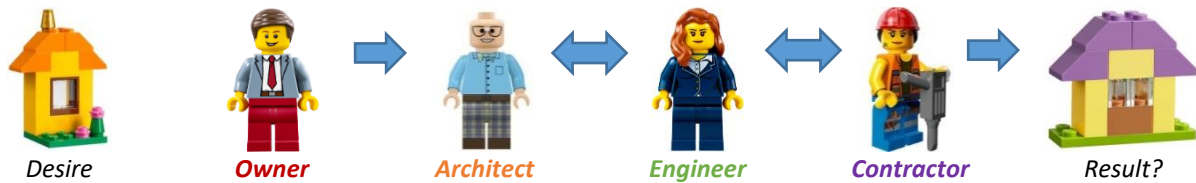


LEGO® BUILDING WITH EFFECTIVE COMMUNICATION

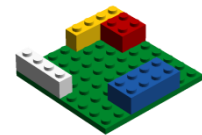


INTRODUCTION

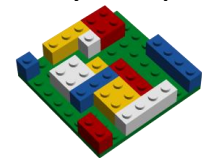
This activity is meant to demonstrate the phases of building construction, the roles involved in a project, and the communication challenges that teams deal with. Students should gain a better understanding of the construction process and an appreciation for the teamwork necessary for a successful project.

MATERIALS

- Construction material bags full of LEGO® blocks of varying shapes, sizes, and colors and one 8x8 stud plate to use as the building foundation. Each team should be given one construction material bag.
- One completed LEGO® block “desired structure” on an 8x8 stud plate using most (but not necessarily all) of the LEGO® blocks included in the construction material bags (*note: the desired structure should be kept hidden from the students*).
- *Optional:* Colored hats or some other method to differentiate between **Owners**, **Architects**, **Engineers**, and **Contractors** from each other.
- *Optional:* Prizes for the winning team.



“easy” example



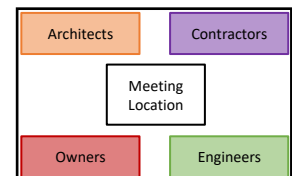
“hard” example

BEFORE YOU BEGIN

- Describe the Construction Process and different team member roles to the students.
- Explain the rules for the activity and state that you will be the referee for the competition.

ACTIVITY INSTRUCTIONS

1. Separate the students into teams of four members. If necessary due to the total number of students, some teams may only have three members.
2. Have the teams decide who will serve in the roles of **Owner**, **Architect**, **Engineer**, and **Contractor**. For teams of three remove the **Architect** role.
3. Have all **Owners** gather in one corner of the classroom, all **Architects** in another corner, all **Engineers** in another corner, and all **Contractors** in the corner that is farthest from the **Owners**.
4. Specify an area in the center of the classroom as the meeting location, where information is allowed to be passed between team members.
5. Demonstrate an example of passing one LEGO® block installation instruction by role-playing each step:
 - a. **Owner** tells **Architect** that they want a 4x1 block in the upper right corner of the plate.
 - b. **Architect** tells **Engineer**. **Engineer** tells **Contractor**.
 - c. **Contractor** sees that there are multiple colors available for the 4x1 block.
 - d. **Contractor** asks the **Engineer** which color to use.
 - e. **Engineer** asks the **Architect**. **Architect** asks **Owner**.
6. Ask the students if they have any questions before starting the competition.
7. Give each **Contractor** a construction material bag.
8. Start the countdown timer (set for 20 minutes) and allow only the **Owners** to see the desired structure.
9. Keep an eye of the students to ensure they follow the “chain-of-communication.” Keep track of time penalties (assessed per rules 7 through 9).



- Once a team announces that their building is complete, record that team's finishing time and verify the accuracy of their created structure.
- Once all teams are complete (or the timer runs out), determine each team's total construction time and determine the winning team (most accurate created structure in the least amount of time).

CONSTRUCTION PROCESS

During the course of a building's design and construction, several team members work together to create the final product. The typical building design and construction process involves the following steps:

Project Phase	Description
Schematic Design	The Architect consults with the Owner to determine the requirements of the project. The Architect works with an Engineer to prepare preliminary documents showing the basic scale and project components for the Owner's approval.
Design Development	The Architect and Engineer prepare preliminary drawings and other presentation documents to describe the size and character of the project as to architectural, structural, mechanical, and electrical systems.
Construction Documents	The Architect and Engineer prepare final drawings, specifications, and bidding information to be used by the Contractor to build the project.
Bidding	The Contractor prepares a formal proposal for how much it will cost to build the project.
Construction	The Contractor constructs the building based on the construction documents. The Architect and Engineer may oversee certain portions of the project's construction.
Occupancy	The Owner takes occupancy of the building, notifying the Architect , Engineer , and/or Contractor if anything does not meet the original requirements of the project.

RULES

- Only the **Owner** can view the desired structure.
- The **Owner** can only communicate with the **Architect**.
- The **Architect** can communicate with the **Owner** and **Engineer**, but not at the same time.
- The **Engineer** can communicate with the **Architect** and **Contractor**, but not at the same time.
- Only the **Contractor** can touch the LEGO® blocks.
- Time will start when the **Owner** first sees the desired structure, and ends when the volunteer verifies that the structure created by the **Contractor** matches the desired structure.
- Once the project is thought to be complete the referee will check the **Contractor's** created structure. If incorrect, the team must try to resolve the errors utilizing the "chain-of-communication."

OPTIONAL RULES TO TEACH ABOUT RFI'S AND CHANGE ORDERS

- The **Owner** may speak with the **Engineer** for a **1-minute penalty** (volunteer must be notified first).
- The **Architect** may speak with the **Contractor** for a **1-minute penalty** (volunteer must be notified first).
- The **Owner** may speak with the **Contractor** for a **3-minute penalty** (volunteer must be notified first).

DISCUSSION

- What problems did you run in to trying to communicate effectively? (*confusion, errors, only being able to communicate with one person at a time*)
- What would make this process easier? (*meeting as a team, documenting things in writing*)
- Which role is most important: Architect, Engineer, or Contractor? (*all are equally important*)

CONCLUSION

Ask the students if they like LEGOs, playing Minecraft, and if they enjoy the freedom to use their imagination to create their own designs. If so, encourage them to consider Engineering as a field of study.