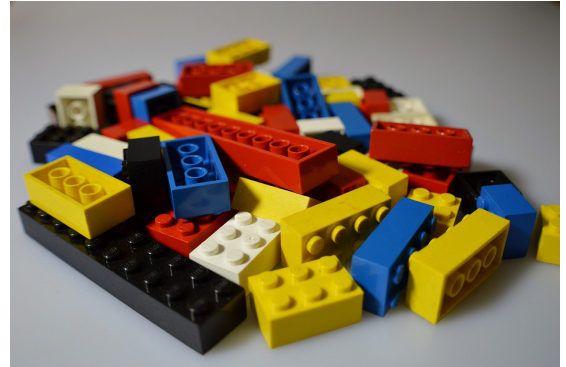


 30 minutes

 Grades
3–5, 6–8

Lego Structures

Create a recognizable building out of whatever materials you get—in 12 minutes or less.



Instructions

Teams build recognizable structures out of whatever materials are in their bag within a specific timeframe, even though the variables change unexpectedly—just as they do on real engineering projects.

PREPARATION:

This activity is both an exercise in being flexible and productive in the face of ever-changing constraints, and a chance to apply the project management cycle to an activity. Make sure students have some familiarity with this cycle, which consists of these stages:

- Define
- Plan
- Do
- Review

Materials

PER WHOLE GROUP:

- Clock or stopwatch

PER TEAM:

- Ziploc bag of Lego or K'Nex pieces, enough for building a structure. Some bags should have great building pieces and some should not.

Find more activities at:
www.DiscoverE.org

ACTIVITY:

- 1** Organize the whole group into teams of three or four. Explain the challenge:
 - You will have 12 minutes to create a realistic structure—that is, one that someone outside your group would be able to identify. You have to use all of the materials you receive. (This is the define stage.)

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- 2** Ask each team to pick a project manager. Give this person a bag of building supplies but say not to open it yet. Explain that the project manager is responsible for:
 - Ensuring that the team has a plan before beginning construction
 - Ensuring that all team members understand the project goal
 - Making sure that every team member is involved somehow
 - Making sure that the deliverable is completed on time

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- 3** Give teams a few minutes to make a plan before starting the time.

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- 4** Set a timer for 12 minutes, and tell students to begin. Once construction has been under way for 1 or 2 minutes, visit each team and remove a handful of building materials. As you do so, explain that resources can change on a project and the team has to adjust.

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- 5** After 1 more minute has passed, announce that you've just been notified that teams have 10 minutes to complete the challenge, not 12; they will have to adjust their timing accordingly.

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- 6** Incorporate some or all of the following adjustments into the rest of the activity:
 - Add non-standard Lego or K'nex pieces to each team's supply, reminding teams that they still have to use all of the pieces.
 - Swap team members from one group to another.
 - Assign a new project manager.

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- 7** Alert teams when there is 1 minute left to finish their structure.

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- 8** Have teams share their structure with the group and discuss how they used the project management cycle in this activity, as well as their reactions to it.

Engineering & Science Connections

🔗 Engineers complete projects under various constraints, and these often change at any point during the project. For example, how much time they have to work with, who is managing the project, who their colleagues are, what the materials are—these may all shift. The only requirement that doesn't change is that the engineers get the job done on time anyway!

🔗 The Panama Canal is considered one of the greatest engineering achievements in the world. However, it was not an easy project. From start to finish, the canal took 33 years to complete. It was managed by two different countries (with lots of political intrigue). Engineers also had to figure out the right type of canal to build, how to move all of the dirt and where to put it, as the canal went straight through a mountain.

🔗 The Burj Khalifa is the tallest building in the world. Engineers drew on techniques used in the world's other tall buildings including the Willis Tower in Chicago and the Tower Palace Three in Seoul, South Korea. They also had to develop a new technique to keep the building from twisting because it was so tall. Engineers also faced challenges like withstanding winds up to 50 miles per hour, moving water up 100 floors and creating a high-speed elevator system.

🔗 Engineering projects can take years and cost millions of dollars. Project management is crucial in these situations, but even small-scale projects need good management in order to avoid delays, mistakes, and other problems.

Guiding Questions ?

What were your team's initial assumptions about the project?

How did your original plan have to change in order to accommodate unexpected modifications to the project?

How did it feel to be the project manager?

Did your group work well together? Explain why or why not.

This activity comes from the Future City project. Every year, teams of middle school students research, design, and build cities of the future, focusing on a particular design challenge of urban life. For more information go to www.futurecity.org.