

SPACE
COLONY
COMPETITION



Competition Handbook

THE COSMIC LEAP FOUNDATION



cosmic-competition.org

Table of Contents

Competition Overview	3
Standard Alignment	5
Steps for Success	6
Step 1 · Register on the Cosmic Competition Portal	7
Step 2 · Identify the Problem	8
Moon & Mars Resources	9
Step 3 · Brainstorm Solutions	10
Step 4 · Design Colony Layout	11
Step 5 · Build Colony	12
Step 6 · Create Report & Video	13
Your Roadmap to Success	14
Submit & Award Ceremony	15

Can you survive a mission to space?

Teams of students take on one of humanity's biggest real-world challenges: designing a colony that keeps people **alive** — and **happy** — on the Moon or Mars. Over several weeks they research, invent, debate, and build, turning an open-ended problem with **no single right answer** into a colony of their own.

Real-world problem solving

Tackle an authentic, open-ended engineering challenge — the same kind NASA and space companies are working on today.

Engineering thinking & skills

Design real systems — power, air, water, food, and shelter — under real constraints like cost, resources, and risk.

Teamwork & communication

Divide the work, debate trade-offs, and present the design together as a team.

Creativity & imagination

Invent a place no one has built before — then bring it to life as a 3D model and a video.



Real teams, real builds.

Why it matters. Students don't just learn *about* space — they practice how real engineers and scientists think: research, prototype, fail, and improve. They finish with confidence, STEM skills, and a personal feedback video from a real professional.

COMPETITION DIVISIONS

Elementary

Grades 3–5

Middle

Grades 6–8

Open to any team of up to six students · register at cosmic-competition.org

Competition Overview



A long-term, student-driven engineering-design project — the teacher facilitates while students research, design, and build.

What is the Space Colony Competition?

Since 2014, Space Club has hosted this competition, originally in San Antonio, Texas. With a grant from NASA, it's now virtual — open to any elementary or middle school site, in Space Club and beyond.

Who can participate?

Any team of up to six students in grades 3–8. Educators register on the competition portal at cosmic-competition.org.

What do participants experience?

Students research and design a colony, build a 3D model from recycled materials, and upload a video and presentation — for a chance to win prizes and get feedback from real STEM professionals. The award ceremony streams live on YouTube, and students can join monthly career chats.

What do teachers experience?

As a student-driven assignment, the teacher is a **facilitator**. Plan for at least 12 hours across the project: you register teams, help access recycled materials, and help with filming and uploading.

How much time do teams need?

Plan for about ten 90-minute sessions:

Identify

2

sessions

Brainstorm

1

session

Design

2

sessions

Build

3+

sessions

Record & submit

2

sessions

Standard Alignment

As a collaborative, student-driven project spanning project management, research, systems thinking, and a range of STEM topics, learning outcomes will vary. Here are a few of the primary outcomes.

Framework	Code	Outcome
Next Generation Science Standards (NGSS)	3-5-ETS1	Define simple design problems with criteria and constraints; generate and compare multiple solutions; plan and carry out fair tests to improve a prototype.
	3-5-ESS3	Obtain and combine information about ways communities use science to protect Earth's resources and environment.
	4-ESS2-1	Living things affect the physical characteristics of their regions.
	MS-ETS1	Define criteria and constraints with precision; evaluate competing solutions systematically; analyze test data to combine the best characteristics into a better design.
	MS-ESS1	Patterns of motion of the sun, moon, and stars; Earth and its solar system within the Milky Way; objects held in orbit by gravity.
	MS-ESS3-3	Apply scientific principles to design a method for monitoring and minimizing human impact on the environment.
	MS-PS2-4	Construct arguments using evidence that gravitational interactions are attractive and depend on the masses of interacting objects.
Texas Essential Knowledge & Skills (TEKS)	3.8A	Identify everyday examples of energy, including light, sound, thermal, and mechanical.
	4.12 · 5.12	Describe patterns, cycles, systems, and relationships within environments.
	6.11	Understand how resources are managed.
	7.9	Understand patterns of movement, organization, and characteristics of our solar system.
	7.12	Understand that ecosystems depend on the cycling of matter and the flow of energy.
	8.12	Understand stability and change in populations and ecosystems.

OTHER TOPICS COVERED

Mental health & society

Architecture

Scale models

NASA technologies

Risk analysis

Budgeting

Project management



Teams present their colony to real STEM professionals.

Steps for Success

The competition is a long-term engineering-design project. These seven steps take a team from registration to a polished, judged submission.

1

Register for the Competition

An educator registers the team in the Cosmic Competition Portal.

2

Identify the Problem

Explore what it takes to keep a crew alive and happy on the Moon or Mars.

3

Brainstorm Solutions

Research engineering and mental-health “zones” for the colony.

4

Design Colony Layout

Arrange the zones into a functional overall layout.

5

Build Colony

Build a 3D model from recycled materials.

6

Create Report & Video

Complete the Project Report and record a presentation video.

7

Submit

Upload the report and video for judging.



We listened.

You told us the old process was scattered across too many tools and share links. So we built **one place** for everything — from registration to results — shaped by years of teacher feedback.

Register free at cosmic-competition.org — no payment to start.



No payment to register. Reserve now; pay by card or purchase order (PO / net-30) before the deadline.



Message Cosmic Leap in the portal — questions and replies in one place.



Get scores & the feedback video the moment judging ends — right in the portal.



Add & manage teams anytime from your dashboard.



Track each team through judging in real time.



Download certificates for every team, and **watch the award ceremony**.



[Home](#) [The Challenge](#) [Judging](#) [News](#) [Resources](#)

[Judge Login](#)

[School Login](#)

[Administrator](#)

REGISTER A TEAM

Bring the Space Colony Competition to your students

Reserve your teams for the Space Colony Competition. Each team is a crew of up to 6 students — reserve now and pay by card or invoice before the deadline.



YOUR INFORMATION

First name

Last name

Email

you@school.org

Your role

Select a role



YOUR ORGANIZATION OR SCHOOL

The Cosmic Competition Portal — register, manage teams, and follow everything in one account.

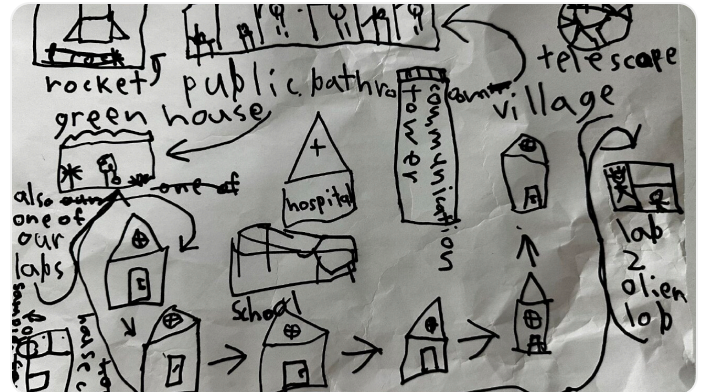
STEP 2 Identify the Problem

Your Mission

Research, design, and build a colony on the Moon or Mars to keep a crew of 12 humans alive and happy.

Designing a colony on the Moon or Mars is an overwhelming undertaking! Ask students to consider the following when introducing the challenge, then use the resources on the next page to explore:

- 1 What do humans need to survive?
- 2 What do humans need to be happy?
- 3 Is there anything we would change about our society on Earth?
- 4 What new challenges will we face on the Moon or Mars?



An example colony base diagram — zones placed and labeled before building begins.

CURRICULUM RESOURCE

Looking for more in-depth curriculum? Our partner, **Vivify STEM**, offers a [Moon](#) and [Mars](#) Project Guide with a teacher guide, a planning game, and student handouts. The planning game helps students debate the pros and cons of each solution — power, oxygen, colony services, and more — within power and budget constraints.

MISSION TO MARS

ENGINEERING ZONES

COLONISTS: 12

BUDGET: \$50 BILLION

MAX POWER: 50

COLONY LOCATION	POWER SYSTEM	FOOD SYSTEM	WATER SYSTEM		OXYGEN SYSTEM
			RECYCLING		
COMMUNICATION SYSTEM	SCIENCE LABS		ROVER	EXTRA SYSTEMS (ANY COLOR)	

©2019 Vivify, LLC. All Rights Reserved | www.VivifySTEM.com

Moon & Mars Resources

NASA Mission to the Moon

- [We Are Going](#)
- [We Go as the Artemis Generation](#)
- [NASA's Moon to Mars Playlist](#)

General Moon Information

- [NASA Moon — Overview](#)
- [Moon.nasa.gov](#)
- [NASA Artemis](#)
- [NASA Moon to Mars](#)

Moon Colony Resources

- [Regolith is Toxic](#)
- [Living on the Moon: The Challenges](#)
- [How to Build a City on the Moon](#)
- [Moondust, Radiation & Low Gravity: Health Risks](#)
- [Establishing a Lunar Colony](#)
- [How it Works: Living on the Moon](#)
- [How to Build a Moon Base](#)
- [Dealing with Trash on the Moon](#)
- [Moon Mining](#)
- [More Moon Mining](#)
- [VIPER Rover to Find Water on the Moon](#)

Mars Information & Missions

- [NASA Mars Facts](#)
- [NASA Martian Moons](#)
- [Mars in our Night Sky](#)
- [Mars Exploration Multimedia \(videos\)](#)
- [SpaceX — Mars & Beyond](#)

Mars Colony Resources

- [Materials that Could Bring Life to Mars](#)
- [How to Feed a Mars Colony of 1 Million](#)
- [Curiosity Inventories Key Life Ingredient](#)
- [Why We Explore Mars](#)



You're not on your own.

The **Cosmic Portal** gives you free Space Club curriculum, ready-to-use resources, and a **community of educators** running this project in classrooms around the world — a place to ask questions, share ideas, and get support.

[Visit the portal → cosmic-portal.org](https://cosmic-portal.org)

STEP 3 Brainstorm Solutions

Once students understand the Moon and Mars, they brainstorm and research possible solutions for their colony. To guide the design, teams consider the following engineering and mental-health “zones.”

Engineering Zones — keep your crew alive

- **Location:** Where will your colony be located?
- **Power:** How will the colony get power?
- **Food:** Where will humans get food?
- **Water:** How will humans get water?
- **Oxygen:** How will humans breathe?
- **Communication:** How will humans reach Earth?
- **Science Labs:** What experiments will run?
- **Extras:** What else keeps the crew alive?

Mental Health — keep your crew happy

- **Eating:** How will the crew keep a healthy diet?
- **Hygiene:** How will humans stay clean?
- **Sleeping:** How will the crew sleep?
- **Entertainment:** How will you prevent boredom and loneliness?
- **Extras:** What else keeps the crew happy?

Guidelines on solutions

- **Realistic** — consider cost and available (or in-development) technology; shipping everything to space is expensive.
- **Efficient** — use resources already on the Moon or Mars.
- **Low-risk** — protect human life in case of unexpected emergencies.

Don't overlook the brainstorming process — give teams ample time to develop the report, covering location, engineering zones, mental-health areas, and scenarios. **Assign the Project Report to students.**

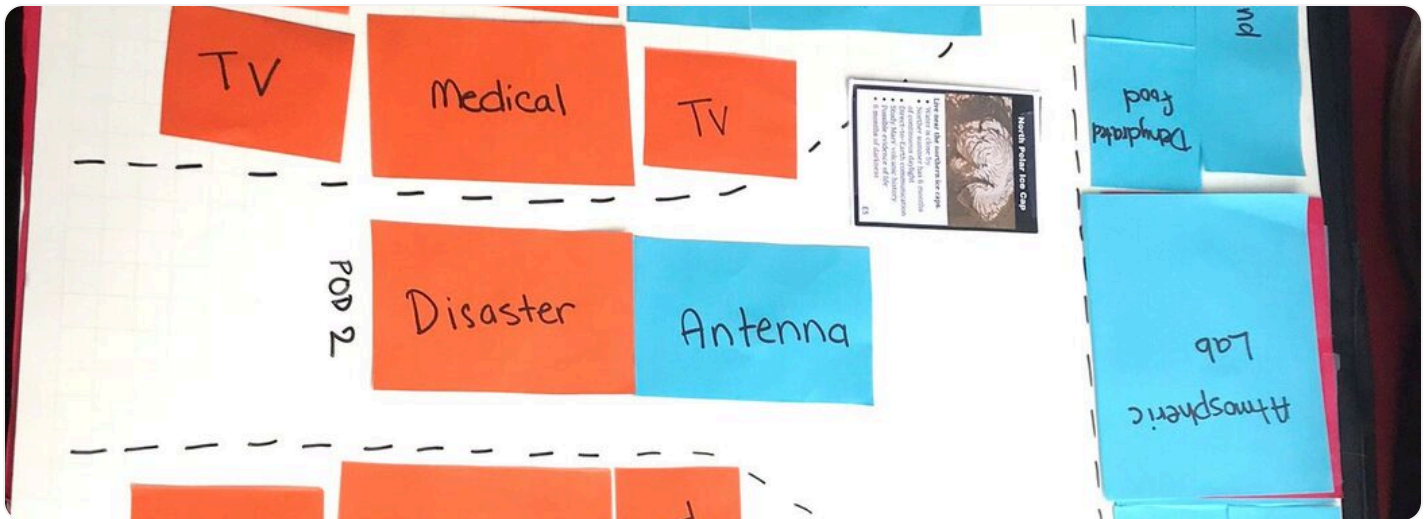


STEP 4 Design Colony Layout

Now that students know the parts of the colony, it's time to bring it all together! How will teams combine the different zones? Consider the following:

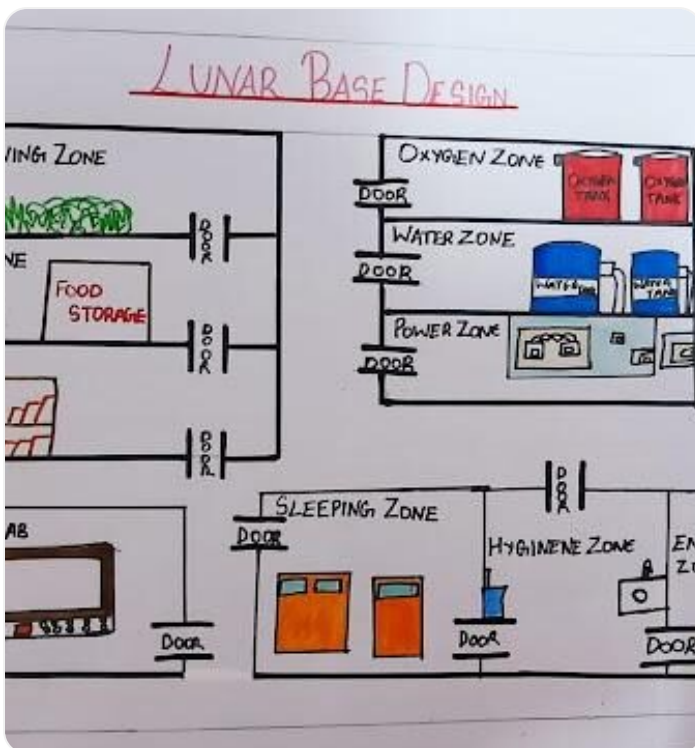
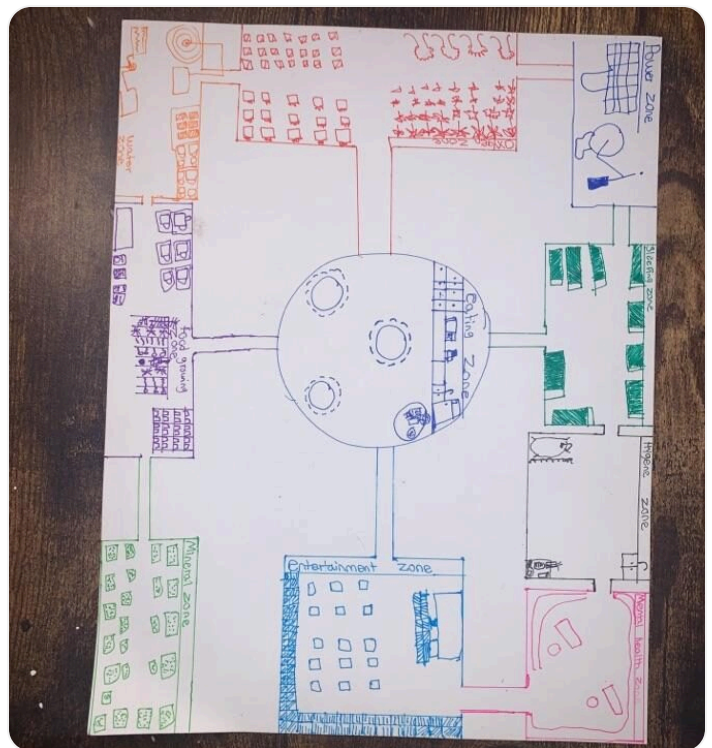
- How much space does each zone need? Introduce the idea of scaling across zones.
- The colony location shapes the layout — inside a crater, in a lava tube, underground, or in a dome.
- A layout can have multiple levels.
- What layout produces the most functional design?

Plan the overall layout. Have each student sketch an idea for the overall colony layout. We recommend using colored paper to represent zones and having students debate the placement of each zone on a poster board or large sheet of paper. The final submission can be a photo or drawing.



A colony layout mapping each zone — the kind of plan teams upload to the Project Report.

Upload a photo of the final colony layout in the Project Report for judges — it should include all zones, clearly labeled. Assign a copy to students.



STEP 5 Build Colony

Now the fun (and mess!) begins — colony-building time. Using materials such as cardboard, plastic containers, and art supplies, teams build the colony on a large foam board or other sturdy structure. Using the layout, teams can assign each member a specific zone to research and build.



Helpful tips

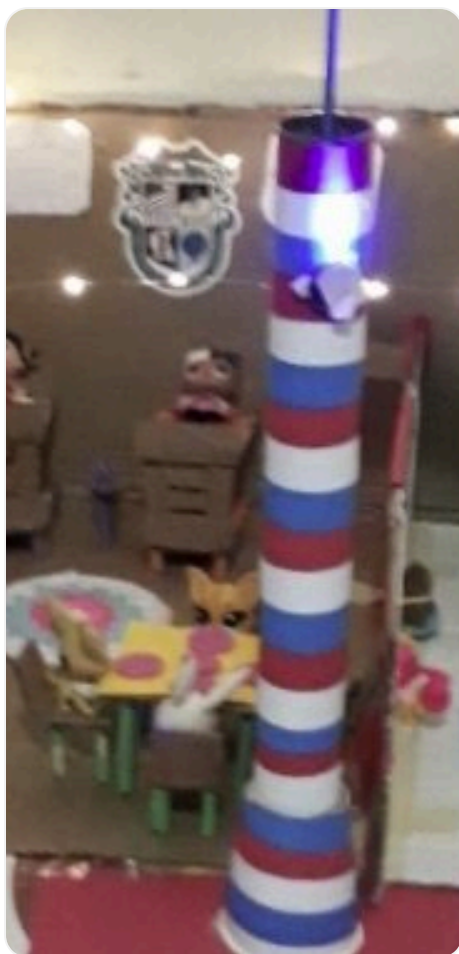
- Use safe, non-perishable materials.
- Determine a scale.
- Use recycled materials.
- Ask grocery stores and restaurants for donations.
- Label each zone on the colony.



Suggested materials

- Scissors
- Tape & hot glue
- Cotton balls
- Pipe cleaners
- Paper cups & plates
- Aluminum foil / tape
- Recycled boxes & rolls
- Paint & tissue paper
- [Foam board](#) to build on

Judges are more impressed by creative use of recycled materials than expensive ones. Upload a photo of the physical model that clearly shows each zone in the Project Report.



STEP 6 Create Report & Video

Every team submits **two deliverables** — a Project Report and a video. Judges use both to score the project. The **Project Report is now built into the Cosmic Competition Portal**, with three ways to complete it, so you can pick whatever fits your classroom and the tech you have on hand.

A

Download the printable / fillable PDF.

Print it, or type into it, then upload the finished PDF.

B

Email the team a fill-in link. Students complete it online (save & continue) — it comes back to you to review and approve.

C

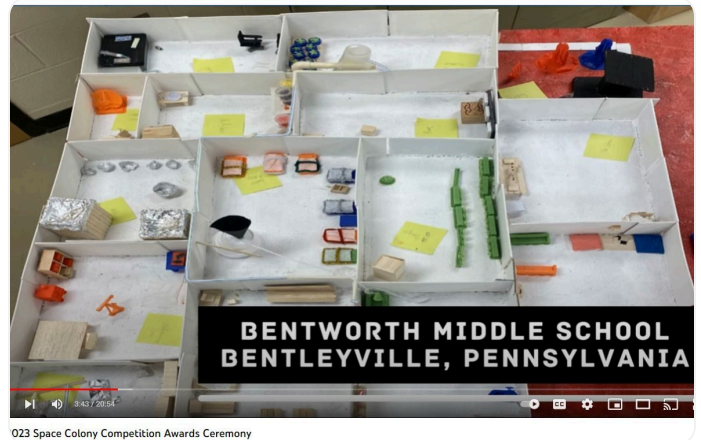
Show a QR code. Students scan to open the same digital report on their own devices.

However it's completed, the finished report lands in the team's folder in your portal, ready for judging.

MAKING THE VIDEO

Record a short video giving an overview of the colony and its zones — the report is a great script. **A phone or computer is fine; aim for a few minutes (around five).** Upload it straight to the team folder — no separate video host. Judges look for:

- 1 Introduction** — team name, mission patch, and each member's role.
- 2 Location** — where the colony is and why.
- 3 Layout** — show the overall layout of the model.
- 4 Zones** — each engineering & mental-health solution and the materials used.
- 5 Scenarios** — how the colony responds to two scenarios.
- 6 Team Spirit** — show your team and how you worked together.



Team highlights are featured in the virtual awards ceremony.

Stuck on anything? Use the **Get help** button in your portal — your question goes straight to the Cosmic Leap team, and replies appear in your **Messages**.

Your Roadmap to Success

Judges score every team on a **100-point rubric** — so use it as your roadmap. Make sure judges can find each of these in your report and video. **Special awards are given in every category!**

% of Score	Category	Met Expectations	Exceptional
25%	Engineering Solutions	A reasonable solution for each zone: power, food, water, oxygen, communication, and science labs.	Solutions are well-thought-out and realistic, showing understanding of resources and technologies. Zones are used to address two scenarios.
25%	Mental Health Solutions	A reasonable solution for each zone: eating, hygiene, sleeping, and entertainment.	
20%	Location & Layout	Basic reasoning for the location and a simple layout that integrates all zones.	Detailed rationale identifying local resources, plus a functional layout that maximizes survival and well-being.
20%	Model	Physical model includes a basic representation of zones with common materials.	Exceptional detail for each zone, with innovative use of low-cost or recycled materials.
10%	Professionalism & Team Spirit	All members contribute; the submission is complete, includes a mission patch, and is well communicated.	Exceptional team spirit and collaboration, a positive attitude, and a creative team name and mission patch.

MAKE SURE JUDGES CAN FIND...

50%

Engineering & Mental-Health Zones

Power · Food · Water · Oxygen · Eating · Hygiene · Sleeping · Entertainment — and how your zones handle **two scenarios**.

40%

Location, Layout & Model

Why this location and its resources · a labeled layout of all zones · a model photo showing each zone and the materials used.

10%

Professionalism & Team Spirit

Clear communication · a positive, collaborative attitude · a creative team name and mission patch.

STEP 7 Submit & Award Ceremony

To enter, every team submits three things through the portal:

- ☐ **Media Release:** a signed release on file for every student appearing in photos or video (kept by the teacher).
- ☐ **Project Report:** the finished report (any of the three ways from Step 6), in the team folder.
- ☐ **Video:** a short video (a few minutes) showing and describing the final model.

Each team folder has its own upload space in your portal — no share links to manage. Stuck? Use the **Get help** button and we'll reply in your Messages.

AFTER YOU SUBMIT

Your project goes to real STEM professionals — NASA engineers, researchers, and scientists. Every project is assigned to **at least two judges** who score each part and record a personal feedback video. Scores, award ratings, a digital certificate, and the feedback videos are delivered right in your portal, and a virtual award ceremony celebrates teams with highlights, special awards, and raffle prizes.

SOLAR



Teams who successfully presented a design for a colony on the Moon or Mars.

GALACTIC



Teams with outstanding designs for a colony on the Moon or Mars.

COSMIC



Teams with exceptional engineering, mental-health, and architecture design.

Questions? We're here to help.

In the portal, use the **Get help** button — or reach us at programs@cosmic-leap.org. See past winners and stellar teams at cosmic-competition.org.



We can't wait to see what your team builds. Good luck, and reach for the stars!

SPACE
COLONY
COMPETITION



Launching STEM Education to Cosmic Heights

www.cosmic-leap.org · www.cosmic-portal.org · www.cosmic-competition.org