# Curricular Activity Template

<table>
<thead>
<tr>
<th>NAME: Patrick Dunfey</th>
<th>University: Tufts University</th>
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<tbody>
<tr>
<td>Email: <a href="mailto:Patrick.Dunfey@tufts.edu">Patrick.Dunfey@tufts.edu</a></td>
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<tr>
<td>Activity Title: LEGO Draw and Build</td>
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<td>Grade Level (s): 11-12 (could be used much lower)</td>
<td>Approx. Time: 20 minutes</td>
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### Subject Areas:

### Standards: (Please list by number using the following abbreviations: Earth and Space Science (ESS), Life Science (LS), Physical Science (PS), Technology/Engineering (TE), Mathematics (M))

### Description of Activity (please limit to 250 words):

Break up the class into an even number of groups. Assign half of the groups to sit on one side of the classroom, and the other half to sit on the other side of the room (this is important so that they cannot clearly see what the other groups are working on). Give each group on one side of the classroom a pre-made LEGO kit to build with the LEGO instructions. Give the other groups the same pre-made LEGO kits with the written instructions. Each group on the same side of the room should have a unique kit. For every group building a kit with the LEGO instructions, there should be a group on the opposite side of the room building the same kit with the written instructions. Let them begin building, sit back, and enjoy watching the groups with the written instructions. Give them about 10-15 minutes to build, and then bring the "built" kits to the front of the room to compare each pair of kits (one from each side of the room) that don't look at all alike (hopefully). Open up a discussion about the importance of drawings in communicating a design, the importance of accuracy in a design, etc.

### Implementation (classroom organization, presentation, other implementation comments):

You will have to prepare written instructions to match the LEGO pictorial instructions you are using (if not using the instructions in this activity).

For added effect, you can tell all the groups on one side of the room that they are competing with each other. And that the groups on the opposite are competing amongst themselves. This further eliminates the desire to find out what the groups on the opposite side of the room are working on.

If the built kits look similar, discuss importance of accuracy and tolerance. If they match, "revise" the written instructions next time.

### Materials (include vendor information if appropriate):

Pre-made (I put each "kit" in a sandwich bag) LEGO kits. LEGO simple machine build instructions (in the LEGO closet, red box). Written instructions (see attached examples)

Please attach any worksheets or handouts in electronic format that accompany this activity.
Engineering Design – Pulley Build Activity

Follow the instructions below to build a LEGO pulley system:

1. Fasten two blue 1x2 LEGO pieces on the green LEGO base next to each other.
2. Then fasten one blue 2x4 LEGO piece onto the green LEGO base 5 units away from the two LEGO pieces from step 1.
3. Repeat steps one and two twice, placing the new LEGO pieces directly on top of previously fastened LEGO pieces.
4. Place two blue 1x12 LEGO pieces on top of the previously fastened LEGO pieces with a one unit overhang on each end.
5. Place a LEGO bushing on the end of a 6-unit long axle. Feed the axle through the second hole of the pieces from step 4.
6. Place a LEGO bearing through one hole of a large pulley. Attach the large pulley to another 6-unit long axle. Feed this axle through the third hole of the pieces from step 4 (from the opposite end of the axle in step 5).
7. Fasten a blue 2x4 LEGO piece on top of the pieces from step 4.
8. Place a medium pulley on each of the axles, securing the axles to the base.
9. Place a belt around the two medium axles.

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Engineering Design – Right-Angle Drive Build Activity

Follow the instructions below to build a LEGO right-angle drive:

10. Fasten two blue 1x2 LEGO pieces on the green LEGO base next to each other.
11. Then fasten one blue 2x4 LEGO piece onto the green LEGO base 5 units away from the two LEGO pieces from step 1.
12. Repeat steps one and two once, placing the new LEGO pieces directly on top of previously fastened LEGO pieces.
13. Repeat step 2 once more, placing the new LEGO piece directly on top of previously fastened LEGO pieces.
14. Fasten two blue 1x4 LEGO pieces on top of the existing pieces from step 1, allowing a 2-unit hangover.
15. Place two blue 1x12 LEGO pieces on top of the previously fastened LEGO pieces with a one unit overhang on each end.
16. Fasten two blue 1x2 LEGO pieces on the existing pieces from step 5.
17. Place a LEGO right-angle gear on the end of a 6-unit long axle. Feed the axle through the hole of the pieces from step 7.
18. Place a LEGO bushing on the opposite end of the axle from step 8, securing the axle in place.
19. Place a LEGO right-angle gear on the end of a 4-unit long axle. Feed the axle through the hole (of the pieces from step 6) at a right angle to the gear from step 8.
20. Place a LEGO bearing through one hole of a large pulley. Attach the large pulley to the other end of the 4-unit long axle from step 10.
Engineering Design – Gearbox Build Activity

Follow the instructions below to build a LEGO gearbox:

21. Fasten two blue 1x2 LEGO pieces on the green LEGO base next to each other.
22. Then fasten one blue 2x4 LEGO piece onto the green LEGO base 5 units away from the two LEGO pieces from step 1.
23. Repeat steps one and two twice, placing the new LEGO pieces directly on top of previously fastened LEGO pieces.
24. Place two blue 1x12 LEGO pieces on top of the previously fastened LEGO pieces with a one unit overhang on each end.
25. Place a LEGO bushing on the end of a 6-unit long axle. Feed the axle through the third hole of the pieces from step 4.
26. Place a LEGO bushing on the end of another 6-unit long axle. Feed the axle through the sixth hole (three away from the axle in step 5) of the pieces from step 4.
27. Place a LEGO bearing through one hole of a large pulley. Attach the large pulley to another 6-unit long axle. Feed this axle through the third hole of the pieces from step 4 (from the opposite end of the axle in step 5).
28. Fasten a blue 2x4 LEGO piece on top of the pieces from step 4.
29. Place a large gear on the axles from steps 5 and 7, securing the axles to the base.
30. Place a small gear on the axle from step 6, securing the axle to the base.

Please attach any worksheets or handouts in electronic format that accompany this activity.