About Galileo Learning

Galileo Learning (Galileo) creates and operates Innovation Camps for kids. Their mission is “to develop innovators who envision and create a better world” and this mission comes to life each summer at nearly 60 imagination-sparking locations (40 in the Bay Area, 15 in SoCal locations and 4 in Chicagoland.) They also train and employ more than 2100 educators and aspiring educators as summer staff. Galileo’s programs serve campers from pre-K through 8th grade.

In all of Galileo’s programs, the curricula focuses on helping campers (and staff) develop 21st Century skills and mindsets through understanding and applying the Galileo Innovation Approach (GIA). The GIA is inspired by the Stanford d.school’s design thinking process and mindsets and fine tuned for 5-14 year old campers who are especially open to absorbing new ways to think, explore and create. Click here for more information about Galileo Learning.
The Galileo Innovation Approach

The Galileo Innovation Approach (GIA) is our unique approach to teach and learning. It is designed to develop Galileo Innovators – campers and staff who imagine and create a better world. Galileo Innovators approach their work with an Innovator’s Mindset, do their work with an Innovator’s Process, and seek/leverage Innovator’s Knowledge.

Galileo Innovator’s Mindset
Galileo Innovators have dispositions that support breakthrough thinking and creative work. The Galileo Innovator’s Mindset has five elements:

BE VISIONARY
- I envision a better world.
- I imagine things that don’t yet exist.
- I believe that it is my place to turn ideas into reality.

BE COURAGEOUS
- I freely share my creative thoughts.
- I stretch myself to try new things.
- I embrace challenges.

BE COLLABORATIVE
- I value the unique perspectives of others.
- I build on the ideas of others.
- I use my strengths to support the work of others.

BE DETERMINED
- I persevere until I achieve my goal.
- I recognize setbacks as opportunities to learn.
- I know that innovation and mastery require effort.

BE REFLECTIVE
- I take time to think about what is and isn’t working in my design.
- I think about how my work impacts other people and the world.
- I seek feedback to improve myself and my work.

Galileo Innovator’s Process
Galileo Innovators learn and practice an iterative process to bring the best ideas to fruition. The diagram below shows the Galileo Innovator’s Process:

1. Identify Goals
2. Generate Ideas
3. Design
4. Create
5. Evaluate
6. Redesign
7. Test
8. Share

Galileo Innovator’s Knowledge
Galileo Innovators require subject-specific knowledge to creatively solve problems and make their visions a reality. Galileo Innovator’s Knowledge lies in the following four categories:

CONCEPTS AND FACTS
Galileo Innovators understand the big ideas, principles, and facts relevant to their work.
Examples: Adding more tension to a rubber band creates a higher pitch when it’s plucked

HISTORICAL CONTEXT
Galileo Innovators understand the contributions, objectives, and processes of relevant movements, artists, scientists, designers, and other experts who came before them.
Examples: Kandinsky uses a variety of brushstrokes and line types to represent music visually

SKILLS AND TECHNIQUES
Galileo Innovators understand how to use relevant materials, tools, and technology so they can effectively build, test, and share their ideas.
Examples: Manipulating cardboard by cutting, curling, bending, folding, scoring, tabbing, and fastening; taping techniques; watercolor resist

AUDIENCE AND ENVIRONMENT
Galileo Innovators understand the needs, beliefs, and circumstances of their users and the physical context in which their work will be received.
Examples: Engineers need to design buildings in a specific way when constructing in an earthquake prone area
Galileo Innovation Approach and the Curriculum

Our curriculum is designed to support you in teaching the Galileo Innovation Approach and nurturing Galileo Innovators. Below are some ways in which the curriculum fosters your development as an Innovation Educator.

First, you’ll find that the components of the GIA literally leap off the page.

• The GIA terms are emphasized throughout the curriculum in ALL CAPS to help you easily identify opportunities to integrate the GIA.
• An overview of the key Innovator’s Knowledge, Process, and Mindset for each lesson appears in the Instructional Priorities & Supporting Innovation section. Think of these as the blueprint of a successful lesson. Starrred sections in the curriculum are connected to these priorities and should not be skipped.

Second, the curriculum includes a daily Innovator’s Mindset Challenge. The Mindset Challenge helps campers focus on developing a different part of the Innovator’s Mindset each day and shows how practicing this element can help them develop as innovators. The challenge is introduced near the beginning of the lesson, supported with details in the facilitation notes and debriefed as part of the lesson wrap up.

Third, each day concludes with a Lesson Wrap Up that provides a forum for you to go deep on innovation themes with campers. Prompts are provided to support project sharing, reviewing key Innovator’s Knowledge and debriefing the day’s Mindset Challenge. Use this time to help campers solidify what they learned, notice how practicing the mindset helped them with their project and recognize the innovator in themselves and in others. Familiarize yourself with the discussion questions before each lesson so you can best guide campers to develop as innovators throughout the rotation.

Additionally, these general practices can help you to bring the GIA to life:

• Think about what it means to you to be an Innovation Educator and find ways to realize that vision.
• Pace your class to allow time for campers to engage with each project, giving ample time for the TEST, EVALUATE and REDESIGN phase so that campers can thoughtfully evaluate how they can improve their designs, and then implement the modifications.

• Model the Mindset in your teaching. When you make a mistake, celebrate it! Tell the campers that your teaching or the project didn’t go as planned, and that you’ll learn from that and try it a different way in the next rotation.
• Help campers understand what it means to be a Galileo Innovator and strive to shape their self-images as such.
• Recognize campers as they exhibit the Innovator’s Mindset as relevant throughout the day—in addition to this focus during the Wrap Up. (E.g., I see that you’re BEING REFLECTIVE, thinking about what is and isn’t working with prosthetic hand design. That’s a great way to start developing an innovative solution!)
• Refer to the steps of the Innovator’s Process (and your Galileo Innovator’s Process Poster) as you describe the day’s activities and as campers work.

Finally, the curriculum supports your own innovations for how to integrate the GIA in your classroom. Please apply the Innovator’s Mindset and Process to this end and SHARE your learning with your colleagues!
Galileo Makers – Supernova (Grades 3-5)

Real-World Inventions

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Day 1

Desktop Safe, Part 1 of 5

Project Overviews

Galileo Makers Day 1 – Desktop Safe, Part 1 of 5

Project Description
Camps begin on a weeklong project to create a safe made of cardboard. The safe will have functioning locks and other security elements, which makes this project practical as well as instructive.

Instructional Priorities and Supporting Innovation
Demo & Discussion: Exploring Lock Types and Safe Construction
★ Explore the CONCEPT of a lock as a group and learn how different locks operate.
★ Demonstrate the TECHNIQUES for assembling the safe and the safe housing, including hot gluing and using the Klever Kutter.

Throughout the Lesson
★ Support the Innovator’s Mindset Challenge: BE DETERMINED – Campers complete each step of today’s project thoroughly and purposefully.
Galileo Makers Day 2 – Desktop Safe, Part 2 of 5

Project Description
A safe is only useful if it’s hard to open. Campers get to design and create working locks that will secure the safes that were made yesterday.

Instructional Priorities and Supporting Innovation
Demo & Discussion: Brainstorm Lock Design Ideas
★ Focus on GENERATING IDEAS on how the three lock types can be expanded upon to create more complex mechanisms.
★ Demo the different building TECHNIQUES that are useful to make each of the lock designs.
★ Outline how campers can DESIGN their locks before beginning construction.

Throughout the Lesson
★ Support the Innovator’s Mindset Challenge: BE REFLECTIVE – Campers plan thoughtfully before they start building and take time to think about the questions on the evaluation checklist to troubleshoot.

Galileo Makers Day 3 – Desktop Safe, Part 3 of 5

Project Description
Alarms provide a fun and useful element that deters intruders even further. If you broke into a safe and an alarm went off, would you pause and rethink what you were doing?

Instructional Priorities and Supporting Innovation
Demo & Discussion: Alarming the Safe
★ Discuss the CONCEPT of a circuit as an unbroken conductive loop leading from and back to a battery.
Do-With-Me: Connect the Alarm Components
★ Demo the wiring SKILLS and construction TECHNIQUES for making a door-activated alarm.

Throughout the Lesson
★ Support the Innovator’s Mindset Challenge: BE DETERMINED – Campers troubleshoot and redesign until they have a working circuit.
Galileo Makers Day 4 – Desktop Safe, Part 4 of 5

Project Description
Campers wrap up any unfinished work from the previous days, add more locks, and add misdirection elements.

Instructional Priorities and Supporting Innovation
Demo & Discussion: Misdirection and Concealment
★ Introduce the CONCEPT of misdirection and how it applies to campers’ safes.
★ Focus on GENERATING IDEAS for how to misdirect potential safe thieves.
★ Brainstorm with campers to GENERATE IDEAS on how to conceal important parts of their safes, and show them some possible building TECHNIQUES to accomplish this.

Throughout the Lesson
★ Support the Innovator’s Mindset Challenge: BE VISIONARY – Campers take preexisting ideas and put their own unique twists on them.

Galileo Makers Day 5 – Desktop Safe, Part 5 of 5

Project Description
Campers finalize the safe with some decorations and try out each other’s safes!

Instructional Priorities and Supporting Innovation
Demo & Discussion: Visionary Decorations
★ Focus on GENERATING IDEAS to inspire campers to innovate on their already functioning safes.

Throughout the Lesson
★ Support the Innovator’s Mindset Challenge: BE COURAGEOUS – Campers share their thoughts about their own projects and the projects of others.
This Week’s Story

Each week at camp a story will unfold though a series of skits done at opening and closing ceremonies. The story provided to your Camp Director for this theme has been included here so that you can incorporate the story into your classroom this week. We’ve provided some suggestions in the curriculum for how to tie activities into the storyline, and we also encourage you to bring the story to life in your own way!

Galileo Makers Story Overview

Website Teaser
Galileo Makers: DIY Art and Real-World Inventions
Flex your maker muscle and put a creative spin on everyday objects. Design a personalized stool, clock or pillowcase for your room. Build useful inventions to take home like a vacuum or a secret lock box with an alarm that really works. Harness your innovative energy and join the marvelous maker movement as you transform intriguing ideas into functional, faire-ready reality.

Characters
• Storyteller
  Our narrator, who reads Monday’s story and parts of Wednesday’s and Friday’s—this role can be played by anyone who is a clear-spoken, engaging reader of stories
• Lucy, a girl who lives in Land Land
  A curious, potentially creative human stuck in a world of dull sameness—a situation that has resulted in a state of constant restlessness, as she never quite knows what to do with herself
• Finn, a boy who lives on Cardboard Island
  A super-enthusiastic kid who’s always up for a challenge and has ideas to spare—an I-have-an-awesome-idea-so-what-are-we-waiting-for kind of guy
• Lucy’s parents
  Formerly creative folks who have lived in Land Land so long they don’t remember what it’s like to make things themselves
• The makers of Cardboard Island
  Assorted creative folks—including our Camp G campers—who live and make on Cardboard Island

Setting
Land Land and Cardboard Island
• Land Land: A place where everyone is the same—everyone dresses the same (in dull colors), decorates the same (minimally, also in dull colors), has the same haircut and says all the same things (e.g.: Person 1: "Welcome to Land Land"; Person 2: "Welcome to Land Land")
• Cardboard Island: An alternate world that’s covered in cardboard as far as the eye can see—its inhabitants spend their days transforming its vast cardboard reserves into awesome hand-made gizmos, gadgets and pieces of furniture, all wildly colored and wonderfully personalized

Plot
Restless in her Land Land existence (and dreading an upcoming move to a new house that’s just like her current house), Lucy draws a doorknob on the back wall of her closet, which opens a portal to Cardboard Island, a land covered in cardboard and inhabited entirely by marvelously creative makers. There she meets Finn, who introduces her to the fabulous, fearless creativity of the Cardboard Islanders. They offer to help her make items to personalize her new room. When Lucy gets stuck back in Land Land, she and the Cardboard Islanders work together to reopen the portal and stage a mini-Maker Faire featuring items for Lucy’s new room.

Conflict
Lucy’s dad paints over the "doorknob" in Lucy’s closet, sealing the portal and locking her in Land Land before she can realize her vision for her new room. She and the Cardboard Islanders need to reopen the portal and stage their Faire before Friday’s move and without upsetting Lucy’s parents, who might not approve of such un-Land Land-like creations.

Resolution
Lucy and the Cardboard Islanders reopen the portal between the lands and put on an awesome Maker Faire on the island. Lucy’s parents follow her through the portal to the Faire, but instead of being upset, as Lucy feared, they’re impressed and inspired by her VISION.

What We Want Campers to Learn
• The Maker Movement is all about making things and getting people together to learn and create.
• Maker Faire is an all-ages gathering of makers who come together to collaborate, get inspired and share what they've made and learned.
• As long as you have an imagination (and a little cardboard) you never have to be bored.
• Innovators are VISIONARY and COLLABORATIVE.

**Galileo Makers: Monday**

**The storyteller reads:**

Once upon a time, so long ago that nobody but the storytellers remember, there lived a girl named Lucy. Lucy lived in a place called Land Land where everything was the same. In Land Land, everyone wore the same clothes, ate the same food, drove the same cars and lived in rows of identical houses. And this is how it had been in Land Land for generations. Year after year, it was the same, and that sameness had been the same for Lucy’s parents, her grandparents and her great-great grandparents, all the way back as long as anyone could remember.

It wasn’t such a bad place to live, but Lucy couldn’t help but feel a little tired of all the sameness. Sure, it made it easy to pick out her clothes in the morning and decide what to eat for lunch, but she couldn’t help but feel like there was something... missing.

On the day our story begins, Lucy was sitting in her room doodling, thinking about her family’s big move to a new house later that week. She wanted to be excited about moving, but she just couldn’t muster up any enthusiasm, because in Land Land, new houses were pretty much just the same as old houses. Which meant that her new room would look pretty much the same as her old room, which, in turn, looked exactly the same as her brother’s room... and her best friend’s room... and her best friend’s brother’s room...

"UGH!" Lucy exclaimed, rising to her feet. She was suddenly so fed up with the dreary, tedious BORINGNESS of it all. "Why does EVERYTHING I own have to look exactly the same as everything everyone else owns?" she wondered out loud, waving her pencil around for emphasis. Throwing open her closet door, she scanned racks and shelves stuffed with identical shirts, shoes, toys, books and sports equipment, all in drab, sensible colors. Pushing them aside, she stood considering the back wall of her closet. "Well," she said, looking at the pencil in her hand, "maybe I there's SOMETHING I can make look a little different."

And with that, she drew a big, round, ornate-looking doorknob on the wall in front of her, right where a doorknob would go if the back of her closet were a door instead of a wall. When she was done, she stood back, pleased with her handiwork. In fact, her doorknob looked so real, she almost felt like she could reach out and grab hold of it... so she did. And to her surprise, the knob turned in her hand and her closet wall swung open in front of her like a big door. Speechless and more than a little curious, she took a deep breath and stepped through it.

Lucy blinked in the bright sunlight. As her eyes started to adjust, she noticed three things about her surroundings:

**Number one:** She wasn’t inside her closet anymore. The warm, dazzling sun and fresh, salty-smelling air made that part pretty obvious.

**Number two:** She was surrounded by cardboard as far as the eye could see. But not just cardboard boxes and tubes and scraps—cardboard EVERYTHING. There were cardboard trees and flowers, cardboard benches and streetlights, cardboard houses and bicycles... and they were all so DIFFERENT. Every last flower petal and bicycle spoke was different from the one next to it—brightly painted, adorned with trims and tassels, some even wired with lights and switches. She’d never seen anything so intriguing or beautiful in her whole life... certainly not in Land Land.

And the third thing she noticed was the people—because there were plenty of people in this strange new place, and they had started to notice this new, drably dressed visitor. The people here were a little like the place itself: decked out in a variety of colors and cool embellishments, every one totally, marvelously different from the last. There was even a whole batch of kids about her age, sitting right in front of her, who seemed to be campers of some kind...

One of these utterly unique individuals—a boy about her age, wearing a wildly cool, totally wacky cardboard hat and a backpack covered in buttons and lanyards—walked right up to her and stuck out his hand. "Finn's the name," he announced cheerfully, "it's awesome to meet you!" Lucy took his
hand tentatively. "Hello, hello. I'm Lucy," she said, nodding her head twice, as was traditional in Land Land. And then, before she could stop herself, she blurted out, "Um... I'm sorry, but I... I'm just a little confused. Where am I?" Finn laughed. "Oh, how silly of me," he said, "where are my manners? Lucy, welcome to Cardboard Island!"

Galileo Makers: Wednesday

1. Lucy and Finn learn about each other's homes
   The storyteller reads: "Now, where did we leave off? Ah yes! There Lucy was, on the other side of a mysterious door in the back of her closet, surrounded by bright people and their bright creations, talking to a boy named Finn..."
   • Finn tells Lucy about Cardboard Island, a place covered in cardboard and inhabited by makers, including this group (i.e., the campers), who only just arrived Monday.
   • Lucy explains how different this place is from her home and tells Finn what led her here: She's tired of everything being so same-y in Land Land, especially the idea of her not-so-new "new" room in the house she's moving to.

2. Finn and his Cardboard Island friends offer to help
   • Excitedly, Finn says that he and his friends are experts at personalizing special spaces—they can help her make stuff for her room!
   • Lucy gets excited too, confessing that she sometimes sketches ideas for inventions.
   • The pair makes a plan: On Friday, Lucy, Finn and the Cardboard Islanders (including the campers) will put on a Maker Faire (an event Finn has to explain to Lucy) on the island, full of creations she can use in her new room.
   • Lucy is thrilled, but she muses that she probably shouldn't tell her parents yet, since she's not sure how they'll feel about all these unique creations in their Land Land home.

3. Lucy gets stuck back in Land Land
   The storyteller reads: "A few days passed, with Lucy traveling back and forth between Land Land and Cardboard Island, sharing her sketches and starting to learn how to bring them to life. But one day, when she came rushing home from school, excited to head to the island with a new batch of ideas, she got an awful shock..."

   • Lucy finds her dad in her closet, just having painted over her doorknob (an innocent mistake—he saw something out of order and thought he'd fix it).
   • Once her dad leaves, Lucy confirms that the door is, in fact, gone.
   • She tries redrawing the doorknob but it's no use—she bangs on the door helplessly.

4. The Cardboard Island folks reopen communication
   • Just then, a note arrives through the closet wall (the Cardboard Island gang heard her banging and fashioned a quick mail slot), which Lucy reads aloud: "Pretty cool mail slot, huh? We think we can figure out a new door, too. We just need a little time..."

5. The Cardboard Island folks convince Lucy to stay the course
   • Lucy is skeptical, but then she hears Finn calling faintly through her wall: He tells her that nothing is impossible if they COLLABORATE—they'll keep planning and making for the Friday Faire (sending plans through the mail slot), plus work on ideas to help them reopen the portal between the two lands.

Galileo Makers: Friday

1. Lucy wraps up the finishing touches on her Maker Faire project
   The storyteller reads: "It had been a busy few days since the door in Lucy's closet—the one between her home in Land Land and Finn's home on Cardboard Island—had been accidentally sealed shut. Lucy had been spending that time hard at work, communicating with her friends on Cardboard Island, sending plans back and forth as they generated ideas and creating her own project for Friday's Maker Faire..."
   • Lucy finishes her project and holds it up to inspect it, looking proud, then sighs, wondering aloud if she'll ever be able to go to Cardboard Island again—was this all a big waste of time?

2. Lucy reopens the door to Cardboard Island
   • Just then, she hears something coming from her closet and walks over to check it out.
   • "Is that you, Finn?" she asks.
   • "Yup," he responds, and then: "Draw a new doorknob!"
• She doesn’t hear him clearly at first, and once she does, she has to remind him that she already tried redrawing the doorknob with no luck.
• Finn explains that they figured out the secret to unlocking the portal: She can’t just draw the same doorknob again: “We’re makers—it has to be a totally reimagined thing... something the world has never seen before!”

3. Lucy attends her first Maker Faire

The storyteller reads: “Lucy picked up her pencil and studied the wall for a moment, then began to draw a completely new kind of doorknob, this one square and modern-looking with broad stripes running across it. When she was done, she picked up her project, took a few steadying breaths and reached out to turn her new doorknob. And once again, there she was, standing in the dazzling sun of Cardboard Island. But before she could celebrate her successful arrival, she was stopped in her tracks by what she saw: Everywhere she looked, there was a different maker with a different incredible thing—chairs and beds and beanbags; nightlights and desk lamps and fairy lights; clocks and door hangings and murals. It was all so overwhelmingly, astonishingly amazing that she almost couldn’t take it all in... but she wanted to try…”

• Lucy runs around the Faire delightedly, meeting makers, hearing about their projects and sharing her own.

4. Some unexpected visitors show up

• As Lucy begins to run to another booth, she runs smack into her mom and dad.
• Lucy is at a loss for words, but begins to stammer an excuse for what she’s doing and why she’s there, trying to hide her project behind her back.
• Her parents (a little speechless themselves) slowly explain that they’re not mad... they’re impressed—in fact, they remember a time, long ago, when they used to make things, too...
• They ask to see Lucy’s project and marvel at it—they’re inspired by her VISION.
• Overjoyed, Lucy says that she couldn’t have done any of it without the COLLABORATIVE efforts of Finn and her other Cardboard Island friends—the community of makers that welcomed her.

5. The storyteller wraps things up

The storyteller reads: "Lucy, her parents, Finn and the rest of the Cardboard Island makers spent hours together at the Faire that day, showing each other what they made and sharing what they learned making it. The Land Landers started to truly understand the power of creating things the world has never seen before and of working together with interesting, innovative people. And they learned a lesson that Cardboard Islanders, Galileo campers and makers all over the world have known for many years: As long as you have an imagination—and maybe a little cardboard—your life will never be boring.

By the end of the day, Lucy and her parents were so utterly inspired and full of ideas for what else they could make—objects to decorate their new house, to solve everyday problems, to give as gifts—that they couldn’t wait to show everyone back home in Land Land. And that's exactly what they did. And from that day forward, to their delight, Land Land was never the same again."

Notes and Additional Ideas

• Your other actors can act out the read-out-loud scenes as the storyteller reads them.
• As inhabitants of Cardboard Island, campers can submit their own ideas/plans for a new door between their land and Land Land.
• Lucy and Finn not being able to hear each other through the wall can be played for comedy: They can stand directly next to each other (with either a cardboard or an imaginary wall between them), shouting as loud as they can, but barely able to make each other out.
• Lucy’s project for the Faire can be anything—a camper project or something entirely different.
• On Wednesday or Friday, Lucy can meet real makers (played by staffers) that campers have been learning about, who can share their projects with her.
• On Friday, campers can stage the Maker Faire that Lucy discovers on the other side of her door.
• Feel free to turn Friday’s Faire into a deeper exploration of campers’ work throughout the week—look at each project and call out (or have campers identify) the Mindset elements and Process steps they used in making it.
Preparation for the Week

This section contains preparation of materials such as cutting paper and cardboard. Give this list to Summer Interns (SIs) who have some time to help Lead Instructors (LIs) or to Team Leaders (TLs) who help LIs do prep work after camp. It also helps you get a sense of the prep needed for the week. It does not include tasks such as setting out materials or preparing a place to store projects. Those suggestions are in the prep section of each lesson.

Day 1 – Desktop Safe, Part 1 of 5

Days earlier

👀 Build an example of the deadbolt lock.

Pictorial of the deadbolt lock

- Assemble an 8” x 8” x 5” box and create a door using one of the methods outlined in the pictorial.
- The deadbolt lock functions by inserting a golf tee through the door and into the corrugations of the cardboard box. This prevents the door from opening unless the deadbolt is removed.
- The deadbolts can be oriented in different ways.

👀 Build an example of the combination lock.

Pictorial of the combination lock

- Cut a 2” x 8” strip of cardboard from an 8” x 8” piece of corrugated cardboard. This piece is called the “lock plate.”
- When using the Klever Kutter to cut strips of cardboard, hold it like this.
- First, glue just one of the short edges of the lock plate to the inside of the safe.
- After the first short edge has been glued in, use the glue gun to glue the other two edges. This technique is necessary because it is difficult to glue all three edges at once.
- Trace the dial position with a pencil on the safe door. Make sure that the dial has at least 0.5” of clearance from the edge of the door.
- Close the door and use an awl to create a hole through both the door and the lock plate at the same time.
- Use scissors to cut a slot, including the hole, that is at least as wide as shown.

👀 Cut out the piece. The slot needs to go past the hole made by the awl, as otherwise the lock may get stuck.
- Insert a 1” piece of dowel through a wood wheel. If the dowel is even slightly loose, then cover the end of the dowel with hot glue.
- Insert the dowel through the hole in the door, and then glue a 0.5” piece of coffee stirrer to the other end of the dowel. This piece is called the “lock stick.”
- While the lock stick is aligned with the slot, draw an arrow that is pointed in any direction. Take a moment to remember the unlocked position.
- Create any number of markings around the dial.
- For your example, cut away the bottom and one side of the safe so campers can see how the lock works. When campers build their locks tomorrow, they will not cut away the side of their safes.

👀 Build an example of the magnetic lock.

Pictorial of magnetic lock

- Assemble an 8” x 8” x 5” box and create a door using one of the methods outlined in the pictorial.
- Place three spools onto the straw-wire.
- Glue two of the spools to the inside of the box near the front.
- Place glue on top of the third spool.
- Make sure the wire is hanging outside of the safe.
- Close the door and wait for the glue to dry.
- Pull on the straw-wire to remove the straw from the spool that is glued to the door.
- This technique ensures that the three spools align perfectly.
- Glue a magnet onto the end of the spool that’s attached to the door.
- Glue a scrap of cardboard onto the end of the other two spools.
- Insert a nail into the two spools with the pointed end facing outward.
- To lock: Close the door and then tilt the box toward the magnet. The nail will slide and connect with the magnet. Now the nail is in between the magnet spool and the other spools, which prevents the door from opening.
• To open: Orient the box such that the magnet is pointed upward. Firmly tap the box once onto a hard surface. This will dislodge the nail from the magnet.

Day 2 – Desktop Safe, Part 2 of 5

Days earlier

- Cut the dowels into 1" pieces (2 pieces per camper).
- Create six straw-wires for the magnetic lock construction (6 per classroom).
  - Cut straws into halves.
  - Cut Twisteez wire into thirds.
  - Tape a piece of wire onto a piece of straw.

Advance prep

Start stripping the wires for the Desktop Safe, Part 3. (See details in the Day 3 prep.) The prep for that day may take longer than usual, and it’s recommended that you start now.

Day 3 – Desktop Safe, Part 3 of 5

Days earlier

- Cut Twisteez wires into four pieces (2 pieces per camper) and strip about 1.5" off of each end.
- Strip wire insulation off of the buzzers’ wires (1 buzzer per camper).
- Install an alarm into one of your example safes.
Circuit and Battery Safety

For All Supernova Science Labs
READ ME: IMPORTANT CIRCUIT SAFETY PROTOCOL

What’s a Short Circuit?
A short circuit will occur any time the electric current can flow around a circuit from one terminal of the battery to the other without passing through any other components, like a motor or light. Without the current passing through a component there is nothing to provide resistance (consume electricity), resulting in an unsafe flow of excess current.

Both of these pictures show a short circuit. Even though the picture on the right has a motor wired to the batteries, the circuit is still shorted because the battery pack wires are directly touching, creating a path that allows the current to travel back to the battery without passing through the motor.

![Short Circuit Image 1](image1)

![Short Circuit Image 2](image2)

It is extremely important that you prevent short circuits while working with electronics. Short circuits can damage the battery and other components. They also cause overheating that may result in smoke or fire.

While we do not expect any issues if you follow these protocols, should you experience any overheating, alert your CD so they can alert the Curriculum and Field teams immediately.

Prevent Short Circuits and Overheating
- Never connect the wires leading from the battery to each other. This will quickly overheat the battery.
- Clearly review with campers the importance of not creating short circuits and demo all techniques for preventing exposed wires.
- Store batteries safely. Avoid unpackaging coin cell batteries until you are ready to use them.

![Battery and Motor](image3)

Signs of a Short Circuit
- Batteries or wires feel uncomfortably hot to the touch. (Note that it is normal for batteries to get slightly warm. This is not a sign of a short circuit.)
- The circuit is smoking or catches on fire.
- Motors or lights are not turning on even when the circuit is turned on.

Instruct campers to let you know immediately if they notice their batteries getting hot. Emphasize it is extremely important that they alert an adult as soon as possible if this is happening.

What to Do If You Experience a Short Circuit or Overheating
- Immediately deactivate the circuit by uncrossing wires and carefully removing the batteries.
  - Do not use your hands if the battery is hot.
- Ventilate the room if you smell overheated batteries.
- Check for damaged components such as melted wires or overheated electronics.
  - Discard damaged parts. Do not reuse them.
  - Wrap battery terminals in tape before discarding.
  - Discard the components in a heat-resistant container. Create an electronics-recycling container for your camp. Don’t dispose of electrical components in the trash.
- Determine the cause of the short.
  - Check for exposed wires and have the camper wrap any imperfect connections in tape.
  - If the wires are not crossed and the batteries are still overheating, put the project sample aside and alert your CD. Save the project sample for the curriculum team to analyze.
Day 1

Desktop Safe, Part 1 of 5

Campers begin on a weeklong project to create a safe made of cardboard. The safe will have functioning locks and other security elements, which makes this project practical as well as instructive.

This is an example of the cardboard safe inside the housing.

The Big Picture

Lesson Breakdown

<table>
<thead>
<tr>
<th>Activity</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welcome to Science</td>
<td>10 min</td>
</tr>
<tr>
<td>Introduction</td>
<td>5 min</td>
</tr>
<tr>
<td>Demo &amp; Discussion: Exploring Lock Types and Safe Construction</td>
<td>5 min</td>
</tr>
<tr>
<td>Camper Work Time: Build the Safe and Housing</td>
<td>25 min</td>
</tr>
<tr>
<td>Seal one side of the housing (9&quot; x 9&quot; x 6&quot; box) and the safe</td>
<td></td>
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<tr>
<td>(8&quot; x 8&quot; x 5&quot; box). Add a door or lid to the safe.</td>
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<tr>
<td>Designable Components: safe/housing orientation and opening</td>
<td></td>
</tr>
<tr>
<td>Clean Up</td>
<td>5 min</td>
</tr>
<tr>
<td>Wrap Up</td>
<td>5 min</td>
</tr>
</tbody>
</table>

GIA Focus

Innovator’s Knowledge Focus: SKILLS AND TECHNIQUES

Innovator’s Mindset Focus: BE DETERMINED – I know that innovation and mastery require effort.

What’s Next: Tomorrow (Day 2) campers will begin making the lock on the safe and/or housing. On Day 3 campers will add an alarm system. On Day 4 they will continue working on any unfinished components and add misdirection. On Day 5 campers will finish any components and decorate.
How to Create Today’s Project

Step-by-Step Pictorial
This is intended to help you understand how to create today’s project. It doesn’t include everything campers will do today (like the group exploration of how each of the lock types works). It also doesn’t describe how you’ll facilitate this lesson for campers. You’ll need to read the “Play-by-Play” section for this information.

Sealing the Housing and Safe
Note: The steps illustrated in Figs. 1-4 are repeated for the larger 9” x 9” x 6” housing box. All of the housings will open on the 9” x 9” side.

Fig. 1
Work with a partner to tape one end of the 8” x 8” x 5” box closed.

Fig. 2
Place two large globs of hot glue under the flap on the inside of the box.

Fig. 3
- Push down on the flap to ensure that it bonds to the glue.
- Repeat with the other flap.
Adding a Safe Door: Option 1 (opening on the 8" x 8" side)

Cut the flaps off of one side of the 8" x 8" x 5" box. Hold the box at the edge of the table and pull the cutter downward. This technique makes the cutting much easier.

Attach an 8" x 8" piece of cardboard to the box with duct tape. This will be the door.
Fig. 7
This shows an assembled safe with the opening on the 8" x 8" side.

Adding a Door: Option 2 (opening on the 5" x 8" side)

- Tape the flaps on the other side of the box closed.
- Cut open three edges on one of the 8" x 5" sides. Be sure to cut right along the edge so the opening is 8" x 5". A smaller opening will make it difficult to access the inside of the safe later in the week.
Fig. 9

Fig. 10
Glue the loose flaps on the inside of the box.

Fig. 11
This shows an assembled safe with the opening on the 8" x 5" side.
Get Ready!

Lesson Materials
* (starred) items are choice materials; un-starred items are required for each camper

Pre-Assembly
(You'll assemble examples of the three lock types: deadbolt, combination, and magnetic.)
☐ box, corrugated, 8" x 8" x 5" (3 per classroom)
☐ cardboard, corrugated, 8" x 8" (3 per classroom)
☐ golf tee, wood, asst. colors, for deadbolt lock (2 per classroom)
☐ wheel, wood, 0.25" center, 1.5" x 0.5", for combination lock (1 per classroom)
☐ dowel, wood, 0.25" x 12", for combination lock (1 per classroom)
☐ coffee stirrer, wood, 5.5", for combination lock (1 per classroom)
☐ spoool, wood, 1" x 3/4" w/ 1/4" hole, for magnetic lock (3 per classroom)
☐ magnet, round, small, 0.5" dia. x 0.25" thick, for magnetic lock (1 per classroom)
☐ nail, finishing, 1.5", for magnetic lock (1 per classroom)
☐ tape, duck, 1-7/8" wide, any color (50" per classroom)

Demo & Discussion: Exploring Lock Types and Safe Construction
☐ pre-assembled locks (3 per classroom)
☐ box, corrugated, 9" x 9" x 6", for housing (1 per rotation)
☐ box, corrugated, 8" x 8" x 5", for safe (1 per rotation)
☐ tape, duck, 1-7/8" wide, any color (32" per rotation)
☐ cardboard, corrugated, 8" x 8", for door option (1 per rotation)
☐ glue gun, mini, low temp (1 per li)
☐ glue stick, for hot glue gun (1 per li)

Camper Work Time: Build the Safe and Housing
☐ box, corrugated, 9" x 9" x 6", for housing (1 per camper)
☐ box, corrugated, 8" x 8" x 5", for safe (1 per camper)
☐ tape, duck, 1-7/8" wide, any color (32" per camper)
☐ *cardboard, corrugated, 8" x 8", for door option (1 per camper)
☐ glue gun, mini, low temp (1 per 2 campers)
☐ glue stick, for hot glue gun (1 per 4 campers)
☐ extension cord, 25 ft. (1 per 4 campers)

Extension
☐ paper, newsprint, 9" x 12" (1 per camper)
☐ pencil, #2 (1 per camper)

Preparation
Days earlier
☐ ☐ Build an example of the deadbolt lock.

Pictorial of the deadbolt lock

- Assemble an 8" x 8" x 5" box and create a door using one of the methods outlined in the pictorial.
- The deadbolt lock functions by inserting a golf tee through the door and into the corrugations of the cardboard box. This prevents the door from opening unless the deadbolt is removed.
• The deadbolts can be oriented in different ways.

Build an example of the combination lock.
*Pictorial of the combination lock*

• Cut a 2” x 8” strip of cardboard from an 8” x 8” piece of corrugated cardboard. This piece is called the “lock plate.”

• When using the Klever Kutter to cut strips of cardboard, hold it like this.

• First, glue just one of the short edges of the lock plate to the inside of the safe.
• After the first short edge has been glued in, use the glue gun to glue the other two edges. This technique is necessary because it is difficult to glue all three edges at once.

• Trace the dial position with a pencil on the safe door. Make sure that the dial has at least 0.5" of clearance from the edge of the door.

• Close the door and use an awl to create a hole through both the door and the lock plate at the same time.

• Use scissors to cut a slot, including the hole, that is at least as wide as shown.
• Cut out the piece. The slot needs to go past the hole made by the awl, as otherwise the lock may get stuck.

• Insert a 1" piece of dowel through a wood wheel. If the dowel is even slightly loose, then cover the end of the dowel with hot glue.

• Insert the dowel through the hole in the door, and then glue a 0.5" piece of coffee stirrer to the other end of the dowel. This piece is called the “lock stick.”

• While the lock stick is aligned with the slot, draw an arrow that is pointed in any direction. Take a moment to remember the unlocked position.
• Create any number of markings around the dial.
- For your example, cut away the bottom and one side of the safe so campers can see how the lock works. When campers build their locks tomorrow, they will not cut away the side of their safes.

- Place three spools onto the straw wire.

- Assemble an 8" x 8", 5" box and create a door using one of the methods outlined in the pictorial.

- Build an example of the magnetic lock pictorial.
• Glue two of the spools to the inside of the box near the front.

• Place glue on top of the third spool.

• Make sure the wire is hanging outside of the safe.
• Close the door and wait for the glue to dry.

• Pull on the straw-wire to remove the straw from the spool that is glued to the door.
• This technique ensures that the three spools align perfectly.
• Glue a magnet onto the end of the spool that’s attached to the door.

• Glue a scrap of cardboard onto the end of the other two spools.

• Insert a nail into the two spools with the pointed end facing outward.

• To lock: Close the door and then tilt the box toward the magnet. The nail will slide and connect with the magnet. Now the nail is in between the magnet spool and the other spools, which prevents the door from opening.

• To open: Orient the box such that the magnet is pointed upward. Firmly tap the box once onto a hard surface. This will dislodge the nail from the magnet.
Day before
- Set aside 9" x 9" x 6" boxes and 8" x 8" x 5" boxes (1 of each per camper).

Morning of
- Set up hot glue stations for campers and a glue gun for the Demo & Discussion (1 glue gun per 2 campers).

Check In With Your TL
Make sure your TLs are clear about their role in helping today’s lesson run smoothly. Specific ways TLs can help today are listed in the dotted overview boxes throughout the lesson.

Notes
Today requires that the campers spend a lot of time listening to you and discussing amongst the group. Be animated and lively as you introduce your class and during the Demo & Discussion.

On the Board

Design Goals
The safe must include a lid or door that can open and close.

Guiding Questions
BE DETERMINED
- What can you do to make sure every part of your box is sturdy and well-constructed?
- What do you need to do next to complete today’s goals?

Vocabulary
safe – a strong container used to lock up valuables
housing – a structure that encloses a piece of equipment
Teaching the Lesson: Play-by-Play

Welcome to Science (10 min)

Introduce the idea of being an innovator. Have campers share what they think innovators are and why they’re important. Explain that innovators are people who have a vision to make things better and the skills to turn those ideas into reality. Let campers know that in addition to learning about science they’ll also be learning how to be great innovators.

Explain that Galileo innovators follow the Innovator’s Process, practice an Innovator’s Mindset, and use Innovator’s Knowledge.

Point out the Innovator’s Process poster in your room. Tell campers that innovators follow steps that are most likely to lead them to creative solutions and that they’ll be using this process throughout the week.

Point out the Innovator’s Mindset poster in your room. Tell campers that innovators have a way of thinking about and doing their work that helps them achieve their goals. Let campers know that there are five parts to this Mindset and they’ll be practicing these all week.

Explain that the last ingredient for innovation is knowledge. Let campers know that this week they’ll be learning a lot of science concepts that will help them bring their creative ideas to life.

Say: Are you ready to be innovative all week? Let’s get started!

Introduction (5 min)

Welcome campers and make a quick story connection

Did you learn about Lucy this morning? What happened to her in the story? (She traveled to a place called Cardboard Island that’s covered in cool cardboard creations.) Why don’t we get into the Cardboard Island spirit by making some inventions ourselves! Maybe we can inspire Lucy to build something that no one in Land Land has ever seen before.

Introduce the week’s theme

- Explain that the week’s theme is all about Making, which means creating things oneself.
  - This includes tools, things for games and play, and totally new inventions.
  - This week, campers are making things that are useful for every day.
- Explain that people who make things are called makers. The maker community is a space where makers can come together to share ideas.
- Tell campers they’ll be learning about some current-day makers who are creating things similar to the things they’ll be making at camp.
- If this is your second or third rotation you can ask campers to tell you what they know about making and makers since they will have gotten this introduction in art.

Build excitement for today’s project

- Ask campers if anyone owns something that they want to keep safe or secret. Maybe it’s a special toy or keepsake, or possibly a stash of cash!
- Show campers the Rishab’s Magic Box color copy (below).

- Explain that Rishab is a young maker in California who had this same challenge.
  - Since he’s a maker he solved his challenge by making something!
  - He calls his innovation a Magic Box. It looks like a normal wooden box, but it has a secret lock! Since only he knows the secret he can now keep things in his box and they’ll be safe!
- Announce that campers will take on a similar challenge as Rishab by making something to keep unwanted intruders away from their valuables.
- Clarify that it won’t be exactly like Rishab’s box. It will be a safe made out of cardboard, but it will also have locks.
• Show campers the Example Safe color copy (below). Explain that a safe is a sophisticated container that uses locks and alarms that make it very difficult to get inside.

![Example Safe](image)

• Explain that today campers will be creating just the container that will be used as the safe, and the safe housing. Everything else will be built upon what’s made today.
• Tomorrow, campers will begin adding locks to their safes, and then later in the week they will create a working alarm, sneaky additions to confuse intruders, and decorations.

**Introduce the Innovator’s Mindset: BE DETERMINED ★**
• Point to this on your Innovator’s Mindset poster.
• Define the Mindset element in the context of today’s lesson. Say: *As we build the safe, you’ll need to be determined by making sure that everything is built well. The parts that you make today will be the foundation for the rest of the week, so it’s important to take your time and build each part carefully and thoroughly.*

**Demo & Discussion: Exploring Lock Types and Safe Construction (25 min)**

<table>
<thead>
<tr>
<th>What You’ll Need to Cover: Overview</th>
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</thead>
<tbody>
<tr>
<td>• Discuss the purpose of a safe.</td>
</tr>
<tr>
<td>• Introduce the basic components of a lock. ★</td>
</tr>
<tr>
<td>• Explore the deadbolt lock. ★</td>
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<tr>
<td>• Explore the combination lock. ★</td>
</tr>
<tr>
<td>• Explain the magnetic lock. ★</td>
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</tbody>
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<table>
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<tr>
<th>What You’ll Need to Cover: Details</th>
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</thead>
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<tr>
<td><strong>Discuss the purpose of a safe</strong></td>
</tr>
<tr>
<td>• Acknowledge that a super strong cardboard safe can be broken into, but even real safes are not designed to be impossible to break into. Rather, safes are designed to simply make it more difficult or take longer for someone to break into.</td>
</tr>
<tr>
<td>• In the real safe-building industry, safes are graded based upon how long it takes to break in.</td>
</tr>
<tr>
<td>• Therefore, as campers construct their safes, it’s good to keep in mind that the goal is not to make the safe impossible to enter, but as difficult and confusing as possible.</td>
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</table>

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<tr>
<th>What You’ll Need to Cover: Details</th>
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<tbody>
<tr>
<td><strong>Introduce the basic components of a lock ★</strong></td>
</tr>
<tr>
<td>• Other than the walls of the safe, the most important component is the lock.</td>
</tr>
<tr>
<td>• There are many different kinds of locks, but all locks share one key idea: When the lock is in place, it prevents two surfaces from moving past each other.</td>
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<tr>
<td>• For example, when you lock the door at home, you are preventing the door from moving past the doorframe.</td>
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<tr>
<td>• Let campers know that even though they won’t be building locks today they’re going to take some time to study three basic lock types so they’ll have the knowledge they need to build their locks tomorrow.</td>
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<tr>
<td>• Review the Mindset Challenge ★ – Remind campers that innovation takes time! Encourage campers to stay determined to focus on all the preliminary information and steps they’ll be going through today.</td>
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<tr>
<td><strong>Explore the deadbolt lock ★</strong></td>
</tr>
<tr>
<td>• Show campers the example of the deadbolt lock. Note the golf tees poking out on the sides.</td>
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</tbody>
</table>
• Have campers turn to a partner and discuss the following for 30 seconds.
  ▪ What two surfaces are not moving past each other?
  ▪ What is keeping them together?
  ▪ What might I do to allow the surfaces to move past each other?
• Ask for a volunteer to share an answer. Try out the suggestion. If it’s incorrect, take another suggestion until the lock is undone.
• Explain that the golf tee acts as a lock, which connects the lid with the rest of the box and prevents them from moving past each other.

Explore the combination lock ★
• Show campers the example of the combination lock while holding the cutaway side away from the group. Note the dial on top of the safe.
• Have campers turn to a partner and discuss the following for 30 seconds.
  ▪ What two surfaces are not moving past each other?
  ▪ What do you think is keeping them together?
  ▪ What might I do to allow the surfaces to move past each other?
• Ask for a volunteer to share an answer. Try out the suggestion. If it’s incorrect, take another suggestion until the lock is undone.
• Show campers the cutaway and demonstrate how the lock works. Note that the lock stick prevents the lid from being opened until it passes over the slot.

Explain the magnetic lock ★
• Show campers the magnetic lock. Note that this lock doesn’t reveal anything on the outside.
• Crack the lid open and point out the three spools. Try jiggling the lid and note that the spool with the magnet moves separately from the other two.
• Have a few campers guess how the lock works using the same prompts:
  ▪ What two surfaces are not moving past each other?
  ▪ What do you think is keeping them together?
  ▪ What might I do to allow the surfaces to move past each other?
• This lock is so sneaky that campers probably won’t be able to guess how it works. After a few guesses show them.
• Demonstrate how the magnetic lock opens by tapping the box forcefully. When the box is open, take out the nail and then insert it into the magnetic spool such that part of the nail is hanging out (following photo).

• Explain that the nail prevents the spools from going past each other. However, if you tap the box in the right direction, the nail will fall off of the magnet and into the other two spools.
• To lock it, simply tilt the box in the direction of the magnet. Try jiggling the lid to confirm that it’s locked.
• Demo how to open and lock the box once or twice until campers understand how it works.

Outline the safe construction process and techniques ★
• Tell campers that the knowledge about these lock types that they learned today will be built upon tomorrow.
• However, the first thing that needs to be made is the safe and housing.
• Explain that campers will get two boxes: a smaller box and a larger box.
• The smaller box will be the safe itself, and the larger box will be the safe housing.
• Show campers how the safe can fit inside the housing. This accomplishes a few things:
  ▪ Adds another layer of protection to the safe
  ▪ Conceals all but one side of the safe, which can help hide the locks
  ▪ The safe can be locked to the housing later in the week

Demo how to seal the open side of the housing and safe ★
• Have your TL hold the flaps of the 9" x 9" x 6" box down while you apply a piece of duck tape. Tell campers that they should also work with a partner on this step.
• Support BEING DETERMINED ★ — Emphasize how you’re really taking your time to make sure the tape is straight and secure.
• Flip the box over and demo how to use a glue gun to glue the flaps of the housing together as shown in the pictorial.
• Note that flaps must be held in place for at least 20-30 seconds before the glue dries.
• Support BEING DETERMINED ★ — Again, emphasize that you’re not rushing and you’re making sure the flaps are glued down well. If the flaps keep opening it will be hard to build all the other components of the safe later in the week.
• Also, as you demo, discuss hot glue safety and technique:
  ▪ Hot glue dries very quickly. Hot glue must be used within 10 seconds after being dispensed.
  ▪ Use dots of hot glue rather than long lines. Long lines of glue usually dry too quickly. Also, hot glue is strong enough so that two or three dots will hold just as well as a long line.
  ▪ When gluing two things together, put the glue on the larger thing. Gluing small things can be tricky.
  ▪ Keep fingers away from the tip of the glue gun and the freshly melted glue at all times.
• Let campers know they’ll repeat these exact steps to close one side of their smaller safe boxes.
• Once one side of the box is taped and glued shut, show campers how to use the Klever Kutter to remove the flaps from the other side of the box.
  ▪ The best technique is to place the box at the edge of a table, then pull the cutter down the fold of the flap (below).

Discuss options for the safe door
• Explain that campers have a choice at this point. They must decide where the opening of the safe will be.
• There are two basic options:
  ▪ Front/back door – Cut the flaps off of the unsealed front/back and then tape a square of cardboard over the opening.
  ▪ Sides/top/bottom door – Close both ends of the box, then cut open one of the smaller sides of the box.

Demo creating each option and using the Klever Kutter ★
• Demo creating each of these as shown in the pictorial so campers can see each option.
• Be sure to go into detail about using the Klever Kutter for the 8” x 8” door option.
• Show campers again how to hold the box over the edge of a table and use the tool to cut away a flap on the other side.
• Show how to use scissors to make a small snip if the Klever Kutter does not cut into the cardboard right away (below).

• The Klever Kutter can then be hooked onto the slit.
• Demo the following technique, which is good for campers who struggle to cut through the whole thickness of the cardboard.
  ▪ Use the hook part of the Klever Kutter to cut into the corrugations (following photos).
Transition to work time

- Review the Mindset Challenge ★ – Remind campers to stay determined to complete each step to the best of their ability, even if this isn’t the most exciting part of the project. Putting in effort on these basic steps will ensure they have a solid foundation to build off of the rest of the week.
- Have campers gather one box of each size and begin constructing the safe and the housing.

Camper Work Time: Build the Safe and Housing (20 min)

During Work Time Campers Will...
CREATE
1. Close the 9” x 9” x 6” housing box by gluing one end closed and cutting the flaps off of the other end.
2. Close the 8” x 8” x 5” safe box.
3. Choose where the safe opening will be and either cut out a new opening, or cut the flaps off of one end of the box.
4. If the flaps were removed, then tape an 8” x 8” piece of cardboard to the open end of the box to create a hinged lid.

Extension
- Hand out paper and pencils and allow campers to sketch some lock ideas or list the kinds of locks they want to employ.
- Help someone else finish.

How Your TL Can Help
- Gluing down the flaps might be difficult. Have your TL assist campers by reminding them to hold the flaps down until the glue dries completely and to flip the box over and press on the flaps from the inside.
- Help cut/tear pieces of duck tape.

Facilitate the Project Steps
CREATE (Steps 1-4)
- Help campers use their time efficiently by directing them to use open glue guns. This will help prevent bottlenecks during the gluing step.
- Remind campers to work with a partner for taping down the flaps.

• Then use scissors to cut the other half

• Review the Mindset Challenge ★ – It can take a few goes to figure out the best way to use the Klever Kutter. Tell campers that if they’re having trouble at first it’s natural. With a little determination and practice they’ll get the hang of it!
Extension

- Campers who finish early can record their great ideas from the brainstorm and refer back to them tomorrow when they begin building the locks.
- If campers finish early, have them write their names on their safes and housings and then help someone else finish.

Support BEING DETERMINED ★
Suggest strategies that help and encourage campers to be determined
Some specific strategies for today:
- Getting a friend to help. Cutting the cardboard can be challenging, but having a partner help speed up the process can renew motivation.
- Tracking their progress so they can see how much they’ve done and how much more they still have to go. You can support this by having a checklist of steps on the board, or simply reminding campers of what they’ve completed and what still needs to be done.

Recognize determined campers
This encourages the camper and helps others see how they can be determined as well. Recognition can be just verbal or include some kind of physical award. Be sure to be specific about how you see campers being determined. Some ways you might see determination today:
- Using any of the strategies mentioned above
- Taking their time to really make sure each step is done well
- Completing a tricky task on their own instead of asking an adult to do it for them

Ask the Guiding Questions that support being determined

Clean Up (5 min)

- Make sure that campers have their names on their safes and housings.
- Store the safe inside the housing.
- Keep all of the cardboard scraps to be used later in the week.

Lesson Wrap Up (5 min)

Review (SKILLS AND TECHNIQUES, CONCEPTS AND FACTS)
Give campers a chance to review what skills, techniques and concepts they learned and used today.

Suggested review activity
- Have campers recap successful hot-gluing and cardboard-cutting techniques they discovered. Point out that they’ll be hot gluing and cutting cardboard all week, so having some good techniques for each will be helpful.
- Review the three lock types campers will get to choose from tomorrow and have campers share if they have an idea of which they think they’d like to try.

Recognition and Reflection (BE DETERMINED)
Help campers see how they or others embraced the Innovator’s Mindset and why this is important for innovation.

Suggested recognition and reflection activity
- Give campers a chance to recognize teammates they noticed being determined. Ask them how that person was determined. (Maybe they noticed someone who was having trouble cutting cardboard at first and kept going, or someone who was extra careful about gluing.)
Day 2
Desktop Safe, Part 2 of 5
Lock It Up!
A safe is only useful if it’s hard to open. Campers get to design and create working locks that will secure the safes that were made yesterday.

The Big Picture

Lesson Breakdown

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<tr>
<td>Introduction</td>
<td>5 min</td>
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<tr>
<td>Demo &amp; Discussion: Brainstorm Lock Design Ideas</td>
<td>20 min</td>
</tr>
<tr>
<td>Camper Work Time: Lock It Up!</td>
<td>35 min</td>
</tr>
<tr>
<td>Choose one or more lock designs and begin building a lock into the safe door and/or the safe and its housing. The safe must use at least one lock type to prevent the door from being opened while the lock is engaged.</td>
<td></td>
</tr>
<tr>
<td>Designable Components: lock type, lock placement, number of locks</td>
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</tr>
<tr>
<td>Testing: attempt to open the door with normal force while the lock is engaged</td>
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</tr>
<tr>
<td>Clean Up</td>
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GIA Focus
Innovator’s Process Focus: DESIGN and EVALUATE
Innovator’s Mindset Focus: BE REFLECTIVE – I take time to think about what is and isn’t working in my design.

What’s Next: Tomorrow (Day 3) campers will add an alarm system. On Day 4 they will continue working on any unfinished components and add misdirection. On Day 5 campers will finish any components and decorate.
How to Create Today’s Project

Step-by-Step Pictorial

This is intended to help you understand how to create today’s project. It doesn’t include everything campers will do today (like the brainstorm on how to combine locks). It also doesn’t describe how you’ll facilitate this lesson for campers. You’ll need to read the “Play-by-Play” section for this information.

Deadbolt Lock

Fig. 1

Insert a golf tee through the box and into the corrugations of the door.

Fig. 2

This shows an example of a deadbolt lock design that uses many golf tees.

Fig. 3
Combination Lock

Fig. 4
Cut a 2\" strip of cardboard from an 8\" x 8\" piece of corrugated cardboard. This piece is called the "lock plate."

Fig. 5
Glue just one short edge of the lock plate to the inside of the safe.

Fig. 6
After the short edge has been glued in, use the glue gun to glue the other edges. This technique is necessary because it is difficult to glue all three edges at once.

Fig. 7
Trace the dial position with a pencil. Make sure that the dial has at least 0.5\" of clearance from the edge of the door.
Close the door and use an awl to create a hole through both the door and the lock plate at the same time.

Use scissors to cut a slot that is at least as wide as shown.

The slot needs to go past the hole made by the awl, as otherwise the lock may get stuck.

Insert a 1" piece of dowel through a wood wheel. If the dowel is even slightly loose, then cover the end of the dowel with hot glue.
Insert the dowel through the hole in the door, and then glue a 0.5" piece of coffee stirrer to the other end of the dowel. This piece is called the “lock stick.”

While the lock stick is aligned with the slot, draw an arrow that is pointed in any direction. Take a moment to remember the unlocked position.
Create any number of markings around the dial.

Multiple Combination Locks

In this example, a combination lock is made using two dials and two lock plates.
This shows an even more complex combination lock with four dials.

**Magnetic Lock**

Place three spools onto the straw-wire. (You’ll prepare straw-wires for campers ahead of time.)

Glue two of the spools to the inside of the box near the front.
Place glue on top of the third spool.

- Make sure the wire is hanging outside of the safe.
- Close the door and wait for the glue to dry.

Pull on the straw-wire to remove the straw from the spool that is glued to the door. This technique ensures that the three spools align perfectly.

Glue a magnet onto the end of the spool that’s attached to the door.
Fig. 24
Glue a scrap of cardboard onto the end of the other two spools.

Fig. 25
Insert a nail into the two spools with the pointed end facing outward.

Fig. 26

• To lock: Close the door and then tilt the box toward the magnet. The nail will slide and connect with the magnet. Now the nail is in both the magnet spool and the other spools, which prevents the door from opening.
• To open: Orient the box such that the magnet is pointed upward. Firmly tap the box once onto a hard surface. This will dislodge the nail from the magnet.
Get Ready!

Lesson Materials
* (starred) items are choice materials; un-starred items are required for each camper

Pre-Assembly
(You'll create straw-wires for campers to use if they're creating magnetic locks.)
☐ straw, regular (3 per classroom)
☐ wire, Twisteze (2 per classroom)

Demo & Discussion: Brainstorm Lock Design Ideas
(You will be showing campers how to make each of the lock types.)
☐ golf tee, wood, asst. colors, for deadbolt lock (2 per rotation)
☐ wheel, wood, 0.25" center, 1.5" x 0.5", for combination lock (1 per rotation)
☐ dowel, wood, 0.25" x 12", for combination lock (1 piece per rotation)
☐ coffee stirrer, wood, 5-5", for combination lock (1 per rotation)
☐ box, corrugated, 8" x 8" x 5", for demonstrating locks (1 per rotation)
☐ spool, wood, 1" x 3/4" w/ 1/4" hole, for magnetic lock (3 per rotation)
☐ magnet, round, small, 0.5" dia. x 0.25" thick, for magnetic lock (1 per rotation)
☐ nails, finishing, 1.5", for magnetic lock (1 per classroom)
☐ cardboard lid scraps from yesterday, for combination lock
☐ copy, color, Combination Lock Pictorial (1 per 4 campers)
☐ copy, color, Magnetic Lock Pictorial (1 per 4 campers)

Camper Work Time: Lock It Up!
☐ *wheel, wood, 0.25" center, 1.5" x 0.5" (3 per camper)
☐ *dowel, wood, 0.25" x 12" (1 per 3 campers)
☐ *coffee stirrer, wood, 5.5" (1 per camper)
☐ *golf tee, wood, asst. colors (6 per camper)
☐ *spool, wood, 1" x 3/4" w/ 1/4" hole (3 per camper)
☐ *magnet, round, small, 0.5" dia. x 0.25" thick (1 per camper)
☐ *nails, finishing, 1.5" (1 per camper)
☐ cardboard lid scraps from yesterday
☐ tape, masking, 1" wide (12" per camper)

Preparation
Days earlier
☐ Cut the dowels into 1" pieces (2 pieces per camper).

☐ Create six straw-wires for the magnetic lock construction (6 per classroom).
  • Cut straws into halves.
  • Cut Twisteze wire into thirds.
  • Tape a piece of wire onto a piece of straw (below).
Day before
* Prep one empty 8" x 8" x 5" box (below) per rotation, for demonstrating how to create the lock types.

Advance prep
Start stripping the wires for the Desktop Safe, Part 3. (See details in the Day 3 prep.) The prep for that day may take longer than usual, and it’s recommended that you start now.

Suggestions for Large Classes
None

Check In With Your TL
Make sure your TLs are clear about their role in helping today’s lesson run smoothly. Specific ways TLs can help today are listed in the dotted overview boxes throughout the lesson.

On the Board
Design Goals
The safe must use at least one lock type to prevent the door from being opened while the lock is engaged.

Guiding Questions
DESIGN, EVALUATE & BE REFLECTIVE (deadbolt lock)
- Will the deadbolt go through both the door and the box in that location?
- Is the deadbolt in the way of any other planned locks?

DESIGN, EVALUATE & BE REFLECTIVE (combination lock)
- Is the combination lock too close to any edges of the box?
- Is the combination lock too close to any other lock parts?
- Is the lock plate wide enough?
- Is the slot wide enough?

DESIGN, EVALUATE & BE REFLECTIVE (magnetic lock)
- Is there space for three spools to fit where you’re planning to put the magnetic lock?
- Is anything else in the way of the magnetic lock?
- Are all the spools lined up?
- Is the nail in the right way?

Vocabulary
None today
Teaching the Lesson: Overview

Instructional Priorities & Supporting Innovation

These are the key lesson elements you’re expected to communicate/support today. Think of this as the blueprint of a successful lesson. When applicable we’ve included details about why an element is important for innovation.

Demo & Discussion: Brainstorm Lock Design Ideas

★ Focus on GENERATING IDEAS on how the three lock types can be expanded upon to create more complex mechanisms.
★ Demo the different building TECHNIQUES that are useful to make each of the lock designs.
★ Outline how campers can DESIGN their locks before beginning construction.

Throughout the Lesson

★ Support the Innovator’s Mindset Challenge: BE REFLECTIVE – Campers plan thoughtfully before they start building and take time to think about the questions on the evaluation checklist to troubleshoot.
Why – Challenging campers to slow down and work out the details of their designs before building will help them develop a more successful final plan.

Teaching the Lesson: Play-by-Play

Introduction (5 min)

Build excitement for today’s project
Tell campers that they’ll get to add the locks to their safes today. There are three different lock ideas, and each of those ideas can be used in multiple ways. No two safes will be the same!

Introduce the Innovator’s Mindset: BE REFLECTIVE ★

• Point to this on your Innovator’s Mindset poster.
• Define the Mindset element in the context of today’s lesson. Say: The lock designs can be complicated. So, we are going to take our time planning and reflecting on our plans before moving onto the creation phase. This will help make sure that we’ve taken time to set up your designs for success before you begin gluing and taping things together.

Demo & Discussion: Brainstorm Lock Design Ideas (20 min)

What You’ll Need to Cover: Overview

• Review the three lock types.
• Explain the design process. ★
• Demo sketching a deadbolt lock. ★
• Demo the deadbolt lock construction and discuss how to use the deadbolt lock in other ways. ★
• Demo sketching a combination lock. ★
• Demo the combination lock construction. ★
• Demo testing the combination lock. ★
• Discuss how to use the combination lock in other ways. ★
• Demo sketching a magnetic lock. ★
• Demo the magnetic lock construction. ★
• Discuss combining lock types.
What You’ll Need to Cover: Details
Review the three lock types
• Briefly remind campers of the three lock types.
• Hold up your cutaway examples from Day 1 and quickly demo how each one works.

Explain the design process ★
• Explain that designing (planning) the lock system before building is going to be key today.
  ▪ Ask: *Is it easier to erase pencil marks, or to take apart a lock that was built incorrectly?*
  ▪ Emphasize that designing the lock placement before building can save campers from a lot of unnecessary problems.
• Tell campers that they’ll design their lock systems by sketching an outline of their planned lock types in the locations they plan to put them.
• Review the Mindset Challenge ★ – Tell campers that one way they’ll all stop to reflect is talking about their plans with you so they can improve and finalize their plans before starting to build.

Demo sketching a deadbolt lock ★
• Show campers how they’ll draw a small circle on the box to indicate if they’re planning to put a deadbolt lock there.
• Support BEING REFLECTIVE ★ – Point out the deadbolt evaluation criteria on the board.
  ▪ Will the deadbolt go through both the door and the box in that location?
  ▪ Is the deadbolt in the way of any other planned locks?

Demo the deadbolt lock construction and discuss how to use the deadbolt lock in other ways ★
• Demo how to construct the deadbolt by pushing the golf tee into the box.
• Point out that there are a lot of options with even this simple lock type.
• Ask: *How can I use the deadbolt lock idea in different ways?* (Use lots of deadbolts and/or insert deadbolts in multiple directions.)
• Demo sketching other circles where you might want to add additional deadbolts.

Demo sketching a combination lock ★
• Show campers how they’ll trace a wooden circle (dial) to indicate if they’re planning to use a combination lock.
• Emphasize that the circle should be at least two finger widths away from any edge of the box and any other locks parts to make sure they have room for the lock stick.
• Show how to draw a line that passes just above the circle from one side of the box to the other to signify how wide the lock plate needs to be.
• Point out that if the lock plate is too skinny it won’t cover the lock stick, which means the lock won’t work.
• Support BEING REFLECTIVE ★ – Point out the combination lock evaluation criteria on the board.
  ▪ *Is the combination lock too close to any edges of the box?*
  ▪ *Is the combination lock too close to any other lock parts?*
  ▪ *Is the lock plate wide enough?*

Demo the combination lock construction ★
• Once you’re sure your lock satisfies the criteria, demo step by step how to make the combination lock using the same 8” x 8” x 5” box and a scrap of cardboard from the lid.
• This is a likely choice for most campers, so spend a little more time going over these steps.
• Let campers know you’ll go over the steps now and they’ll also have a sheet to help them remember the steps later. Show them the Combination Lock Pictorial color copy (below).

• Make a mark on the scrap cardboard to show how wide to cut it for the lock plate. Use the line you drew on the box as a guide.
• Review techniques for using the Klever Kutter as you cut the lock plate.
• Demo gluing the lock plate to the inside of the box.
  ▪ Emphasize gluing one short side first and then gluing the other two sides, as shown in the pictorial.
  ▪ Also emphasize gluing the lock plate as flush with the edge of the box as possible. If it’s too far down it won’t cover the lock stick.

• Demo using an awl to puncture a hole through the lid and lock plate at the same time. Emphasize that you’re punching the hole right in the middle of the circle you traced.

• Demo cutting a wide slot into the lock plate where the hole is.
  ▪ Let campers know that if this slot is too skinny the lock will be too hard to open (even for them!).
  ▪ Emphasize that the slot needs to be wider than the coffee stirrer lock stick.

• Finally, show campers how to create the dial and lock stick using the wooden wheel, a piece of dowel, and a piece of coffee stirrer. Make sure they know that they must put the dowel (already attached to the wheel) through the hole before they hot glue the coffee stirrer lock stick on!

**Demo testing the combination lock ★**

• Tell campers that the first thing they should do is test that the lock stick can fit through the slot by lining it up with the slot and opening and closing the door.
  ▪ Once this works, they should immediately draw a straight line across the dial and box to remind them what position the dial has to be in so the door opens. Demo this.
  ▪ Emphasize that if they turn the dial without doing this they can lock themselves out of their own safes!
  ▪ Point out that later they can change the line on the dial into an arrow (or something else) and add markings onto the box around the dial.

**Discuss how to use the combination lock in other ways ★**

• Note that it’s very easy to break into a safe with just one dial.

• Ask: *How can you make this lock more complicated?*
  (Have more than one dial and/or include more markings to confuse people. The more markings there are, the harder it is to guess the combination. For example, if you have two dials with 10 markings each, that’s 100 possible combinations!)

**Demo sketching a magnetic lock ★**

• Show campers how they’ll trace a wooden spool lengthwise three times to indicate if they’re planning to use a magnetic lock. Do this on the inside of the box where you’re planning to put the magnetic lock.

• Remind campers that two of the spools get glued to the side of the box, but one of them gets glued on the lid. Draw an arrow pointing up on the third spool as a reminder of this.

• Support BEING REFLECTIVE ★ – Point out the magnetic lock evaluation criteria on the board.
  ▪ Is there space for three spools to fit where I’m planning to put the magnetic lock?
  ▪ Is anything else in the way of the magnetic lock?

**Demo the magnetic lock construction ★**

• Show campers step by step how to make the combination lock using the same 8” x 8” x 5” box, as shown in the pictorial.

• This a more complex lock and fewer campers will be likely to choose it, so you can go through this demo quickly and work with campers one on one if they’re planning on doing this lock.

• Again, tell campers that there will be a reminder sheet of all the steps you demo and show the Magnetic Lock Pictorial color copy (below).

**Discuss combining lock types**

• Let campers know they’re welcome to combine lock types.

• If they’re planning to do this, they should sketch all their ideas and pay extra attention to making sure lock components aren’t getting in the way of one another.

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Camper Work Time: Lock It Up! (35 min)

During Work Time Campers Will...

**DESIGN ★**
1. Sketch a plan for the lock design on the box.
2. Review the design with the TL and redesign as necessary.

**CREATE**
3. Build the lock according to the penciled design.

**TEST, EVALUATE AND REDESIGN**
4. Test the lock for ease of use and security.
5. Adjust lock components if the mechanism is not working smoothly or not fitting.

**Extension**
- Sketch additional lock designs.
- Add an additional lock to the safe.

How Your TL Can Help
Help talk to campers about their plans before they start building.

Facilitate the Project Steps

**DESIGN (Steps 1-2) ★**
- Be sure to leave your samples out so campers can reference them as necessary.
- Remind campers that they need to talk to you about their plans before they start to build. Help campers see potential design issues.
- Ask guiding questions to help campers evaluate their designs.
- If you want you can have campers sketch on the floor then have them sit at tables with campers who are making the same lock type. This will make troubleshooting with multiple campers easier. Campers are also more likely to help each other if they are working on similar designs.

**CREATE, TEST, EVALUATE AND REDESIGN (Steps 3-5) ★**
- When troubleshooting with a camper, ask the table group if anyone else is having a similar problem. In this way you’ll be able to proactively handle design challenges rather than waiting for campers to come to you.

- Explain that these pictorials are just to help them remember some of the construction techniques, and campers do not have to follow the pictures exactly as shown.

**Extension**
- Campers who finish early can sketch out additional lock designs and show them to you.
- Campers will have plenty of time to finish anything that they begin today, so it is acceptable for campers to start a new lock even if there is only 10 minute left in the build time.

**Support BEING REFLECTIVE ★**
Suggest strategies that help and encourage campers to be reflective
Some specific strategies for today:
- Asking themselves the evaluation criteria questions.
- Talking with their tablemates about what they are noticing when building. Talking to others is a great way to reflect.
- Making small changes instead of big ones. This is a great way to really notice what’s going on in a design.

**Recognize reflective campers**
This encourages the camper and helps others see how they can be reflective as well. Recognition can be just verbal or include some kind of physical award. Be sure to be specific about how you see campers being reflective. Some ways you might see reflection today:
- Using any of the strategies mentioned above
- Changing a part of the design based on something they notice

Ask the Guiding Questions that support being reflective

Clean Up (5 min)
Lesson Wrap Up (5 min)

Recognition and Reflection (BE REFLECTIVE)
Help campers see how they or others embraced the Innovator’s Mindset, and why this is important for innovation.

Suggested recognition and reflection activity
• Ask for a volunteer whose lock isn’t working yet to share the design so the group can reflect and help troubleshoot. Everyone will have more time on Day 4 to keep working on anything that isn’t working yet.
• Ask the volunteer to explain what the lock is currently doing and what s/he wants it to do. If possible, attempt to operate the lock.
• Ask the group to pretend to stroke their innovator’s beards. Hmm...
• Have the group share suggestions of what might be causing the design to not work and how they think the camper might fix it.
• Thank everyone for being so reflective.
• Repeat this wrap up with one more design if you have time.
### Day 3

**Desktop Safe, Part 3 of 5**  
**Installing an Alarm**

Alarms provide a fun and useful element that deters intruders even further. If you broke into a safe and an alarm went off, would you pause and rethink what you were doing?

The alarm circuit switches on when the clothespin shuts.

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### The Big Picture

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<td><strong>Do-With-Me: Connect the Alarm Components</strong></td>
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<td>Create the alarm trigger and wire the battery and buzzer together.</td>
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<td><strong>Camper Work Time: Test, Evaluate, and Redesign the Alarm</strong></td>
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<td>Mount a clothespin on the inside of the safe, and then install a switch on the outside of the safe.</td>
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<td><strong>Designable Components</strong>: switch placement</td>
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### GIA Focus

**Innovator’s Knowledge Focus**: SKILLS AND TECHNIQUES  
**Innovator’s Mindset Focus**: BE DETERMINED – I persevere until I achieve my goal.

**What’s Next**: Tomorrow (Day 4) campers will have time to continue working on any unfinished components and add misdirection. On Day 5 campers will finish any components and decorate.
How to Create Today’s Project

Step-by-Step Pictorial

This is intended to help you understand how to create today’s project. It doesn’t include everything campers will do today. It also doesn’t describe how you’ll facilitate this lesson for campers. You’ll need to read the “Play-by-Play” section for this information.

Wiring the Buzzer (Option 1)
Note: see the end of this pictorial for an easier option for younger groups.

Fig. 1
Begin by twisting the red wire from the buzzer to a piece of Twisteez wire.

Fig. 2
Wrap tape around the connection to reduce the chance of the wires crossing.
Locate the negative side of the battery (the side with dots/bumps).

- Place the black wire from the buzzer onto the negative side of the battery, and then press a piece of tape on to secure it in place.
- Make sure that the other side of the battery is not covered in tape.
Cut or tear a small piece of foil.

Tightly wrap the foil around the clothespin. Use your fingers to press the foil against the form of the clothespin.

Tape a piece of wire to the foil. Make sure that the tape does not cover the foil that’s inside the clothespin’s grip.

Place glue on the taped (negative) side of the battery.
Glue the battery to the top of the clothespin. Now when the clothespin shuts, the battery will come into contact with the foil.

With the clothespin closed, touch the ends of the two Twisteez wires together. The buzzer should buzz!

Mounting the Buzzer to the Box

Glue three wood cubes onto the bottom of the clothespin on the part that is not covered in foil.
Fig. 12
Place glue on one side of the cubes.

Fig. 13
Glue the clothespin to the inside of the safe about $\frac{1}{2}$" under the edge of the opening.

Fig. 14
- Glue one or two cubes onto the end of the clothespin as shown.
- Now when the door closes, the circuit opens and deactivates the alarm.
- Glue the buzzer to the inside of the safe (not shown here).

Fig. 15
In this case, two cubes are too much, but one cube is not enough.
Creating a Switch

You can use the woodcutters to trim the cubes.

Now the door shuts just enough to open the clothespin without showing a large gap.

Use the awl to create two holes in the back of the safe.

Insert the Twisteez wires through the holes.
Wrap the ends of the wires around a paperclip and a brass fastener.

Wrap tape around the connections to prevent them from coming undone over time.

- Turn the switch on by slipping the brass fastener tabs around the paperclip. In this position the alarm will activate when the door opens.
- Deactivate the alarm by disconnecting the brass fastener and the paperclip before opening the box. The door can now be opened without setting off the alarm.
**Buzzer (Option 2)**
Note: If your class is especially young or challenging you can opt to create this simpler buzzer. It can’t be disarmed from the outside, so it will go off whenever the box is opened.

**Fig. 23**
Connect the buzzer wires directly to the clothespin and battery as shown above. Don’t include the extra Twisteez wire.

**Fig. 24**
Once the box is opened, deactivate the alarm by placing a non-conductive material, such as a piece of foam, between the battery and the foil.

**Fig. 25**
- In this example, the simple circuit is installed in a safe that uses a magnetic lock.
- **Important:** For magnetic locks, the alarm should be installed as shown. The alarm needs to be installed so that the clothespin is very near to the hinge on the door. Otherwise it will be difficult or impossible to calibrate correctly.
### Get Ready!

**Lesson Materials**
* (starred) items are choice materials; un-starred items are required for each camper

**Pre-Assembly**
(You’ll need to pre-strip the Twisteez wires and the wires on the buzzer.)
- buzzer, electric, w/ leads (1 per camper)
- wire, Twisteez (1 per camper)
- wire stripper (2 per classroom)

**Demo & Discussion: Alarming the Safe**
- sample alarm (1 per classroom)

**Do-With-Me: Connect the Alarm Components**
- copy, b&w, Circuit Components (1 per 4 campers)
- battery, coin cell, 20mm, 3V (1 per camper)
- wire, Twisteez, with wire leads stripped (1 per camper)
- buzzer, electric, w/ leads, with wire leads stripped (1 per camper)
- clothespin, wood (1 per camper)
- foil, sheet, aluminum, 12” x 10.75” (3 per rotation)

**Camper Work Time: Test, Evaluate and Redesign the Alarm**
- alarm circuit from the Do-With-Me (1 per camper)
- cube, wood, 0.5” (5 per camper)
- fastener, brass, 1-1/2” x 1/2” (1 per camper)
- paperclip, small (1 per camper)
- glue gun, melt, mini (1 per 4 campers)
- glue stick, melt, mini (1 per camper)

### Preparation

**Days earlier**
- Cut Twisteez wires into four pieces (2 pieces per camper) and strip about 1.5” off of each end (below).

- Strip wire insulation off of the buzzers’ wires (1 buzzer per camper) (below).

- Install an alarm into one of your example safes.

**Morning of**
- Place the Do-With-Me materials on trays, to be passed out during the Do-With-Me portion of this lesson.

### Suggestions for Large Classes
None
Check In With Your TL
Make sure your TLs are clear about their role in helping today’s lesson run smoothly. Specific ways TLs can help today are listed in the dotted overview boxes throughout the lesson.

On the Board
Design Goals
The safe must include an alarm that activates when the safe is opened.

Guiding Questions
BE DETERMINED
• How can you make each connection more secure?
• What part of your circuit can you double-check?
• Does something need to be redone to get your circuit to work properly?
• How can you get your circuit to work even better/more consistently?

Vocabulary
electrical circuit – a path that electricity can follow
conductivity – how well a material allows electricity to flow through it

Teaching the Lesson: Overview

Instructional Priorities & Supporting Innovation
These are the key lesson elements you’re expected to communicate/support today. Think of this as the blueprint of a successful lesson. When applicable we’ve included details about why an element is important for innovation.

Demo & Discussion: Alarming the Safe
★ Discuss the CONCEPT of a circuit as an unbroken conductive loop leading from and back to a battery.

Do-With-Me: Connect the Alarm Components
★ Demo the wiring SKILLS and construction TECHNIQUES for making a door-activated alarm.

Throughout the Lesson
★ Support the Innovator’s Mindset Challenge: BE DETERMINED – Campers troubleshoot and redesign until they have a working circuit.
Why – Setting the expectation that circuitry involves a lot of patience and troubleshooting will help campers push through the issues that are likely to come up as they work.
Teaching the Lesson: Play-by-Play

**Introduction (5 min)**

**Welcome campers and make a quick story connection**
What’s going on with Lucy? (She’s been working on inventions for Friday’s Maker Faire, but she got locked out of Cardboard Island.) We can’t let her give up now. Let’s keep creating awesome inventions so we can showcase them at the Faire – maybe we’ll even come up with an idea to get Lucy back to Cardboard Island as we work!

**Build excitement for today’s project**
- Hold your example that has the alarm installed in front of the group with the cutaway facing away from the campers.
- Tell campers that they are going to add a new element to their safes to make them even more secure.
- Unlock your example to sound the alarm! Act surprised and flustered as you attempt to close and lock the safe door.
- Lock your example with a sigh of relief. Let campers know that they’ll be adding alarms like this one!

**Introduce the Innovator’s Mindset: BE DETERMINED ★**
- Point this on your Innovator’s Mindset poster.
- Define the Mindset element in the context of today’s lesson. Say: *Getting the alarm to work perfectly might be challenging. Today, being determined means not giving up, even if the safe isn’t working the first time, or if you have to take it apart and install it more than once.*

**Demo & Discussion: Alarming the Safe (10 min)**

**What You’ll Need to Cover: Overview**
- Show the example alarm and outline the components.
- Introduce the concepts of circuits and conductivity.
- Explain and show how the clothespin works to open and close the circuit.
- Introduce the switch.

**How Your TL Can Help**
Replenish the Do-With-Me supply trays.

**What You’ll Need to Cover: Details**

**Show the example alarm and outline the components**
- Disable your alarm circuit by placing a piece of foam or cardboard in the clothespin. Don’t show or use the switch yet to simplify things.
- Show all the components campers will be using for their circuits besides the switch:
  - The buzzer.
  - The coin cell battery glued to the top of the clothespin that provides the electricity needed to power the buzzer. (You can hold up an unused battery if campers are having a hard time seeing it on the clothespin.)
  - The wires that connect the battery and buzzer and provide a path for the electricity to travel through.

**Introduce the concepts of circuits and conductivity**
- Inform campers that in order for electricity to flow, it must be able to travel in an unbroken loop or path from the battery and back again. This is known as a closed (connected) circuit.
- Explain that electricity can only travel through materials that are conductive, like metal wires or tin foil.
- Not all materials are conductive. Air, tape, cardboard, and foam are not conductive, which is why your buzzer isn’t going off right now.
  - The electricity can’t flow through the foam or cardboard you’ve slipped between the battery and foil.
  - The path is now broken, which is known as an open (unconnected) circuit.

**Explain and show how the clothespin works to open and close the circuit**
- When the door is closed, it presses on/opens the clothespin and prevents the battery from touching the foil on the bottom of the clothespin.
- This opens the circuit and prevents electricity from flowing from the battery to the buzzer.
- When the door opens, the clothespin closes, and the battery touches the foil.
- This completes the circuit and allows electricity to flow to the buzzer.
- Remove the foam or cardboard you’ve placed between the clothespin’s sides on your example. Hold the example toward the group with the door open and show how the clothespin closes as the door opens. Repeat a few times.
Introduce the switch
(Skip this if you’ve decided to do the simpler alarm without a switch.)
• Point out that you only want the alarm to go off if an intruder is opening
  the safe, but not if you’re opening it.
• Explain that this can be achieved by having some way to open (disconnect) the
circuit from the outside of the box, so you can disarm the alarm before you
  open the safe.
• Show the switch on the back of your example. Explain that a switch makes it
  easy to disconnect and reconnect parts of the circuit.
• Remind campers that metal is conductive, which means electricity can travel through the paper clip and brass fastener.
• Demo how undoing the metal components will open the circuit and prevent the alarm from going off even when the box is opened.

Do-With-Me: Connect the Alarm Components (20 min)

What You’ll Need to Cover: Overview
(Note: You’ll need to omit steps from this activity if you’ve chosen to do the
simpler buzzer.)
• Set Do-With-Me expectations.
• Give campers an overview of the circuit they’ll be building.
• Twist the red buzzer wire to a piece of Twisteez wire.
• Tape the black buzzer wire to the negative side of the battery.
• Add foil and wires to the clothespin.
• Demo attaching the battery and testing the circuit.
• Demo installing the clothespin.
• Demo creating the switch.

How Your TL Can Help
• Offer hands-on help to campers who are struggling to keep up with the group.
• Keep an eye on campers as they build and correct mistakes as they crop up.

Guiding Campers
Set Do-With-Me expectations
• Explain that campers are going to wire the circuit together as you explain
  the correct wiring procedure.

• Emphasize that everyone will do this together, which means no one
  should be jumping ahead.
• Instruct campers to avoid turning the alarm on during the Do-With-Me since it makes it difficult for you and others to focus.

Give campers an overview of the circuit they’ll be building
• Review the diagram on the Circuit Components copy (below) to show what connects to what in the complete circuit.

  ![Circuit Diagram](image)

  - A Twisteez wire is connected to the buzzer wire to make it longer.
  - That wire is taped to one side of the battery.
  - The other side of the battery makes contact with conductive foil.
  - Another piece of Twisteez wire is taped to the foil.
  - A switch (brad and paper clip) connects the Twisteez wire to the
    other buzzer wire.
  - Let campers know they won’t be adding the switch as part of the Do-With-Me. They’ll mount the alarm and add the switch on their own in a bit.

Twist the red buzzer wire to a piece of Twisteez wire
• Explain that the buzzer wires are a bit short, so campers will add Twisteez wires to make them longer so they can mount the switch to the outside of the box.
• Show campers how to hold two wires in one hand to form an X shape and then twist the wires together.
• Use pipe cleaners to help campers visualize this technique more easily (following photos).
• Wrap tape around the connection.
• Explain that since tape isn’t conductive, wrapping the exposed wire in tape prevents short circuits, which happen when two wires that aren’t supposed to touch each other accidentally touch.

**Tape the black buzzer wire to the negative side of the battery**
• Help campers identify the negative side of the battery by explaining that it has lots of little dots on it.
• Have them tape the black buzzer wire to it using a small piece of tape.
• Have campers make sure that the other side of the battery isn’t totally covered in tape. If it is, the electricity won’t be able to travel from the other side of the battery to the foil.

**Have campers add foil and wires to the clothespin**
• Instruct campers to tightly wrap the foil around the clothespin.
• Remind them that the clothespin allows the circuit to be opened or closed by the safe door. (When the door is open the circuit is closed, and vice versa.)

• Let campers know they’ll hot glue the battery to the top of the clothespin after this Do-With-Me.
• Finally, tape the other piece of wire to the foil.
• Emphasize that campers need to firmly press the tape and avoid taping the inside of the clothespin’s grip.

**Demo attaching the battery and testing the circuit**
• At this point, tell campers that you are going to show them the remaining steps and campers can complete them at their own pace.
• Show campers how to hot glue the battery to the top of the clothespin.
• Tell campers that once this is done they should test the buzzer by holding the Twisteze wires together. It will be much easier to troubleshoot any wiring issues before the buzzer is mounted to the box.
• If it doesn’t work, instruct campers to check each connection to make sure each wire or metal component is making good and secure contact with the next component. Campers may need to:
  ▪ Add more tape to secure loose wires
  ▪ Remove tape that may be covering up the foil or battery
  ▪ Re-twist wires together more securely
• Review the Mindset Challenge ⭐ — Encourage campers to stay determined if their buzzers aren’t working right away. There are lots of reasons the circuit might not be working, and with patience and attention to detail campers will be able to figure it out.
• Once the buzzer works they can install it and add the switch.

**Demo installing the clothespin**
• Glue three cubes to the bottom of the clothespin as shown in the pictorial. This supports the clothespin so it can open and close without being ripped off the box.
• Mount your clothespin into the box as shown in the pictorial so that one cube won’t be enough, but two will be too many.
• Emphasize that the clothespin has to be at least a half inch below the edge of the box. It can’t be right at the edge or it won’t be able to open.
• Start by gluing one cube to the top of the clothespin to show that if the cube is below the edge of the box it won’t work. The alarm will keep going off even if the door is closed.
• Glue another cube to solve this problem. Now the alarm stops when the door is pressed down, but since the cubes extend too high above the edge of the box, the box isn’t able to close all the way.
• Show how to use the woodcutter to cut the second cube so just a little extends above the edge of the box. Let campers know only adults will use the woodcutter.
• Alternatively, campers could unglue the clothespin and re-glue it lower.
• Review the Mindset Challenge ⭐ – Point out that it will take some tweaking to get everything to be just right, which means campers will need to stay determined.

Demo creating the switch
• Finally, demo how to create the switch as shown in the pictorial.
• Reiterate that the switch components should go on the outside of the box so that the campers can deactivate the alarm without opening it.

Camper Work Time: Test, Evaluate and Redesign the Alarm (25 min)

<table>
<thead>
<tr>
<th>During Work Time Campers Will...</th>
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</thead>
<tbody>
<tr>
<td><strong>CREATE, TEST, EVALUATE &amp; REDESIGN ⭐</strong></td>
</tr>
<tr>
<td>1. Glue the battery to the clothespin.</td>
</tr>
<tr>
<td>2. Touch the two Twisiteez wires together to make sure the buzzer works. If not, troubleshoot the wiring.</td>
</tr>
<tr>
<td>3. Mount the clothespin into the box.</td>
</tr>
<tr>
<td>4. Close the door.</td>
</tr>
<tr>
<td>5. If the door doesn’t close or there is a big gap, redesign by reducing the block height or moving the clothespin position.</td>
</tr>
<tr>
<td>6. If the alarm is still on while the door is closed, redesign the clothespin positioning and/or add another block.</td>
</tr>
<tr>
<td>7. Open the door. The alarm should sound.</td>
</tr>
<tr>
<td>8. Create a switch.</td>
</tr>
</tbody>
</table>

**Extension**
Finish the lock if it was not finished yesterday, or begin building a second lock.

**How Your TL Can Help**
Help campers position and adjust their clothespins.

Facilitate the Project Steps

**CREATE, TEST, EVALUATE & REDESIGN (Steps 1-8) ⭐**
• Remind campers to test their wiring before mounting their clothespins.
• Cut cubes for campers with the woodcutters as necessary.
• Make sure campers don’t forget to glue the three support cubes onto the clothespin before mounting it, and make sure they mount the clothespin with the support cubes on the bottom.
• Help campers troubleshoot as necessary by asking them what they notice about different parts of their circuits.
• Help campers struggling with taping techniques so that they aren’t held back by their taping abilities.

Support BEING DETERMINED ⭐

Suggest strategies that help and encourage campers to be determined
Some specific strategies for today:
• Asking a friend! Having a friend help out with a project is a great way to get that extra boost to finish, and it’s fun.
• Making small changes instead of big ones when troubleshooting. Often the best way to reach success is to take the time to refine what you have instead of starting from scratch.
• Taking a deep breath. Getting calm is the first step to working productively.

Recognize determined campers
This encourages the camper and helps others see how they can be determined as well. Recognition can be just verbal or include some kind of physical award. Be sure to be specific about how you see campers being determined. Some ways you might see determination today:
• Using any of the strategies mentioned above
• Not giving up and having a positive attitude when something doesn’t work or a new challenge arises
• Completing a tricky task on their own instead of asking an adult to do it for them
• Undoing and redoing something to get it just right

Ask the Guiding Questions that support being determined
Clean Up (5 min)
Keep the alarm switches turned off and the safe doors open.

Lesson Wrap Up (5 min)

Recognition and Reflection (BE DETERMINED)
Help campers see how they or others embraced the Innovator’s Mindset, and why this is important for innovation.

Suggested recognition and reflection activity
• Have campers raise their hands if their alarms didn’t work perfectly the first time.
• Have a few campers share what didn’t work and how they stayed determined to fix it. Other campers can give snaps if they had a similar experience.
• Give campers a chance to recognize others they noticed being especially determined.
Day 4
Desktop Safe, Part 4 of 5
Misdirection

Top: An additional set of locks secures the safe to the housing. Bottom: A false pair of sliders gives the impression of a lock, but in fact does nothing to open the safe.

The Big Picture

Lesson Breakdown

<table>
<thead>
<tr>
<th>Activity</th>
<th>Duration</th>
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<tr>
<td>Introduction</td>
<td>5 min</td>
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<tr>
<td>Demo &amp; Discussion: Misdirection and Concealment</td>
<td>15 min</td>
</tr>
<tr>
<td>Camper Work Time: Adding Misdirection</td>
<td>40 min</td>
</tr>
<tr>
<td>Wrap up</td>
<td>5 min</td>
</tr>
</tbody>
</table>

Camper Work Time: Adding Misdirection
Wrap up any unfinished work from the previous days, add more locks, and add misdirection elements. By the end of this day, the safe must:
- Have all the locks and the alarm working properly
- Include at least one misdirection element

Designable Components: lock type and placement; misdirection element design and placement

GIA Focus
Innovator’s Process Focus: GENERATE IDEAS
Innovator’s Mindset Focus: BE VISIONARY – I imagine things that don’t exist yet.

What’s Next: Tomorrow (Day 5) campers will decorate their safes, then share their creations with other campers.
How to Create Today’s Project

Step-by-Step Pictorial

This is intended to help you understand how to create today’s project. It doesn’t describe how you’ll facilitate this lesson for campers. You’ll need to read the “Play-by-Play” section for this information.

Misdirection Ideas

Fig. 1
This example depicts two false dials. These dials with numbered markings do not open anything, but they look quite convincing!

Fig. 2
Here colorful metallic beads and mini craft sticks are aligned with the golf tee deadbolts to create a pattern that looks decorative. It’s less apparent that the golf tees play a role in locking the door.
Fig. 3
This example of misdirection features false instructions and a false locking system.

Fig. 4
This example of misdirection features the real lock. However, the false directions do not open the safe door. Instead, the door is opened when the dial indicators are aligned with the tips of the arrows.
Here a fun-looking false lock is added to the door.
This lock is made by first cutting slits into the door with the cardboard saw.
Two cubes are glued to the sides of a 1" piece of craft stick. The stick is inserted into the slit.
Another cube is glued to the other end of the craft stick (on the other side of the cardboard) to hold it in place.
Colorful beads and other indicators give the impression that there is a solution.
False Panel (Optional)

Fig. 7
- This part of the pictorial shows how to create a secret panel.
- Begin by cutting a scrap of cardboard to the size of the components you want to conceal.

Fig. 8
Glue pairs of magnets to opposite corners of the cardboard.

Fig. 9
Place plenty of glue on top of the magnets.

Fig. 10
Flip the cardboard over and attach it over the area you want to conceal.
Attach pieces of cardboard or paper to cover the sides of the secret panel.

- Trim the panel if necessary.
- Now the magnets hold the panel in place while also allowing you to easily remove it.

This is an example of a smaller panel used to conceal the alarm switch.
Locking the Safe to the Housing (Optional)

- This section of the pictorial shows ideas for how to lock the safe to the housing.
- In this example, the safe is locked to the housing using an additional two dials.
- The slots for the lock sticks are cut into the safe itself. The best way to make the slot is to punch a line of holes using the awl, then cut away the cardboard with a pair of scissors and some determination.

Fig. 14

Fig. 15
The safe opening faces the back of the housing, making it even more difficult to get into.
Fig. 16

- In this example, the deadbolt lock idea secures a safe to the housing.
- The safe is also locked to the housing with a magnet lock.
- Once again, the safe opening is facing inward.

Fig. 17

The same safe is flipped upside down (deadbolts are on the bottom), making it even more difficult to detect where to begin unlocking the safe.
Get Ready!

Lesson Materials
* (starred) items are choice materials; un-starred items are required for each camper

Demo & Discussion: Misdirection and Concealment
- copy, b&w, Fake Lock Examples (1 per 4 campers)
- copy, b&w, Other Misdirection Examples (1 per 4 campers)

Camper Work Time: Adding Misdirection

misdirection elements
- *tape, masking, 1" (12" per camper)
- *foam, geometric shape, asst. colors, sticky back (15 per camper)
- *foam, alphabet piece, sticky back (15 per camper)
- *pom-pom, asst. colors & sizes (8 per camper)
- *craft sticks, mini, asst. colors, 3" (8 per camper)
- *penny (8 per camper)
- *gemstone, acrylic, assorted sizes (8 per camper)
- *bead, old world, asst. sizes & colors (8 per camper)
- *bead, pony, metallic, asst. colors (8 per camper)
- *spool, wood, asst. sizes & colors (8 per camper)
- *Woodsies, asst. shapes (star, heart, square, triangle) (5 per camper)
- *pipe cleaner, asst. colors, 12" (5 per camper)
- *felt, acrylic, asst. colors, 9" x 12" (1 per 2 campers)
- *paper, cardstock, brights, asst. colors, 8.5" x 11" (2 per camper)
- *foil, sheet, aluminum, 12" x 10.75" (1 per camper)
- *stencils, individual letter, 1" (2 per classroom)
- *marker, asst. colors, set of 8 (2 per classroom)

Extension (same lock materials as Day 2)
- *wheel, wood, 0.25" center, 1.5" x 0.5" (2 per camper)
- *dowel, wood, 0.25" x 12" (one 1-inch piece per camper)
- *coffee stirrer, wood, 5.5" (1 per camper)
- *golf tee, wood, asst. colors (3 per camper)
- *spool, wood, 1" x 3/4" w/ 1/4" hole (2 per camper)
- *magnet, round, small, 0.5" dia. x 0.25" thick (1 per camper)
- *cardboard scraps

Preparation
None!

Suggestions for Large Classes
None

Check In With Your TL
Make sure your TLs are clear about their role in helping today’s lesson run smoothly. Specific ways TLs can help today are listed in the dotted overview boxes throughout the lesson.

On the Board

Design Goals
The safe must:
- Have all the locks and the alarm working properly
- Include at least one misdirection element

Guiding Questions
BE VISIONARY
- How can you take two ideas from the brainstorm and turn them into one new idea?
- What exciting ideas do you see around you, and how can you use those ideas in your design?
- How can you use the materials in a way that no one else is?

Vocabulary
misdirection – to send someone to the wrong place, or give them false information
Teaching the Lesson: Overview

Instructional Priorities & Supporting Innovation

These are the key lesson elements you’re expected to communicate/support today. Think of this as the blueprint of a successful lesson. When applicable we’ve included details about why an element is important for innovation.

Demo & Discussion: Misdirection and Concealment
★ Introduce the CONCEPT of misdirection and how it applies to campers’ safes.
★ Focus on GENERATING IDEAS for how to misdirect potential safe thieves.
★ Brainstorm with campers to GENERATE IDEAS on how to conceal important parts of their safes, and show them some possible building TECHNIQUES to accomplish this.

Throughout the Lesson
★ Support the Innovator’s Mindset Challenge: BE VISIONARY – Campers take preexisting ideas and put their own unique twists on them. Why – Giving campers a chance to customize/personalize a project highlights the infinite possibilities inherent in any design and helps campers see that they each have a unique perspective and vision.

Teaching the Lesson: Play-by-Play

Introduction (5 min)

Build excitement for today’s project
Tell campers that today they’ll add misdirection to their safes to make it even harder for potential thieves to break in!

Introduce the Innovator’s Mindset: BE VISIONARY ★
• Point to this on your Innovator’s Mindset poster.
• Define the Mindset element in the context of today’s lesson. Say: We’re going to practice being visionary today by coming up with unique ways to confuse intruders. The way you choose to do this will be up to you, and everyone’s safe will do this differently!

Demo & Discussion: Misdirection and Concealment (15 min)

What You’ll Need to Cover: Overview
• Introduce the idea of misdirection. ★
• Brainstorm ideas around how to misdirect potential thieves. ★
• Introduce the idea of concealment. ★
• Discuss the testing procedure.
• Transition to work time.

What You’ll Need to Cover: Details
Introduce the idea of misdirection ★
• Ask: What does misdirection mean? (To deceive, or to draw attention away from one thing and onto another.)
• Point out that a thief might not know how to get into your safe, but they will probably know where to start, especially with deadbolt and combination locks.
• Therefore, adding elements that draw attention away from the real lock will improve the security of the safe.

Brainstorm ideas around how to misdirect potential thieves ★
• Point out that one way to draw attention away from the real lock is to create a fake lock.
• Have campers share some ideas about how they might create a fake lock.
• Show the Fake Lock Examples color copy (below) to give campers some ideas.

• Ask: What else could you build or write onto your safe to create confusion? (Some ideas:
  ▪ Confusing opening instructions
  ▪ Label the safe as something boring
  ▪ Decorations that camouflage the real lock
  ▪ Something that looks like a door that doesn’t open)
• Show the Other Misdirection Examples color copy (below) to give campers some ideas.

Introduce the idea of concealment ★

• Tell campers that in addition to misdirection, another way to improve safe security is to hide or conceal important components.
• Campers could cover the front of the housing so the entire safe is not visible.
• Campers can also cover components, like the lock or alarm switch, so they are not visible.
• Show campers your hidden panel example and demonstrate it.
• Demo how to create a hidden panel as shown in the pictorial by gluing magnets onto a piece of cardboard.

Discuss the testing procedure
• Let campers know that when they’re done they’ll give the safe to a neighbor to see how long it takes to open.
• If the person can’t open it in less than two minutes, the safe is very secure!
• If the person can open it in less than two minutes, campers should redesign to make the safe harder to open. This could include adding elements of misdirection or additional locks.

Transition to work time
• Note that before campers add misdirection elements they must have completed their lock components from Day 2 and finished the alarm.
• When that is finished, campers must add at least one misdirection element today.
• Let campers know that if they’re done early they can also lock the safe to the housing for even more security. You’ll talk with campers who are ready for this one on one or in small groups.
• Review the Mindset Challenge ★ – Remind campers that how they choose to misdirect intruders is 100% up to them. They can build on and combine ideas from the brainstorm, or make up something completely different! Being visionary is all about bringing ideas to life that don’t yet exist.
Camper Work Time: Adding Misdirection (40 min)

**During Work Time Campers Will...**

**CREATE**
1. Finish the alarm and/or locks from previous days.
2. Add at least one misdirection element.
3. (Optional) Add a secret panel.

**TEST, EVALUATE AND REDESIGN**
4. See if a neighbor can open the safe in under two minutes.
5. Redesign if necessary.

**Extension**
Add additional locks to the safe or lock the safe to the housing.

**How Your TL Can Help**
Work with campers who are still working on finishing locks and alarms from previous days.

**Facilitate the Project Steps**

**CREATE (Steps 1-3)**
- You or the TL may offer hands-on help to campers who are feeling discouraged and are struggling to finish their locks or alarms.
- Help campers remember the steps to create hidden panels if necessary.

**TEST, EVALUATE AND REDESIGN (Steps 4-5)**
- When having someone else try to open their safes, campers can use the wall clock or a stopwatch to time two minutes.
- Encourage the camper who is testing to give feedback and ideas about how the camper might make his/her safe even harder to open, especially if the safe was very easy to open.
- If the sound of the safe alarms is starting to drive you crazy, you may implement a rule that all alarms must be disabled until the last 10 minutes of the build time.

**Extension**
- If a camper or a group of campers has finished early, show them how they can lock the safe to the housing using the lock types they already know about. (See the pictorial for examples of this.)

**Support BEING VISIONARY ★**

Suggest strategies that help and encourage campers to be visionary
Some specific strategies for today:
- Taking two ideas from the brainstorm and combining them into a new idea
- Taking a walk around the room to gather inspiration from fellow campers

**Recognize visionary campers**
This encourages the camper and helps others see how they can be visionary as well. Recognition can be just verbal or include some kind of physical award. Be sure to be specific about how you see campers being visionary. Some ways you might see vision today:
- Using any of the strategies mentioned above
- Using the materials in new or unexpected ways
- Trying unique ideas that have not yet been mentioned

**Ask the Guiding Questions that support being visionary**

**Clean Up (5 min)**
- Disable all the alarms.
- Keep the decorative materials set out for tomorrow.

**Lesson Wrap Up (5 min)**

**Recognition and Reflection (BE VISIONARY)**
Help campers see how they or others embraced the Innovator’s Mindset, and why this is important for innovation.

**Suggested recognition and reflection activity**
- Have campers each turn to a partner and share one element they added that makes their safes unique and tricky.
- Give campers a chance to shout out visionary partners they feel had especially creative ideas.
- Ask the camper whose idea it was how s/he got the idea. Was the idea sparked from the brainstorm, from seeing what someone else was doing, from putting different ideas together, etc.?
Day 5  
*Desktop Safe, Part 5 of 5*

Finalize the safe with some decorations and try out each other’s safes!

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**The Big Picture**

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<tr>
<td>Demo &amp; Discussion: Visionary Decorations</td>
<td>5 min</td>
</tr>
<tr>
<td>Camper Work Time: Finalize the Safe</td>
<td>35 min</td>
</tr>
<tr>
<td>Finish the design goals from previous days and decorate.</td>
<td></td>
</tr>
<tr>
<td>Clean Up</td>
<td>5 min</td>
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<tr>
<td>Demo &amp; Discussion: Reflection Overview</td>
<td>5 min</td>
</tr>
<tr>
<td>Do-With-Me: Reflection and Wrap Up</td>
<td>15 min</td>
</tr>
</tbody>
</table>

**GIA Focus**

Innovator’s Process Focus: GENERATE IDEAS  
Innovator’s Mindset Focus: BE COURAGEOUS – I freely share my creative thoughts.
How to Create Today’s Project

**Step-by-Step Pictorial**

This is intended to help you understand how to create today’s project. It doesn’t describe how you’ll facilitate this lesson for campers. You’ll need to read the “Play-by-Play” section for this information.

Safe Decorations

Fig. 1
In this safe, colored duck tape was used to create a base color and a striped design around the side of the safe. Alternating colors of foam squares and outlines around drawn elements like arrows add a fun, finished look!

Fig. 2
In this example, colored duck tape has also been added to the safe. Colored craft sticks have also been added.
Get Ready!

Lesson Materials
* (starred) items are choice materials; un-starred items are required for each camper

Camper Work Time: Finalize the Safe
☐ *tape, duck, 1-7/8" wide, red (20" per camper)
☐ *tape, duck, 1-7/8" wide, blue (20" per camper)
☐ *tape, duck, 1-7/8" wide, yellow (20" per camper)
☐ *tape, duck, 1-7/8" wide, green (20" per camper)
☐ *tape, duck, 1-7/8" wide, purple (20" per camper)
☐ *tape, duck, 1-7/8" wide, paint splat (20" per camper)
☐ *unused materials from yesterday’s misdirection elements (do not exceed maximum allotted materials)

Preparation
None!

Suggestions for Large Classes
None

Check In With Your TL
Make sure your TLs are clear about their role in helping today’s lesson run smoothly. Specific ways TLs can help today are listed in the dotted overview boxes throughout the lesson.

On the Board
Feedback Prompts
- I appreciated how the maker designed ___ because ___.
- You could keep improving this design/pushing this design forward by ___.

Vocabulary
None today

Teaching the Lesson: Overview

Instructional Priorities & Supporting Innovation

These are the key lesson elements you’re expected to communicate/support today. Think of this as the blueprint of a successful lesson. When applicable we’ve included details about why an element is important for innovation.

Demo & Discussion: Visionary Decorations
★ Focus on GENERATING IDEAS to inspire campers to innovate on their already functioning safes.

Throughout the Lesson
★ Support the Innovator’s Mindset Challenge: BE COURAGEOUS – Campers share their thoughts about their own projects and the projects of others. Why – Sharing one’s work and creative thoughts is an integral part of the Innovator’s Process. Giving campers a safe and supportive environment in which they can practice doing this will help them continue to put their ideas out into the world in the future.
Teaching the Lesson: Play-by-Play

Introduction (5 min)

Welcome campers and make a quick story connection
Let’s wrap up the week's inventions and get them ready to show off at today’s Maker Faire. I'm sure Lucy is going to be super inspired by all of your innovative projects and get lots of ideas for how to make her new house unique.

Build excitement for today’s project
• Announce that today is a wrap up day. This means that the first thing campers will be doing is wrapping up any unfinished parts of the safe from previous days. This also means meeting the design goals from earlier in the week.
• Once campers complete the design goals from previous days, they can decorate their safes with all kinds of fun stuff!
• Tell campers that you are not going to show them any new safe construction ideas. Instead, everyone can decorate and build at their own paces to make the most awesome-looking and functioning safe possible.
• At the end of class, everyone will have a chance to share the finished safes they’ve been working on so hard all week!

Introduce the Innovator’s Mindset: BE COURAGEOUS ★
• Point to this on your Innovator’s Mindset poster.
• Define the Mindset element in the context of today’s lesson. Say: It takes courage to put your creations out in the world and share them with others. Today we’re going to practice being courageous by sharing our final projects and sharing feedback with others about their projects.

Demo & Discussion: Visionary Decorations (5 min)

What You’ll Need to Cover: Overview
• Show campers the decorative materials and generate ideas on how to use them. ★
• Explain the final sharing process.

What You’ll Need to Cover: Details
Show campers the decorative materials and generate ideas on how to use them. ★
• Stand by the materials table and briefly show campers each of the decorative materials.
• Demonstrate how to tear duck tape or use scissors to cut it.
• Explain that decorations look better when they are applied in a pattern or some other meaningful way. Adding random things in random places usually doesn’t look as good.
• Hold up an example safe. Choose a material and ask: Where can I add this material in a way that will make the safe look better?
• Ask: What sorts of patterns can I use when adding this material? (For example: For gemstones, you could glue them on the markings of a combination lock, or add them to the corners of the safe door.)
• Repeat with two or three more materials. As you field camper suggestions, move the materials into various positions without actually attaching them.

Explain the final sharing process
• Tell campers that the last 15 minutes of today’s class will be used to share the safes.
• They will have another camper try to figure out how to open their safes and spend some time talking about their designs.
• This means that everyone’s safes should be finished by the end of the work time, and most importantly, all the locks and the alarm should be functioning.
Camper Work Time: Finalize the Safe (35 min)

<table>
<thead>
<tr>
<th>During Work Time Campers Will...</th>
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<tbody>
<tr>
<td>CREATE (main safe components)</td>
</tr>
<tr>
<td>1. Complete the design goals from previous days</td>
</tr>
<tr>
<td>DESIGN AND CREATE (decorations)</td>
</tr>
<tr>
<td>2. Decorate the safe and housing.</td>
</tr>
</tbody>
</table>

How Your TL Can Help
Have your TL assist campers with decorations and working with the duct tape while you assist campers who need to wrap up components from previous days.

Facilitate the Project Steps
CREATE (main safe components) (Step 1)
• Have all the campers who need to finish parts of their safes work in one area to make it easier for you to help them.
• Give campers hands-on help to ensure that their projects are fully functioning by the end of the class, and to ensure that they will have some time to customize their creations.

DESIGN AND CREATE (decorations) (Step 2)
• Like yesterday, you may want to disable all of the alarms until the wrap up.

Clean Up (5 min)
• Activate the alarms.
• Lock up the safes in preparation for the wrap-up activity.
• Bring the safes to the Demo & Discussion.

Demo & Discussion: Reflection Overview (5 min)

<table>
<thead>
<tr>
<th>What You’ll Need to Cover: Overview</th>
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<tr>
<td>Discuss the importance of sharing work and receiving feedback. ★</td>
</tr>
<tr>
<td>Discuss and model good and bad feedback. ★</td>
</tr>
</tbody>
</table>

What You’ll Need to Cover: Details
Discuss the importance of sharing work and receiving feedback ★
• Let campers know that they will celebrate this awesome week with a really important step in the Innovator’s Process, sharing the products of their hard work.
• Remind campers that when they share their creations they can inspire others.
• Explain that they’ll also be sharing feedback with the maker whose work they’re looking at.
• Tell campers that feedback will give the maker a chance to hear how his/her work has impacted the people using the creation.
• Feedback is also a great way for makers to get ideas for how they might improve their designs or for what they might try in another project in the future.
• Point out that even though campers won’t have time to continue working on their safes at camp, they’re welcome to continue working on them at home. They can also just take the ideas they get from today’s feedback and think about them the next time they do a project.

Discuss and model good and bad feedback ★
• Explain that good feedback is specific and is about helping the maker learn, not about putting the maker down.
• Model giving feedback about your own sample safe.
• First demo some examples of less-than-ideal feedback. Use phrases that are negative or too general. For example:
  ▪ This is a dumb idea. You’re not very good at ___.
  ▪ I like this. This is cool.
• Point out that even though some comments can be positive (“I like this”), this feedback isn’t very helpful. It doesn’t give the maker any information about what s/he might do again or change next time.
• Do another round that models giving good feedback. Use the feedback prompts on the board:
  ▪ I appreciated how the maker designed ___ because ___.
  ▪ You could keep improving this design/pushing this design forward by ___.
• Review the Mindset Challenge ★ – Recognize that sharing work and feedback about the work of someone else can feel difficult at first. Remind campers to be courageous and put their creative thoughts out there even if they’re nervous.

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Do-With-Me: Reflection and Wrap Up (15 min)

What You’ll Need to Cover: Overview
• Have campers observe each other’s safes.
• Have campers try out each other’s safes.
• Have campers reflect on the partner’s safe. ★
• Have campers share feedback with their partners. ★
• Have campers share about their own creations. ★

How Your TL Can Help
Help facilitate for partners who are having trouble sharing.

What You’ll Need to Cover: Details
Have campers observe each other’s safes
• Pair campers up and have them switch safes.
• Have campers take 30 seconds to a minute just to look at the safe.
• Ask campers to think about what they appreciate about how it looks.

Have campers try out each other’s safes
• Announce that each partner will have a few minutes to try to unlock his/her partner’s safe.
• Instruct campers to be gentle with each other’s safes. For example, do not pull on dials too hard, and don’t bang the safe too hard when trying to unlock the magnets.
• As campers try the safes, ask them to notice the kinds of locks and misdirection their partners have created.
• Also have them notice what parts of the safe are easy to figure out and which are hard.

Have campers reflect on the partner’s safe ★
• After two or three minutes have partners pass the safes back to the creators.
• Let campers know that in a moment they’ll share at least one thing they appreciated about the design of the safe. Give a few examples of what this might include:
  ▪ A cool way the maker decorated the safe
  ▪ A system of locks that was especially hard to figure out
  ▪ An especially neat and well-built construction

• A type of misdirection they thought was especially clever, etc.
• Let campers know they’ll also share at least one thing they think the maker could add or do differently to make it better/more secure.
• Give campers a minute or two to come up with both of these things. Remind them about being specific in their feedback.

Have campers share feedback with their partners ★
• Support BEING COURAGEOUS ★ – Let campers know that they can help each other be courageous in a variety of ways:
  ▪ Being good, respectful listeners while the other person is sharing
  ▪ Asking follow-up questions to solicit more ideas from their partners
  ▪ Thanking partners for sharing when they’re done
• Facilitate to make sure all campers are participating and sharing useful and respectful feedback.

Have campers share about their own creations ★
• Tell campers that next they’ll have a chance to share about their own creations.
• Give campers a moment to share their favorite parts of their safes. It can be a part they worked especially hard on, an idea they really like, or a part that came out particularly well.
• Then have campers each share a challenge they encountered while creating their safes this week and how they tackled that challenge.
• Finally, have partners thank each other for sharing their work and their feedback and recognize everyone for their hard work all week!