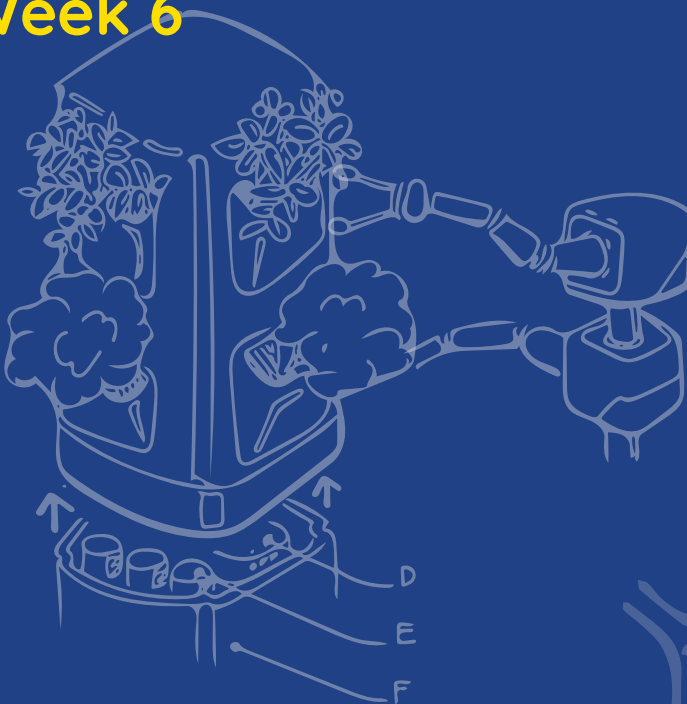


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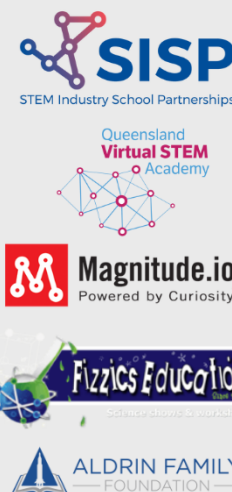
# ENGINEERING DESIGN FOLIO



The Australian Virtual Astronaut Challenge  
Week 6



# Australian Virtual Astronaut (AVA) Challenge



## Australian Virtual Astronaut Challenge. Week 6 - Recap

Your mission, should you accept it, is to assist Ted and his team from Magnitude.io to design a new plant growth mission, either on the International Space Station (ISS) or on the moon.



## The Challenge

You are part of a team of astronauts, scientists, engineers and leaders who are working on the Artemis program. In this 6-week design sprint, students will complete an engineering design process to develop a new plant growth mission for the International Space Station or for the moon.

This mission could be a new growth experiment, device or environment, your client will be Ted and the team at Magnitude.io. Throughout the 6 weeks, students will complete activities as if they were real astronauts on a mission. Students complete a series of collaborative activities leading to a 1-minute video pitch.



## Design Brief



Students are to design a new plant growth mission for Magnitude.io in pursuit of NASA's Artemis program. This mission could be in the form of a plant growth experiment, device or environment either on the International Space Station or on the moon itself. The mission should align to at least one of the United Nations Goals for sustainable development. Each week students will work through an engineering design process to develop solutions to the problem.

# Project Update

## Due Date for the 1- Minute Pitch entries.

Note: many schools are running the AVA challenge offline and therefore, different schools will complete the challenge at other times. As a result, the 1-minute video pitch will not be due until **Monday 22nd November 2021**.

## Video Pitch Details

The 1-minute video pitch file will need to be sent to **STEM@det.nsw.edu.au**. Considering the size of the video file it is suggested that schools use cloud storage services such as; Google Drive, Dropbox, SharePoint or WeTransfer to upload the file and then email the link to the chosen address (above).



### File Formats

For the judging panel to efficiently assess the video, schools should provide them in either. MOV or .MP4 format. Alternatively, schools may upload to YouTube or Vimeo and provide the link.



Fizzics Education

## What's Next?

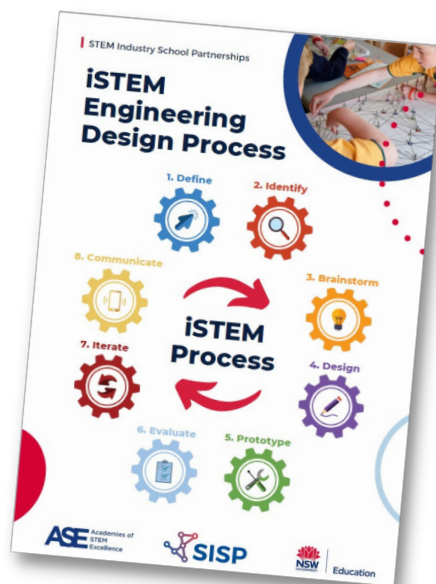
We hope to do a follow-up AVA showcase event highlighting several of the most innovative or interesting entries. This showcase will hopefully occur towards the end of next term. In addition, schools with the top 5 entries will receive a VIP event invitation to a Fizzics Education 30 – 45 minute liquid nitrogen show with a space twist!

**We sincerely thank you for supporting the AVA challenge.**

## This Week

In this week's AVA challenge we focus on the communication cog of the iSTEM engineering design process. Students will finalise their ideas and produce final drawings or prototypes for use in their 'Pitch'.

Students receive tips on making an effective 'Pitch' from Dr Sleaf, and Ben shares valuable information on creating a video for Instagram or developing a PodCast to communicate your ideas.





# Communication

Records of a design, e.g. drawings/plans/blueprints, are often kept as a computer-drawn file (CAD). This information allows other team members to update or modify the design in the future.



Students learn to work collaboratively in preparation for work in industry. When working in a team, complex projects rely on people's ability to create drawings that accurately communicate technical information.

### Activity:

Produce an orthogonal drawing (a front and a top view). You may choose to include a detail or 'close up view' if some parts are not easy to see clearly.

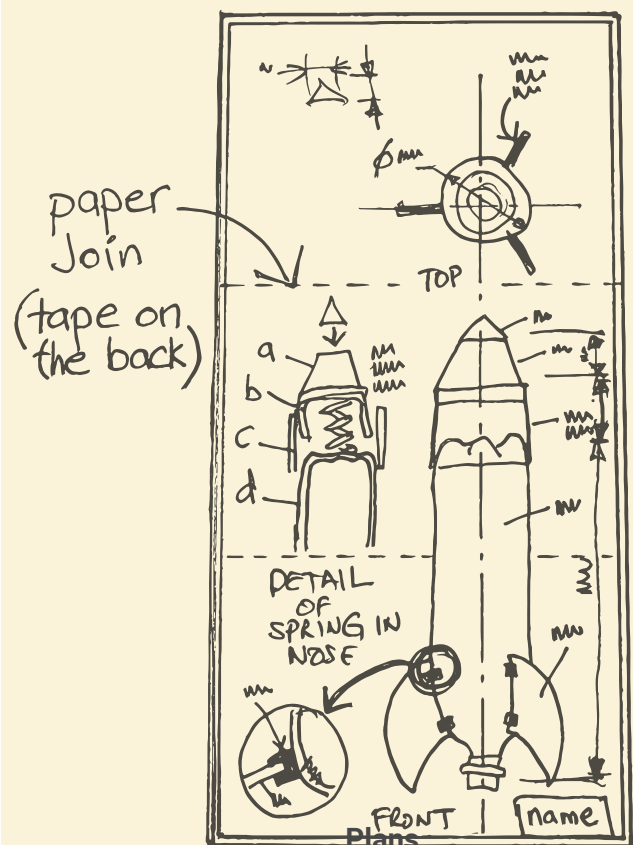
Include dimensions (measurements) on your plans. Dimension lines are very thin lines so as not to distract from the actual drawing. If possible, draw your plans full size, i.e. (scale 1:1).

In the example below our designer Glenny D joined three sheets of A4 paper together to draw a model bottle rocket at full size (see below).

To start a drawing, rule a margin. Add your name in a title block. Use a ruler and sharpened pencil and make these the drawings neat and tidy.

Placing the top view above the front view is the correct way of arranging your views on a drawing.

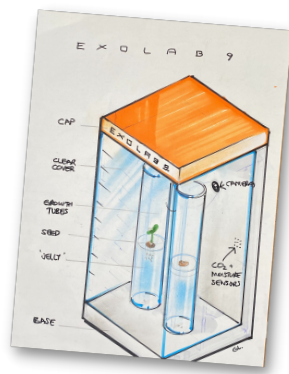
These sheets can be folded on the joins to fit inside an A4 display folder.



Click on the links below for video tutorials from Glenny D to assist with your communication



Jiggler Device



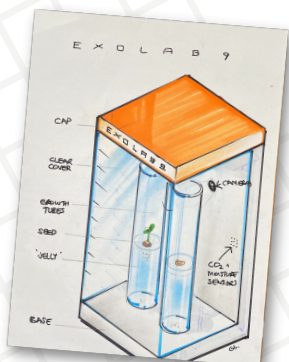
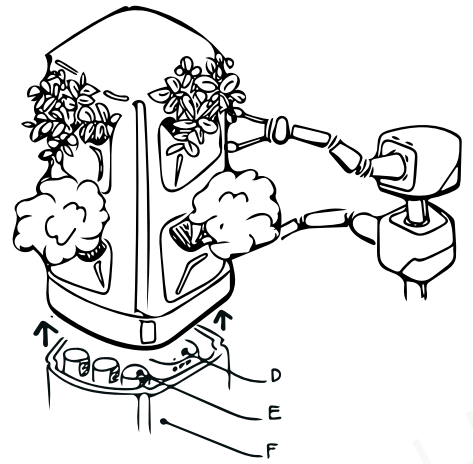
Exolab 9





# Communication

**Activity:** Use the space below to communicate your final design solution. This could be a CAD drawing, sketch, rendering or photo of your prototype or plant growth experiment. This will be the artifact used to pitch your solution to TED. Make sure it clearly communicates what you are trying to achieve.





# Communication



## Pitching your solution with Dr Sleep

### What is a Pitch?

A pitch is a concise way to tell a story about a problem, its solution and why people should invest in your product.



### Pitch Deck

A pitch deck is, in essence, the presentation slides that you use for the 'Pitch'. You may use different techniques to pitch, but typically you would still design your presentation using a series of slides. You may use a storyboard to develop your pitch deck.

### Common mistakes while pitching



- Taking too long
- Lack of a story
- Use graphics and images instead of words
- Not recognising a real problem
- Not identifying the opportunity

### Structuring your pitch

Typically a 5-minute pitch would include eight to twelve slides. Because you only have one minute, include only the most essential slides:

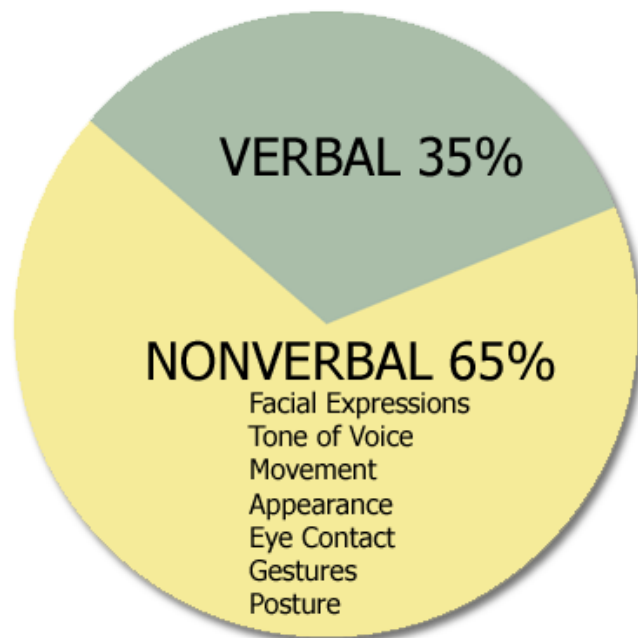
- Identify the problem
- Identify your solution
- Outline the potential of your idea
- The ask / why pick mine?
- Highlight the team

### Make your Pitch Magical: Tell a story!

- Where did the idea come from?
- What is your background?
- How did you get here?
- What is your vision?

### Presentation

- Know your audience
- Keep language simple but powerful
- Be confident, be in control and do not speak too fast
- Be passionate



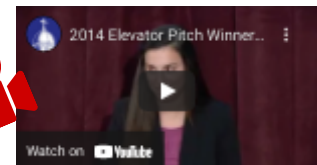
### Some examples of a good pitch



MIT Elevator Pitch  
Winner 2011



TEDx Southbank  
Pitch Winner



University of Dayton  
Business Plan Competition



# Communication

**Storyboard Activity** - In the boxes below produce a storyboard for your pitch. Each box would represent a pitch deck slide or a different aspect of your talk.

1.	2.	3.
4.	5.	6.

**Activity** - Use the space below to plan out other aspects of your 'Pitch'. This could include use of props, non-verbal communication.

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# Communication



## Creating Instagram Videos for AVA Challenge

### Utilising BYOD for AVA

Given that many students carry smart devices in their pockets and bags, you might as well take advantage of the powerful apps that these devices use. Many schools have implemented Bring Your Own Device (BYOD) policies for use in your classroom. Using smart devices in your classroom helps teach students to use everyday technology, a direct curriculum requirement in many syllabus documents.

### Instagram in AVA

As we all know, students love using smartphones! So why not take advantage of smartphone content creation apps by asking students to create informative short videos about their AVA projects and upload them to Instagram? Every day in your classroom, students gain new insights and make their interpretations of how the world works. Here is a fantastic opportunity for students to use their devices as a creative outlet and share their knowledge in a medium they love.

### So, how could Instagram be useful for teaching AVA?

#### Documenting learning

With a point of their camera and some simple content creation apps, your students could be documenting the AVA experiments, the challenges and questions raised in your classroom for other classes to learn from, plus they're a good reflection tool in their own right.

#### Creation of student challenges

Using Instagram as the medium, you could set a communication challenge for your students to explain a given concept to their peers.



## Tools for creating videos for Instagram

Instagram allows you to publish videos up to 60 seconds in length. While you can get students to upload raw video to Instagram with no editing, it's nice to teach students how to use a couple of apps to make their science video much better. Of course, free apps may limit the scope of editing; however, here are two free apps that could come in handy:

### 1 Squareready for Video

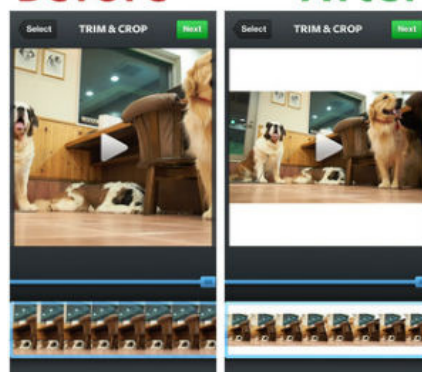
An issue with working with Instagram is that the videos are square rather than 16:9 ratio. If you are unsure how to crop your video to a square aspect or how to add top and bottom borders, you can still use Square Ready for Video. Like many free apps, it does have in-app purchases; however, you can pay to have them removed. Additionally, you must convert your entry to .mp4 /MOV file format.



Post to  
Instagram

Before

After





## Tools for creating videos for Instagram



### 2 Magisto

Available on iTunes and Google Play, Magisto is a free video editing app that does the editing for you (!). Simply select the raw video file, add a soundtrack and a title and the editor stitches it all together.

### Dropbox

If you create videos on your PC, it can be challenging to get these files to Instagram. A common workaround is to use Dropbox instead. First, convert your video file to a .mp4 file and then upload it to Dropbox. Now on your smart device, open Dropbox, select the .mp4 file you uploaded and then export it to Instagram.

### Students using a laptop

The raw video created by students does not just have to reside on Instagram. Your students could upload the same video to your classroom blog or pass it across to upload it onto your classes YouTube or Vimeo account. Also, students can upload 6.5-second videos using Snapchat. Snapchat has become a major social media outlet for students, and its popularity cannot be ignored. Of course, there are significant issues around how content created on Snapchat disappears once viewed, subsequently opening up the platform for potential cyberbullying and other inappropriate behaviours. As such, I recommend that you discuss the pro & cons of this platform with your school administration first.



So, what AVA challenge activity could you get your students to document in your classroom with the above in mind? It does not have to be the entire project, and perhaps you could showcase snippets of the in-class activity or use it for your AVA challenge pitch, just like Shark Tank! No matter what you choose, make sure you adhere to your school's social media policies. Above all, make sure the students have fun with it!

**Happy teaching,  
Ben Newsome**



## Create a Student PodCast for AVA

Podcasting also offers yet another opportunity for your students to engage with their world digitally. Armed with a microphone and a recording device, students could be sharing their ideas and insights gained from the AVA Challenge. The content they could produce does not need to be groundbreaking it just needs to be engaging for the intended audience and motivating for your students to put together.

### Benefits of student podcasting

- Podcasting is perfect for teaching students to use multimedia and build their confidence as digital natives.
- Student podcasting allows students to communicate original ideas and plan their implementation using various digital tools to a deadline (e.g. Trello).
- It's fantastic preparation for students wishing to enter science communication.
- A student podcast does not need to be just about AVA; students can showcase the great work your school does. It could become a regular feed for families to listen to each week!
- Podcasting is a fantastic medium of teaching teamwork! Some students can be the vocal talent, and others can be involved in creating each episode's artwork. Some can edit and pull together sound bites in post-production, and other students can be tasked with creating a student blog for you, to potentially share on a social media site approved by your school administration.
- Above all, many students enjoy the challenge and the audio platform to share their ideas.

### Which format will suit your school?

Like the topic area, podcast format is very much dependent on what audio students are recording and your overall mission. Still, there are a few pretty common podcast formats:

**A series of interviews?** A great format for bringing in a subject matter expert or focussing on a particular person's achievements or perspectives. The format for this type of podcast tends to be as follows:

*Introduction > Transition > Interview > Transition > Summary > Outro*

**A series of solo podcasts?** This format suits those students who want a platform to share their ideas. The format tends to be as follows:

*Introduction > Transition > Topic A > Transition > Topic B > Summary > Outro*

**An ongoing group discussion?** Similar to a talk show, a possible format for this could be:

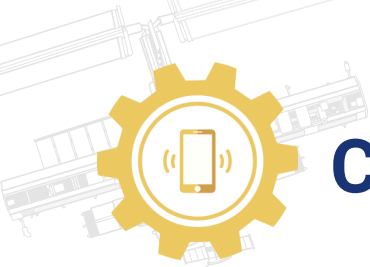
*Introduction > Transition > Catch up > Transition > Topic A > Transition > Topic B > Summary > Outro*

**Mix it up!** Maybe you could have a variety of different segments and have it act more like an audio magazine? You could include listener feedback from email or social comments.

No matter which format your students intend to produce, it's worth considering how often your school will produce a podcast. Pulling together your show can be quite demanding if there are many elements.

By the way, your podcast doesn't need to be 30 minutes long. It could even be a short 2-minute segment! Simply, it just needs to be as long as it needs to be.





## Which podcast equipment will you need?

This does not need to be as demanding as you might think.

### The simplest and cheapest option

Use the voice recorder from a smartphone or built-in microphone on your computer or tablet. The only issue with this is that the sound quality will be poorer than dedicated microphones built for a purpose. From there, you can use free software such as Garageband (Mac) or [Audacity](#) (PC) and host your podcast files on free platforms such as [Podbean](#) or [Soundcloud](#). Unfortunately, you cannot post directly to iTunes; however, Podbean can get the files across for you via an RSS feed.



The Rode Podcaster microphone mounted on a shock mount and attached to a boom arm

No matter your equipment, record your audio files in a location where the recording will not be affected by outside noise.

### Going a little further

The following list is for student podcasters wanting a better sound and more options for post-production and distribution

- A microphone such as a [Zoom H2N](#), Rode [Podcaster](#) or [Blue Yeti](#). There are plenty of other microphones suitable for podcasting, just be sure to purchase one that has a pop-filter and noise-cancelling where possible.
- [Skype](#) or Zoom web conference recording software for remote guests.
- A computer with a quiet fan.
- You can use free software such as Garageband (Mac) or Audacity (PC) or a tool such as SoundTrap
- A premium podcast hosting service such as Omny or Speaker. We use Omny, as not only is it easy to use but it also produces a handy embed code to be able to share the FizzicsEd podcast episodes easily onto our website.

**Important: If you choose to use music or other sound files to support your podcast... don't use copyrighted material without permission! It is far better to create your own music or effects anyway and it also teaches your students to respect ownership.**

### Extra podcasting tips

- *The students may want to eliminate filler words such as 'um' and 'ah', however, I prefer to keep these in as it makes your audio sound more authentic and less overly-produced.*
- *For your introductions, it is best to keep these to less than 3 minutes to get to the main content quickly.*
- *It's worth creating a 'run sheet' whereby the students note the section of the podcast and its associated mp3 file name. If they include short descriptions of each section, it'll help them write show notes and blog articles more effectively.*
- *Just start! Nothing is going to be perfect in your first few episodes. Please encourage students to simply create episodes that are useful for their intended listener... perfection can come later!*





# Train Like an Astronaut

Let's get active!

## Your Mission: Crew Strength Training

You will perform body-weight squats and push-ups to develop upper and lower body strength in muscles and bones.

Strong muscles and bones are essential to your overall health. They are necessary to perform chores and tasks at home, at school, or while playing. For example, when you lift an object off the floor, push yourself up out of bed, you are using upper and lower body strength. Physical activities such as these will help keep your muscles and bones strong!



**MISSION QUESTION:** How could you perform a physical activity that would strengthen your muscles and bones in both your upper and lower body?

## Mission Assignment: Strength Training

### Bodyweight squats:

Using only your bodyweight, perform a squat (each squat is a repetition).

- Stand with your feet shoulder-width apart, back straight, looking forward, arms at your side.
- Lower your body, bending your knees while keeping your back straight (as if sitting). Raise your arms forward for balance as you squat. At the bottom of the motion, your upper legs should be close to parallel with the floor and your knees should not extend past your toes.
- Raise your body back to a standing position.
- Try to perform 10 to 25 squat repetitions, increasing over time as possible.

Rest for 60 seconds.

### Push-ups:

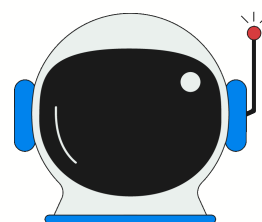
Using your arms to lift your body, perform a push-up (each push-up movement is a repetition).

- Lie down on the floor on your stomach.
- Place your hands on the floor, under your shoulders, shoulder-width apart.
- Using only your arms to lift your body, lift up slightly until your lower body is off the floor and only your toes and hands are touching the floor. (If this is difficult, you may keep your knees on the floor.) This will be your starting position.
- Straighten your arms to raise your body. Do not lock your elbows.
- Lower your body back to the starting position.
- Try to perform 10 to 25 push-up repetitions, increasing over time as possible.

Rest 60 more seconds.

This entire routine of strength training should be repeated two more times.

**Follow these instructions to train like an astronaut**



<https://trainlikeanastronaut.org/>





### Strength Training:

Physical activities which use resistance to increase muscle and bone strength, and help improve overall health and fitness.

### Crew (crew members):

People working together on a common activity or for a common purpose; a term for NASA astronauts who share their mission with each other.

### Repetition:

A motion (such as a body-weight squat or a push-up) that is repeated and usually counted.

### Resistance:

An opposing force (through gravity, weight, or equipment).

# Train Like an Astronaut

Let's get active!

### It's a Space fact:

Astronauts must perform physical tasks in space that require strong muscles and bones. In a reduced gravity environment muscles and bones can become weak, so astronauts must prepare by strength training. They work with NASA strength and conditioning specialists on Earth and continue to work in space to keep their muscles and bones strong for exploration missions and discovery activities.

### Fitness Accelerations:

- Complete five squats, holding the last squat for 30 seconds. Complete five more squats, holding the last squat for 60 seconds. Rest for 60 seconds. Do this three times for a total of 30 squats.
- Complete 10-25 pushups on a balance ball. You will balance your body on the exercise ball and push off with your hands to complete one push-up.
- Grab two 1.5kg dumbbells. Get into the push-up position and do five push-ups as your hands balance on the dumbbells. Now, lift the dumb bell with your right arm off the floor and bring it to your underarm. You will be balancing your body in the push-up position using one arm as you lift your right hand with the dumbbell to your underarm. Do these ten times and repeat with the opposite arm.

### Think Safety:

Astronauts carefully practice proper strength training on Earth so they can safely strength train in space.

- It is important to do these activities slowly and correctly to avoid injury.
- Remember that drinking plenty of water is important before, during, and after physical activities.

### Mission Explorations

- Climb across the monkey bars of the play equipment using only your hands.
- Do walking lunges across the gym floor.
- Walk up and down a set of stairs.
- Compete in a game of rope tug-of-war. (Wear gloves to avoid rope burns.)



<https://trainlikeanastronaut.org/>