

# **PEEK Kindergarten Curriculum: Introduction to Building Principles (Stationary)**

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Lesson 1:  
Intro to Legos

Lesson 2:  
Build a Sturdy Wall

Lesson 3:  
Drop Test/Henry Builds a Cabin

Lesson 4:  
Strong Shapes

Lesson 5:  
Chair for Mr. Bear

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## Lesson 1: Introduction to Legos

**Lesson Objective:** To familiarize students with specific Lego building pieces and vocabulary in order to give students equivalent levels of understanding to make future explanations and discussions easier.

**Learning Objective:** To learn the names and purposes of Lego building pieces; to learn basic math skills through the naming of different pieces by the number of studs and dimensions.

**The Challenge:** To cut out the Lego bricks and beams on the Engineer's Checklist and paste them in the correct box on their response sheet.

### Materials:

- Lego Simple Machine kits or other Lego building pieces
- Large laminated picture of Lego beams & bricks
- Engineer Parts List (the handout) – enough for the whole class

### Vocabulary:

- bricks
- beams
- studs

**Procedure:** The lesson begins with a teacher-led discussion about engineering and Legos. Ask questions such as:

- Who has played with Lego blocks before?
- What kinds of things have you built?
- What is fun about playing with Lego blocks?
- Why do you think we are playing with Lego blocks in school?
- Does anyone know an engineer?
- What do you think an engineer does?

Then introduce the two Lego pieces of the day - the brick and the beam. Hold up a beam (such as a one by eight-1x8) and talk about the piece with probing questions.

- What can you tell me about this?

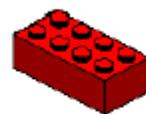


The bumps are called **studs**. The piece is called a **beam**. This specific beam is called a one-by-eight.

- Why do you think it's called that?

Next introduce a brick, such as a two by four- 2x4. Compare the two Lego pieces.

- Can you tell be what the differences are?
- Why do you think this piece is called a two-by-four?



Discuss with the children how Lego pieces are measured. The number of rows times the number of studs measures the pieces.

Next, instruct the students to cut out the Lego bricks and beams on the Engineer's Parts List and paste them in the correct box on their response sheet.

In the last part of the lesson, instruct students on how to properly care for, put away, and store Lego materials. THIS IS VERY IMPORTANT.

**Extensions:**

- Students can build a structure using beams and bricks.
- Students can draw their structure on a sheet of paper.
- Volunteers/teachers can discuss how a 2x4 brick has 8 studs – simple introduction to multiplication.

**Assessment:**

- Completion of Engineer's Checklist
- Name bricks and beams, using size and type
- Sort pieces into correct bins
- Teacher observations and interviews

**Troubleshooting:**

- Some students will be very familiar with vocabulary and building while for others this will be a new experience.
- Kindergarten students are on different levels of reading comprehension and math ability.
- Try to encourage everyone to participate in the discussion. We don't want a free-for-all where only the most vocal/experienced students learn something.
- Try to learn names of the students.

**Resources:**

- Lego/Tufts website- [www.ceeo.tufts.edu/curriculum](http://www.ceeo.tufts.edu/curriculum)
- Lego Dacta "Simple and Motorized Machines" Teacher Guide

Engineer: \_\_\_\_\_

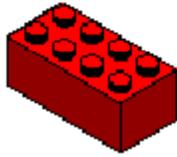
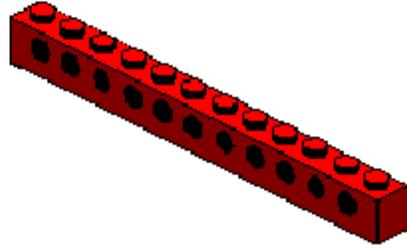
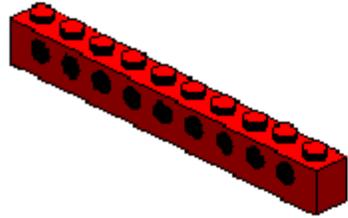
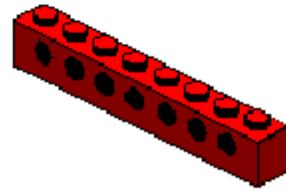
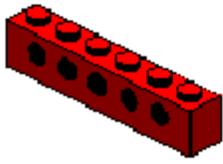
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Partner: \_\_\_\_\_

**Engineer's Parts List**

Cut and Paste the picture to match the words.

2 x 4 Brick	1 x 8 Beam
1 x 6 Beam	1 x 2 Beam
1 x 4 Beam	1 x 2 Brick
1 x 12 Beam	1 x 10 Beam



## Lesson 2: Building a Sturdy Wall

**Lesson Objective:** To familiarize the students with specific Lego building strategies and vocabulary.

**Learning Objective:** To learn the basic building strategies with Lego blocks.

**The Challenge:** To build a sturdy wall that withstands the 'flick test'.

### Materials:

- Lego Simple Machine kits or other Lego building pieces (including green building plate)
- Engineer's Journal (the handout)
- Fictional book: The Three Little Pigs

### Vocabulary:

- Sturdy
- Overlapping
- 'Flick Test'
- Plate
- Axle
- Tire
- Hub
- Bushing
- Beam
- Brick

**Procedure:** Take a moment before today's lesson and see if the children can recall the names and sizes of the Lego pieces that you talked about in the last session.

Begin the lesson by reading a version of The Three Little Pigs. Discuss the different techniques that the little pigs used when they built each house:

- What were the three materials the pigs used?
- Why did the bricks save the pigs. but the other materials didn't?

**Engineering Challenge:** The engineering challenge today is to build a sturdy wall with a partner. Children may use only the Lego pieces we have talked about, and their walls must withstand the 'flick test'. Be sure to demonstrate a two and three finger 'flick test' to show the children what is expected. They need to build their walls strong enough so they will not be pushed down by the finger-flicking teacher. Be sure to give building tips, as well:

- Overlapping beams and bricks are stronger than non-overlapping ones.
- Three stacked plates are the same height as one beam or one brick.
- Discuss overlapping beams and bricks on the corners of houses.

After building, the students should complete the Engineer's Journal response sheet.

At the end of the session, examine the walls and talk about each one:

- What building technique made a sturdy wall?
- Call attention to the way the bricks are placed on the classroom walls.

Finally, be sure to instruct students on how to properly care for, put away, and store Lego materials.

**Extensions:** Build a sturdy house that will withstand the 'drop test'. This is when the structure is dropped from the knees of the teacher. (This will be the focus of next lesson.)

**Assessment:**

- Name learned pieces, using size and type
- Sort pieces into correct bins
- Teacher observations and interviews
- Completion of Engineering Challenge

**Troubleshooting:**

- Some students will be very familiar with vocabulary and building while for others, this will be a new experience.
- First grade students are on different levels of reading comprehension and math ability.

**Resources:**

- Lego/Tufts website- <http://www.ceeo.tufts.edu/curriculum>
- Lego Dacta "Simple and Motorized Machines" Teacher Guide

## Lesson 3: Drop Test

**Lesson Objective:** To familiarize students with the components of sturdy structures.

**Learning Objective:** To learn basic Lego structures.

**The Challenge:** To build a sturdy Lego house that passes the 'Drop Test.'

**Materials:**

- Lego Simple Machine kits or other Lego building pieces
- Fictional book: Henry Builds A Cabin

**Vocabulary:**

- 'Drop Test'

**Procedure:** Students will view and listen to the story Henry Builds a Cabin. They will then build a cabin using information from the story.

Before building, discuss the 'Lego Tip' of how to alternate the Lego blocks when building a sturdy structure. Point out to the children if your classroom has cement block walls.

**Engineering Challenge:** The engineering challenge for the day is to build a house that will withstand the 'Drop Test'. The 'Drop Test' involves the teacher dropping the child's house from his/her knees to the floor to see if the house remains in one piece. The entire structure must stay intact.

As each structure passes the test have the children share with their classmates how it was built. (Note: Pairing of students is suggested.)

**Extensions:** Test the houses using the 'Ultimate Drop Test' - dropping a structure from the teacher's waist to the floor.

**Assessment:** Bring the class together to discuss the various designs and what they found worked well.

- What was the biggest problem you had as you were building?
- What did you try? Did it help?

Take pictures if a camera is available. Save at least one finished product for the next Lego challenge - The Strongest Shape.

**Resources:**

- Lego/Tufts website- <http://www.ceeo.tufts.edu/curriculum>
- Lego Dacta "Simple and Motorized Machines" Teacher Guide

## Lesson 4: Strongest Shape

**Lesson Objective:** To familiarize the students with Lego pieces, their functions, and how to build sturdy structures.

**Learning Objective:** To discover which shape would be the strongest for a roof and to determine how to construct such a shape in a sturdy way.

**The Challenge:** To build a roof that withstands the 'push test.'

### Materials:

- Pictures of houses with different types of roofs
- Both types of connector pegs – black connector pegs with friction and gray connector pegs
- A house, previously built by the children

### Vocabulary:

- Connector peg

**Procedure:** First introduce the connector peg to the children. Have them discover that there are two different colored ones. Let them experiment with them and try to discover the difference. How do you use them? Why are they different? What could they be used for?

Ask the children what is missing from the houses they built last time. What does a roof look like? Why do houses need them? What are they made out of? Show pictures of various houses and point out the differences. Which shape is most popular?

Once they decide that the shape is a triangle, show them how to connect three beams together to make a triangle with connector pegs.

Next, tell the children their challenge for the day - to build a roof for their house that can withstand the 'push test.' This test involves one of the teachers pushing on the top of their roof to see if it is able to keep its shape. This is an ongoing test, and if their roof doesn't hold up they need to problem-solve to find another way to meet the challenge.

**Assessment:** Have the children share their final structures with the class and talk about any problems they had along the way, as well as what they found worked best. Encourage them to offer suggestions to each other.

### Resources:

- Lego/Tufts website- <http://www.ceeo.tufts.edu/curriculum>
- Lego Dacta "Simple and Motorized Machines" Teacher Guide

## Lesson 5: Build a Chair for Mr. Bear

**Lesson Objective:** To familiarize the students with the following Lego building strategies:

- How to make a sturdy structure
- Building a structure to size
- Building a vocabulary

**Learning Objective:** To learn basic building strategies, as well as size differentiation of objects.

**The Challenge:** To build a sturdy chair that will withstand the drop test, as well as be the correct size for Mr. Bear.

### Materials:

- Lego Simple Machine kits or other Lego building pieces
- Engineer's Journal (the handout)
- Fictional book: A Chair for Mr. Bear or Goldilocks and the Three Bears
- A small stuffed bear about the size of a beanie baby

### Vocabulary:

- Sturdy
- Overlapping
- 'Drop Test'
- Size
- Shape

**Procedure:** Take a moment before today's lesson to see if the children can recall the Lego Tips that were discussed last lesson:

- Overlapping beams and bricks are stronger than non-overlapping ones.
- Three stacked plates are the same height as one beam or one brick.
- Discuss overlapping beams and bricks on the corner of a structure.

Begin the lesson by reading a version of A Chair for Mr. Bear or Goldilocks and the Three Bears. Discuss what happened to Goldilocks when she sat in the three different chairs.

**Engineering Challenge:** Today's engineering challenge has two parts.

1. Build a sturdy chair for Mr. Bear with a partner. Students may use only the Lego pieces we have talked about. Their chairs must withstand the 'drop test'. Be sure to demonstrate a 'drop test' to show the children what is expected. (Drop the bear's chair from the teacher's knees to the floor.) The children need to build their chairs sturdy enough so they will not break from the teacher's drop.

2. Students must build a chair that is the correct size for Mr. Bear. It is important that he is able to fit in the chair.

At the end of the session, examine each chair and discuss how it was built.

- What building technique made a sturdy chair?
- What difficulties did you encounter today?
- Describe what it was like to build a structure to size.

You can also photograph this lesson to write about another day.

When the students have finished building, they should complete the Engineer's Journal response sheet.

**Extensions:**

- Build a bed for Mr. Bear.
- Build something special for Mr. Bear. It must be 'his size.'

**Assessment:**

- Name learned pieces, using size and type
- Sort pieces into correct bins
- Teacher observations and interviews
- Completion of engineering challenge (did Mr. Bear fit in the chair?)
- Completion of Engineer's Journal

**Troubleshooting:**

- Some students will be very familiar with vocabulary and building while for others this will be a new experience.
- First grade students are on different levels of reading comprehension and math ability.

**Resources:**

- Lego/Tufts website- [www.ceeo.tufts.edu/curriculum](http://www.ceeo.tufts.edu/curriculum)
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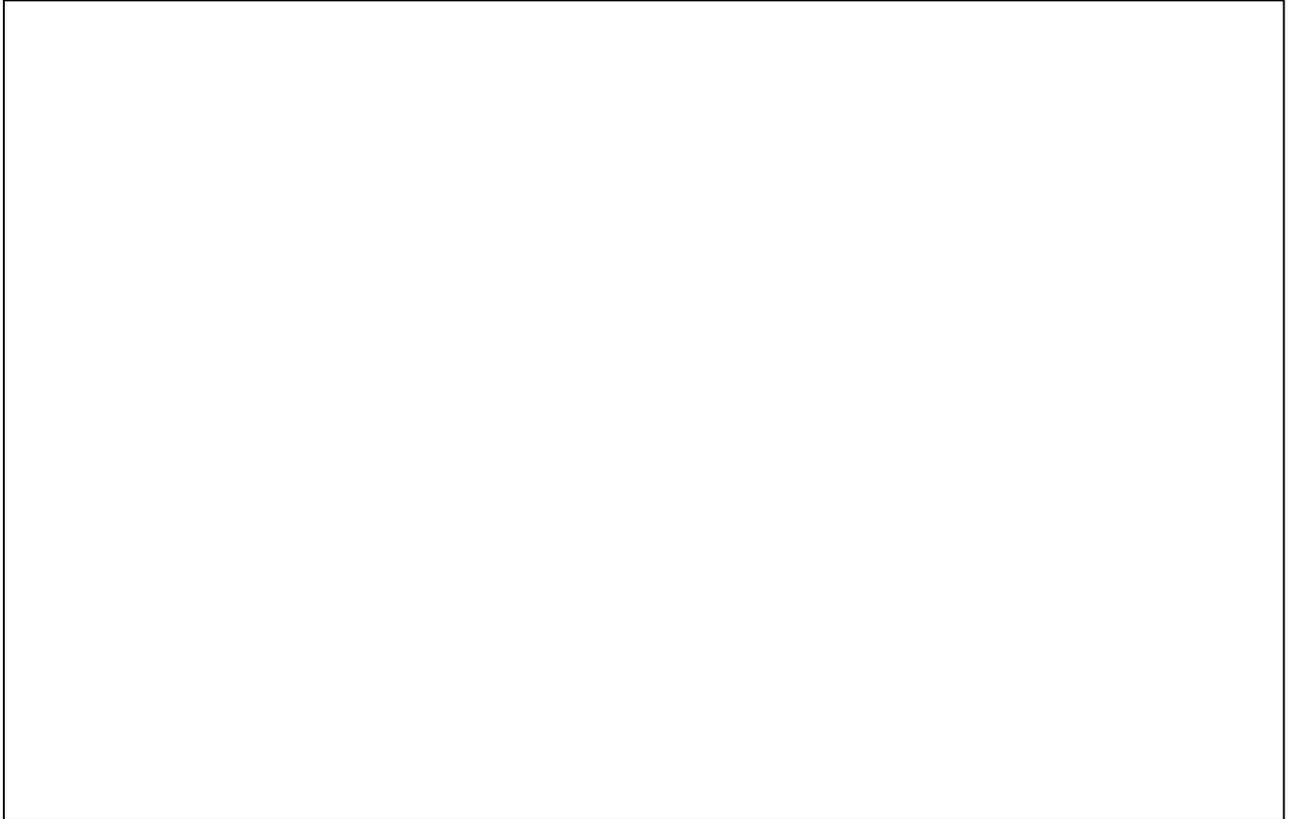
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Date: \_\_\_\_\_

Partner: \_\_\_\_\_

## Engineer's Journal

1. Draw a picture of your chair. Try to show where the pieces overlap. Write about how you made it.



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