Terms

Dimensions

Program

Scale

Volume

Spatial Descriptors



Area

Volume



Container House Floor Plan



Students with taped floor plan



Students with taped floor plan

Procedure

Summary:

Working together, students will translate their scaled plan for the shipping container house onto the floor of the exercise space at full scale with painters tape. This process will allow students to visually experience the scale of the spaces they drew on paper in reality. Once the spaces are taped off, students should gather inside the taped outline to evaluate the design. Questions to consider: What elements of the design affect the quantitative aspects of the space? What elements affect the qualitative aspects? Does the scale of the spaces affect their relationship to each other?

Step 1

🕔 30 minutes

- Students will work together to translate the scaled dimensions from the group drawing to taped outlines on the floor. Facilitators should work closely with students to ensure accuracy. Multiple students may tape at the same time if necessary.

- Be sure to include windows, doors, furniture elements, plumbing fixtures, and other components of the design to maintain accuracy.

Step 2

() 13 minutes

- Each team will present their design to the larger group by pointing out the design considerations which were translated into the taped plan.

Break-Out Discussion

Space is the air between things, and it may be described qualitatively or quantitatively. The goal of this exercise is to allow students to gain an understanding of scale, and how objects drawn on a page represent dimensions in real space. The qualities of the shipping container home can be imagined by students when standing inside the taped outlines. Questions to pose include: *How is the translated space different from what I had imagined on paper? Are the spaces too big or too small? What would I have done differently if given the chance?*

Program Document

Key Terms	Summary
Dimensions	This document contains the basic dimensions for each of the programs and
Program	furniture elements that should be implemented in the design for the shipping
Scale	container house. One copy will be distributed to each group. Students must
Volume	incorporate all of the following elements into the design.

Shipping Container Dimensions



3'-0" min.

Spaces

Kitchen

Х

Spatial Descriptors





Area

Volume

X
Bathroom
3'-6"
6'-0"
Bedroom
8'-0"
7'-0"
Living Space
8'-0" min.
X
Storage
2'-0" min.

Toilet (30" x 20") Shower (36" x 36") Sink (12" x 16")

Fixtures and Furniture

Sink (1'-0" x 2'-0")

Counter (2'-6" x X)

Single Bed (37" x 80")

Small Seat (34" x 34")

Space for hanging clothing and storing small items

Exercise 4 Community City

Summary

Cities are made up of communities. In this exercise, students will work independently to develop a community plan, then aggregate their plans together to create a larger design for a city. Students will gain an understanding of the elements of the built environment which make up a community, and how communities combine to form a city.



CREATER HEIGHTS CREATE

Mapping Communities



Describing Communities

Key Terms

Community	A group of people living in the same place
Context	The environment in which a building is located
Identity	The characteristics defining a building or place
Infrastructure	Shared organizational structures and utilities
Мар	A representation of a large area of land
Master plan	A framework in which relationships are defined
Neighborhood	A district forming a community within a town or city
Public space	Space which is generally open and accessible to people
Scale	The relative size of architectural elements and spaces

Exercise Organization

Time () 60 minutes

Space Requirements

One room with open space for students and facilitators to move around in. There should be tables for students to work on.

Facilitator Requirements

1-2 facilitators per group of students. It is recommended that students work in groups of no more than five.

- Facilitators should review the lesson ahead of time and be familiar with the concepts discussed.

Materials

- Letter-sized, multi-colored paper (students will select pages and colors)
- Writing utensils (colored pencils, crayons, pencils, pens, colored markers)
- Scotch tape (1 roll per group)

Preparation

Students will form groups of five. Facilitators will distribute the appropriate amount of materials as listed above to each group of students. One roll of tape should be distributed to each group.



Iconic Identity



Community Identity

Part I: Community Plan

Key Terms

Community

Context

Identity

```
Neighborhood
```

Community Components



House

Landscape



Public Space

Procedure

Summary

Students will work individually to develop community plans by organizing components of the built environment. Students should consider how the components work together to create a place. These individual plans will then be aggregated together in Phase II. Questions to consider: *How do the scale of components relate to each other? How might the pieces of a community work together to form a neighborhood? How might an identity be created for the community?*

Step 1

5 minutes

- Students should sit in teams. Facilitators will distribute materials to each student to work individually. Facilitators should begin the exercise by brainstorming with students on the components of the built environment which contribute to a community. These may include:

- Housing (single-family or multi-family)
- Civic services (library branch, hospital, post office, school, etc.)
- Cultural centers (museums, galleries, performance arts, etc.)
- Public space (parks, plazas, etc.)

Step 2

🛈 20 minutes

- Working independently, students will design a community plan, using the components of the built environment listed in Step 1. Students will use the letter-sized paper as a module, and may combine as many sheets together as necessary to accommodate the master plan.

 Students should work with color to represent important aspects of their design. The community plan does not need to be drawn to scale.

Discuss

The desired outcome of Part I is for students to draw a master plan for a community. Students should consider the many different uses and components of the built environment that contribute to a community. The paper module size will ensure standard dimensions among student drawings when they are combined in Part II.



Students design individually



Students design individually

Part II: City Plan

Key Terms

Community

Infrastructure

Мар

Public space

Connective Components



Road & Sidewalk





Public park

Procedure

Summary:

Working together, students will attach their individual community plans together to form a city. Once the attachment is complete, students will react to each other's plans by adding connective infrastructure to tie the city together. Questions to consider: *How do communities relate to one another? What elements of the built environment provide connections?*

Step 1

() 10 minutes

– Students will aggregate their individual community plan sheets together with tape to form a city plan. Coordination among students determine which individual plans might work best together.

Step 2

() 20 minutes

 Once the team has agreed upon and connected the city plan, students will work to add connective infrastructure to link the individual plans together.
 This may include:

- Streets and sidewalks
- Bike paths and walking trails
- Public parks and landscape features

Step 3

5 minutes

– In the remaining time, each team will present their city plan to the larger group, pointing out the elements of the individual communities as well as the ways in which the communities have been connected together.



Teams work to aggregate plans

Team presents their city plan

Break-Out Discussion

Our city is a collection of many communities. These communities retain an individual identity through social connections and the built environment. These different communities are joined together with infrastructure which we all share. Questions to pose include: *What components of the built environment give an identity to my community? How might I contribute to my community?*

Exercise 5 Learning Park

Summary

This exercise will focus on the environment. The environment encompasses everything around us, including built components, the global climate, the context of local conditions, and our immediate landscape. This exercise will allow students to design a small park with a solar classroom to consider how architecture may respond to the environment.



Key Terms

Built environment	All of the things around us that have been built by people
Climate	Prevailing weather conditions in an area
Community	A group of people living in the same place
Global environment	The closed ecosystem which encompasses the Earth
Landscape	Physical features of an area of land, including vegetation
Public space	Space which is generally open and accessible to people
Social environment	The immediate social setting in which people live
Sustainable design	Design for a social, environmental, and ecological context
Topography	The composition of natural physical features of an area

Exercise Organization

Time () 60 minutes

Space Requirements

One room with open space for students and facilitators to move around in. There should be tables for students to work on.

Facilitator Requirements

1-2 facilitators per table of students.

- Facilitators should review the lesson ahead of time and be familiar with the concepts discussed.

Materials

- Letter-sized, multi-colored paper (students will select pages and colors)
- Writing utensils (colored pencils, crayons, pencils, pens, colored markers)
- Scissors
- Glue sticks
- Cardboard sheets, cut to 12" x 12" (3 sheets per student)
- Materials for Solar Classroom structure:

- Binder clips, Popsicle sticks, marshmallows, toothpicks

Preparation

Facilitators should distribute materials evenly among the tables where students will be working.



Cardboard Topography Model



Cardboard Topography Model

Part I: Designing the Site

Key Terms

Landscape

Public space

Sustainable design

Topography

Cardboard Contour Template



Base

Piece B



Align



Attach

Procedure

Summary

Students will work individually to design topography for their park. The shape of the ground will determine the design for the program which will be added to the park in Part II. This initial phase is meant to encourage students to break away from thinking of the ground as flat. Questions to consider: *How* can the ground be shaped? How might water be collected by the shape of the ground? Will the solar classroom be located to obtain views? How might people use the ground?

Step 1

() 10 minutes

- Students will draw contours onto the cardboard sheets (see diagrams at left). Multiple contours of a smaller size may be traced on the same sheet. One cardboard sheet must remain intact as a base for the smaller pieces to be glued to.

- The site should contain high areas and low areas, as well as a considered location for the solar classroom

Step 2

() 10 minutes

- Students will trace the cardboard shapes onto colored paper, then glue the paper onto the cardboard to represent material.

- Green paper may be used for grass, blue for water, etc.

Step 3

\bigcirc 5 minutes

- Once the cardboard shapes have an associated material, students will glue the cardboard pieces together and attach them to the 12" x 12" base. This will create the site for Part II.

Discuss

The desired outcome of Part I is for students to design a site model that will be used in the design of Part II. The model should take into account elevation changes, ground materials, and a site suitable for the solar classroom.



Students design the site



Materials are added to cardboard

Part II: Designing the Park

Key Terms

Landscape Public space Sustainable design Topography



Student solar classroom



Students work on park programs



Array of completed park models

Procedure

Summary:

Working with the site from Part I, students will add programs to the park. These programs will complement the landscape and add public uses. Students should consider the ways in which landscape can be leveraged through their design. Questions to consider: *How might sustainable design be implemented to enhance the environment? What will the public experience of the park be?*

Step 1

🕚 30 minutes

- Students will design and construct programs to add to the park with the remaining materials. These programs may include:

- An outdoor learning space (solar classroom)
- A community garden
- Water feature
- Seating or rest area
- Picnic area
- Other

Step 2

🛈 5 minutes

 Once students have completed their designs, each student will present their park individually to the larger group.

- Students should point out the important design features, as well as the ways in which the design responds to the environment.

Break-Out Discussion

The environment is a critical for design consideration. The environment not only includes physical landscape, but climate and social conditions as well. It's important that we recognize our environment and think about the ways in which design might enhance it. Questions to pose include: *How is the design for the park sustainable? How might the specific park programs enhance the social environment?*