Engineering and Design Thinking
Class Overview

Lando classes teach students the skills needed to **solve real world engineering problems** without relying on step-by-step instructions. Our unique classes give students the freedom to **explore their own solutions** to engineering problems, while our **expert teachers** guide them with tactical hints and suggestions, as well as explanations of core engineering and design concepts. This approach allows them to gain early exposure to complex concepts and ideas, while developing the mental **toughness and perseverance** necessary to solve difficult challenges.

Our curriculum has been designed specifically to foster grittiness and creativity in our students and by the end of our semester, your child will have gained the confidence and ambition to solve problems through iterative design and engineering. Studies have shown that the combination of grittiness and desire to tackle new problems, without waiting for a provided answer, is a key driver of student performance.



Problem Solving

Students enhance their problem-solving skills through constructing a range of structures like houses and vehicles with LEGO bricks. Engaging with LEGO sets, children learn to think critically, connecting diverse pieces to surmount challenges and refine their abilities. This tactile method not only cultivates creativity but also hones their capacity for innovative solutions in a fun and interactive setting.

Creativity

Fostering creativity is essential, and our challenges offer an enjoyable and impactful method to encourage kids to think creatively. Every challenge ignites their imagination, demanding innovative approaches to construct distinct structures. Through these activities, children not only cultivate but also actively apply their creative abilities to problem-solving, all within a stimulating and engaging setting.

Collaboration

Lando classes serve as an outstanding tool for promoting teamwork and social skills among children. By engaging in collaborative challenges, kids are encouraged to cooperate, which nurtures a strong sense of camaraderie. The act of playing with LEGOs naturally brings children together, creating an enjoyable environment that not only ensures they have a great time but also teaches them the value of working as a team. Through these shared experiences, children learn essential interpersonal skills in a fun and interactive way.

Semester Overview

Class 1: Durable Dome

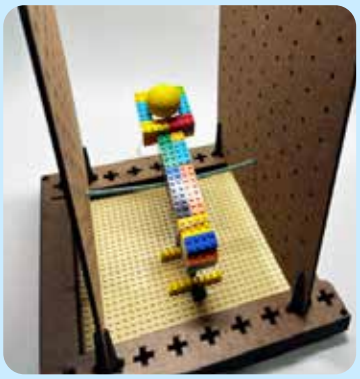
Concepts Structural Integrity | Weight Distribution

In our dome challenge, students will **learn how to construct resilient domes without any central supports**. The objective is to design domes that can endure the impact of increasingly heavier weights dropped from above. This test will challenge students to think innovatively about **structural integrity** and weight distribution. If a dome isn't built to withstand these rigors, it will break under the pressure, providing a **practical lesson in the principles of strong architectural design**.

Class 2: Catapult

Concepts Energy Transfer | Kinetic Energy | Pivots

In our catapult challenge, students will explore the **principles of energy transfer and mechanics**. The objective is to design a catapult that can launch objects increasing distances. By experimenting with the arm length, pivot point, and tension of the catapult, students will understand how potential energy converts into kinetic energy. Through this engaging project, students will learn not just how to build a catapult, but also **gain critical early exposure to the science** that makes it work effectively.



Class 3: Rebuilding a Village

Concepts 3D Design | Adaptability

In this class, students will use **3D pens** to create essential components for constructing a new town on an alien planet. They'll be tasked with **designing and building a variety of critical structures and devices**, such as a functional rover for exploration and strong shields to protect the town from falling asteroids. This challenge **encourages creativity and innovation**, as students brainstorm and materialize solutions for the unique environmental challenges of an extraterrestrial setting. This hands-on project **not only hones their 3D design skills** but also instills a **sense of resourcefulness and adaptability**, crucial for thriving in an unfamiliar and dynamic environment.

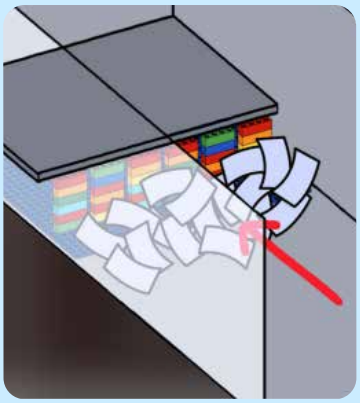
Class 4: Underground Tunnel

Concepts Iterative Design | Adaptability

In the underground tunnel challenge, students will tackle the **intricate task of constructing a tunnel** capable of securely and effectively guiding a package through disparate paths, ranging from 0 to 270 degrees. This challenge requires a blend of iterative design and meticulous planning, as students must ensure the tunnel's structure can handle a wide range of angles and objects. The exercise tests not only their engineering skills, but also their **ability to adapt and refine their designs** for optimal performance in a dynamic environment.

Class 5: Air Filter

Concepts Filtration | Air Purification | Environmental Engineering

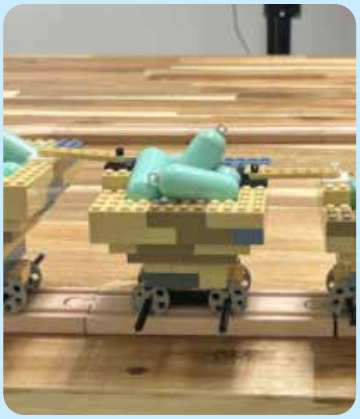


In our air filter challenge, students will learn about the **effectiveness of multi-layered filtration.** The task involves designing filters that combine coarse layers for large particles and fine layers for small particles, ensuring comprehensive air purification. Success will be tested by filtering a mix of various sized debris, with clean air post-filtration indicating a successful design. This challenge will enhance students' **understanding of air filtration technology** and its practical application in environmental engineering.

Class 6: Luggage Train

Concepts Weight Distribution | Structural Integrity

In our train challenge, students will explore various solutions to the complex task of **transporting weight across train tracks**. This challenge will be tested by navigating the constructed carts along a winding track, providing a practical and engaging way to understand the dynamics of **weight distribution, structural integrity, and efficient design**.



Class 7: Elevator

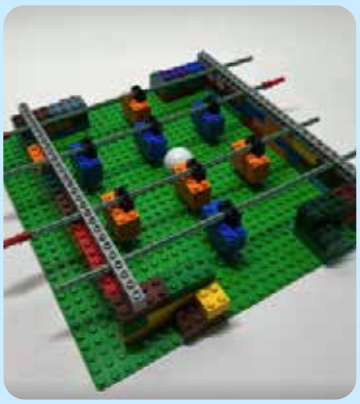
Concepts Weight Distribution | Counterweights | Interlocking

In our elevator challenge, students will delve into the critical concepts of **weight distribution and the use of counterweights**. The challenge involves the elevator lifting increasingly heavier loads, emphasizing the necessity of a well-balanced counterweight system. Success hinges on ensuring that the elevator is properly counterbalanced, the weight is adequately distributed, and the elevator car utilizes proper interlocking systems, fostering a **preliminary understanding of these fundamental physics** principles in our students.

Class 8: Foosball Table

Concepts Mechanical Design | Durability

Our Foosball challenge will be tasked with constructing a f**ully functional foosball table using only lego bricks**. This challenge will teach the **intricacies of mechanical design** as they must create an operational playing surface, usable player figures and a reliable scoring system to ensure the table is both durable and playable. Throughout this engaging hands-on project students will push their creativity as they navigate translating a traditional game into a Lego masterpiece!



Class 9: Giant Seesaw

Concepts Torque | Leverage

Our giant seesaw challenge teaches students the **importance of torque**. The goal of the challenge is to build a mechanism that can lift progressively heavier objects using only a 100 gram weight. We limit the lego resources available to students, so only by leveraging the power of torque can students **successfully use the same weight to lift heavier objects** (up to 3 pounds!)

Class 10: Giant Dome

Concepts Weight Distribution | Teamwork

Our giant dome will put **everything we've learned in our semester to the test**! The class is split into teams, and each team is tasked with building a giant dome (with no direct supports) that can support a very heavy weight falling from the sky! Proper weight distribution and interlocking are the keys to the construction of a strong and durable dome. This class **culminates your child's learning throughout the semester** and re-emphasizes the importance of teamwork, task delegation, and LEGO engineering fundamentals!

Sample Class

Class Synopsis

In this class, students will tackle a hands-on challenge by designing and constructing a prototype based on given parameters. They will work individually and in teams to solve problems, develop prototypes, and refine their designs, culminating in a reflection session.

Objectives

Enhance **problem-solving**, **teamwork**, and **prototyping** skills through engaging, hands-on challenges that require creative thinking and collaboration. Students will develop their ability to independently and collectively tackle complex tasks, refining their designs and approaches along the way. This class aims to teach students the **principles of center of gravity and structural stability** through hands-on crane construction.

Class Structure

1. Introduction
   Objective: Introduce the project and key learnings.
   - Discuss techniques and potential challenges of building a lifting crane.
   - Explain concepts of center of gravity, and winch systems.
   - Introduce the storyline.

2. Prototype
   Objective: Develop initial crane designs and understand basic principles.
   - Students draw and explain components.
   - Learn how different crane designs affect stability.
   - Understand the importance of balance and weight distribution.

3. Building Phase 1: Individual Challenge.
   Objective: Build and test the crane.

Sample Challenge Report

Challenge 1
Build a crane 15 LEGO's tall, lifting a 50-gram weight.

Challenge 2
Build a crane 20 LEGO's tall, lifting a 100-gram weight.

Challenge 3
Build a crane 25 LEGO's tall, lifting a 200-gram weight.

Sample Challenge Report [cont.]

Challenge 4
Build a crane 30 LEGO's tall, lifting a 500-gram weight.

Challenge 5
Build a crane 40 LEGO's tall, lifting a 750-gram weight.

4. Short Break
   - Students use the restroom, have snacks, and play outdoor games.

5. Building Phase 2: Individual, Team or Creative Challenge.
   Objective: Encourage creativity and teamwork through advanced challenges.
   - Continue with challenges by working individually or in teams to create crane designs.
   - Share innovative solutions and learn from peers' designs.

6. Clean-Up
   Objective: Teach Responsibility and Organization.
   - Students are guided to clean-up their workspaces.
   - Ensure all tools and materials are put away properly.
   - Encourage teamwork and a sense of responsibility in maintaining a clean and organized classroom.