



30 Week Homeschool Curriculum Guide



RUMBLELAB MISSION TO MARS

HEY! MY NAME IS MOULTRIE.
I'M ONE OF THE RUMBLELAB
ENGINEERS.

AND I'M RUMBLE, MOULTRIE'S
ROBOT ASSISTANT.

OVER THE NEXT 30 WEEKS WE ARE
GOING TO BE GOING WITH YOUR KID ON
A MISSION TO MARS.

ON THE MISSION THEY
WILL HAVE TO USE
SCIENCE AND
ENGINEERING TO
INVENT SOLUTIONS
TO PROBLEMS.

$$P = \sqrt{\frac{P_0}{\mu w m^t}}$$
$$f = \sqrt{P_0 \sin L}$$
$$g = \frac{P_0}{L} - m$$

THEY WILL PROBABLY
NEED HELP FROM YOU ON
A COUPLE PROBLEMS.

ALL OF THESE
PROBLEMS ARE ONES
THAT AN ENGINEER
IN SPACE MIGHT
HAVE TO FACE.

LIKE
ELECTRICAL
ISSUES

ELECTROMAGNETIC
STORMS.

AND SURPRISE ATTACKS
BY ASTEROIDS.

WE'RE EXCITED!
USE THIS
CURRICULUM GUIDE TO
FIGURE OUT HOW TO PACE
YOUR CHILD FOR A YEAR
OF FUN AND HANDS-ON
SCIENCE.

OH AND IF YOU NEED ANY
HELP, DON'T HESITATE TO
GET IN TOUCH. SEND US
AN EMAIL AT
RUMBLE@RUMBLELAB.COM

RUMBLE
LAB

Table Of Contents

For the digital PDF with clickable links go to
www.RumbleLab.com/MarsCurriculum

Introduction.....	4
Leading Questions.....	5
The Path.....	5
Suggested Resources.....	5
I Need Help.....	6
Wormholes.....	6
Proposed Paths.....	6
Build Week Structure.....	6-7
ReEngineer Week Structure.....	8
Innovation Week Structure.....	9-10
Sample Weekly Topic.....	10
Possible Weekly Topic Table.....	11-15



30 Week Curriculum Guide

Mars is a Launchpad

Mars is meant to be a fun and engaging, general overview of the major stem topics where your child learns through hands on experiences. One day you might learn about circuits by building the electric racer. Next week you could be learning about hydraulics by building the crusher, followed by another circuits project when you invent the electric guitar. Bouncing around to these different topics does two things. For one, it keeps things fresh and interesting. It also reinforces and builds on what they already learned. So when you make it to the second circuits project, we won't tell you all the steps. We will challenge your kid to use what they learned in the last experience to figure it out.

Probably more importantly though, with such a broad overview, your kid will encounter topics that they find interesting. This is where the launchpad analogy comes in. Once they work through some of the challenges you will notice topics that interest them. From there our engineers can help point you in the right direction with some more research topics, project ideas, videos, etc. to keep them curiously learning.

The Goal

We want your kid to learn problem solving skills. Because these are skills are SO SO SO SO SO SO SO (one more so? ...I think so...) SO important. It doesn't matter what they choose to be "when they grow up." It could be an engineer, scientist, or just your average DIY'er. We want them to have the courage to face a problem, make an informed decision, try it, learn from the results and try again. I guess the technical term is the scientific method.

Oh and on the journey to Mars, they will get a general overview to some of the main science topics like circuits, forces, motion, energy, hydraulics, mechanical advantage, electricity and magnetism, gears, aerodynamics, mechanisms, tools, measurements and more all by making cool stuff.

Warning

This is called a Challenge Crate for a reason... This will challenge your kid. Just like we get stronger by stressing our muscles. By challenging them, we are helping them become stronger problem solvers.

We will need your help in two ways.

- 1) The first is physical help. Some parts may be difficult for them to put together. This allows them to try, and realize where they need help. They then have to communicate with you, what they need help with. Be careful though, we have seen kids ask for more help than they physically need.
- 2) We will also need your help by encouraging them. If they are stuck, ask questions. Questions like: What are you trying to do? What seems to be the problem? How do you think you could solve this problem? We call these "leading questions" because they help lead them in the right direction to discover the answer themselves. There is a list of these in another section labeled **Leading Questions**. Oh, and if they are really stuck, we are more than happy to help. We would love to hear from them!

We HATE Worksheets

What kid wants to do a worksheet? Instead, we give them a research log where we challenge them to make observations, document their findings, make note of failures, write down something they are curious about, ask good questions, jot down ideas and solve problems just like a real engineer does. More than likely, we will need your help encouraging them to complete this. This may be unnatural at first. Just wait though eventually they will be making log entries on their own. So encourage them to carry their Research Log with them and make log entries. After they fill their first log, let us know and we will send them another.

Leading Questions

This is where the magic happens. When we teach these classes, we never give answers. When kids get stuck, we ask questions. Questions like...

- Tell us what is going on?
- What do you think is going wrong?
- How do you think you can figure it out?
- What does this part do?
- What could be helpful?
- What else?
- What else?
- What else?

This is a favorite question because it encourages lateral thinking.

The Path

In getting from A-B there is a path that is most direct and others have detours. We are convinced, no kid is standard, so why should their learning plan be standardized?

Our favorite path is the one where they follow their curiosity. They take their time and explore topics as they are interested. If you get behind because they want to dive deeper into something like the can crushing robot...Then great!

Some kids will want to work straight through the mission and skip any investigation. If this is the case, you might want to circle back after and encourage them to explore the science behind the projects.

If you prefer more weekly structure, we have a proposed path below.

Whichever path you choose, there is no right answer.

For more details about the Proposed Path section keep reading.

Suggested Resources

We recommend three main Resources:

- 1) [The RumbleLab YouTube Channel](#)
- 2) The Internet (Relevant links included in the 30 Week Guide)
- 3) [The Usborne Science Encyclopedia](#)

First, if you are having problems with the paper instructions, check out our YouTube channel. We have build videos for each of the challenges. [Click Here](#) or search RumbleLab on YouTube.

In the Proposed Paths section, we have links where you can dive deeper into the science topics covered by each project. The connected world is really cool. We now have instant access to infinite amounts of information. The important part is learning how to find relevant information and do something with it. Use this as a teachable moment. If they are interested in a topic and want to learn more, check out some of the links we provide in the table at the end of this guide. You might also try a Google or YouTube search on some of the relevant topics.

For those of you who would prefer a book, we understand. It's hard to beat the feeling of cracking the spine.;)

We generally find a science encyclopedia to be a good resource. You should be able to find one at your local library. If not, they can be pretty cheap on Amazon. Personally, our favorite is "THE USBORNE SCIENCE ENCYCLOPEDIA." Maybe try using a book in conjunction with the internet.

I Need Help!

Awesome! We love helping. You are more than welcome to send us an email at Rumble@RumbleLab.com. We also have a super awesome Facebook group where you can post a question. We are very active there, but there are some awesome families just like yours who can jump in and give suggestions. We totally recommend you check it out! Learn more [HERE](#).

Wormholes

A wormhole is a theoretical passage through space-time that could create shortcuts for long journeys across the universe. We have highlighted a couple of proposed metaphorical wormholes in the table at the back of this guide. No they won't transport you across the universe. But they could help transport you from working on a fun science project to a relevant and purposeful math topic...

For example: We understand math is a tricky subject. It's not very COOL. But, what if your kid saw it as a tool that they could use to be a better problem solver/engineer/maker? On one of their first challenges, they invent an outer space hydraulic can crusher. Well the crusher, it works because of mechanical advantage. And mechanical advantage...well to really use it, you need to understand the concept of area. And to do the whole "pies are squared thing"(I'ma make a great dad, right? ;)), it helps to know a little algebra. When you give math a purpose it becomes a little more...COOL. Try it!

Proposed Paths (Curriculum)

Don't be intimidated, we have reviewed a lot of curriculum and slept through just as much. I think you will find this to be the easiest, most laid back, curriculum you will ever follow. Each family will work through this at their own pace. You're more than welcome to follow your own path and do activities and challenges as you please. But we do want to give you some "fuel" for your kid to consume as they get curious.

If you follow this path, we have 3 different week structures.

- 1) [Build Week Structure](#)
- 2) [ReEngineer Week Structure](#)
- 3) [Innovation Week Structure](#)

Starting this will take a little more involvement on your part but once they get up and going, you will be amazed.

The following outline of the different weeks serves as your guide. For the kids, we have our [How To Engineer Guide](#). For example, if it is a Science Topic Research Day, encourage them to reference the Research Section in the How To Engineer Guide. It will give them a kid friendly overview of what they need to do and how to do it.

Build Week Structure

Day 1	Day 2	Day 3	Day 4
<i>Build/Investigate</i>	<i>Build/Investigate</i>	<i>Research</i>	<i>Reconcile</i>

Please, treat this weekly structure loosely. When the building bleeds over into Day 3, great! You are getting more mileage out of your crate. If the week goes short, use the rest of the time to check out some of the Exploration Topics in the table at the end of this guide. If your child is going down a rabbit hole, curious about a specific topic, PAY ATTENTION! Let them go, make a note and let us know. This will help us point you in the right direction for other activities they may be interested in.

Build

On build days, we are doing exactly what it sounds like. They are working with their hands and figuring out how to make something. They use their Mission To Mars Comic and their Mission To Mars Survival Guide to figure out what they are building and how to build it.

Just a little note on building...Some kids will want to dive in and try to figure things out on their own. Others will want to look at instructions or [watch a video](#). Some may need a little encouragement. As they progress through the Mission, you will notice, we challenge them to figure things out on their own more.

Investigation

This is one of our favorite parts. This is where they “play” with the project and see if the science doesn’t make itself obvious. Most of the time it does. They can even use the scientific method to see if things behave the way they think they do.

For example, maybe after working through the paper airplane activity, it seems like the wings of a plane are what hold it up. So if the wing is bigger it should stay in the air longer...right? Well, referencing the [How To Engineer Guide](#), they can design and run a simple experiment to try and get a better understanding of what is going on.

To make some of these discoveries you may need to ask Leading Questions like....What did you notice? What happens when you do X? Why is this better than that? Is there an experiment you could do to figure that out? Be sure to encourage them to jot some of their thoughts about the science in their Research Log.

Those are some of our go-to leading questions but every kid is different. The end goal here is to get them exploring the science behind the projects. You can also hop on our [Facebook group](#) if you need more help for these investigation days.

Remember, this outline serves as your guide. For them, we have our [How To Engineer Guide](#) that you can encourage them to work with as a reference.

Research

First, we have some playlists on our YouTube channel that we think do a good job. Check them out [HERE](#). If there is a topic you really wish we would cover, let us know!

Otherwise, research should be pretty straight forward. Personally, we prefer the internet. It's the tool that your kids will use most in their career for research, why not start now? Learning how to find answers on the internet is incredibly powerful and boils down to asking good questions. This can also be a great opportunity to teach them about acceptable and responsible use.

You can also try a Google search. Maybe check out some other YouTube videos. For example, if you want to understand how electricity works, try searching in YouTube “how electricity works.”

Reconcile

Now for the magic. After investigation and then researching the topics, what makes more sense? What were you wrong about? What was surprising? Again, their guide for this can be found in the [How To Engineer Guide](#).

How To Follow:

Take a look at the table at the end of this guide. Week 1's activity is the guitar. It also says it's a Build week. Referencing the Build Week Structure table above, we see that Day 1 and 2 of our Build week is Build/Investigate. So on days 1 and 2 they will work on building the guitar and doing some investigation while building. They will need to reference the Mission To Mars Comic and The Mission to Mars Survival Guide for building and the [How to Engineer Guide](#) for investigation.

ReEngineer Week Structure

Day 1	Day 2	Day 3	Day 4
Brainstorm	Experiment	Analyze and Repeat	Report

The ReEngineer Week Structure is all about the scientific method. See our post about the scientific method [HERE](#). We have it broken into days but as your kid progresses through the mission, you may find that they brainstorm, experiment and analyze on one day. The next day, they might start another run through the scientific method.

Brainstorm

This step is pretty straight forward. This is where they are throwing out ideas about ways they could make their invention better. You can ask questions like...After exploring the science, what are some things that you think you could tweak to make it better? Why do they think that would make it better? Encourage them to log this in their Research Log.

For example they may log: I think larger wings on a paper airplane will make it stay in the air longer because the wings are what is creating lift which is holding up the plane.

Experiment

Here they are designing a test that will help prove or disprove their hypothesis that they generated during the brainstorming process. Sounds complicated but it is as simple as writing. "I will fold the same paper airplane with 3 different wing sizes and measure and record the distance that they travel."

Then complete the experiment and log the data.

Analyze and Repeat

What does your data tell you?

For example, "Of the 3 planes, the middle sized wing went the furthest. I will try a different style of plane to see if this is true for other planes or just this design."

Report

This is nothing formal. We just want them to be able to communicate what they found after working through the ReEngineering Week Structure. Looking at all their experiments and data, what can they say and prove. They can reference the Report section in the How To Engineer Guide.

How To Follow

Let's assume we are following the 30 week schedule at the back of this guide. It's the end of week 4. We have just finished the Electric Racer Build. Well, for week 5, we have a ReEngineer week where they are using the scientific method to improve their Electric Racer. So day 1 of week 5, they can brainstorm ways they could improve their racer. Again, they will reference the Brainstorm section in the kid friendly, [How To Engineer Guide](#) for tips on conquering this day. They will then move on to Experiment, Analysis, Repeat and Report. If this week runs short, feel free to move on to the following week. Otherwise you can dive into some of the Exploration Topics.

Innovation Week Structure

Day 1	Day 2	Day 3	Day 4
Problem Focus	Ideation	Implementation	Report

The Innovation Week Structure is all about taking what they have learned through the other weeks and applying it. Its goal is to encourage out of the box thinking and to help foster creative problem solving skills.

Please please please, do not overemphasize structure here. Innovative thinking does not follow a framework and is impossible to force. Sometimes out of the box ideas come from out of the box methods. For examples, we have several families recommend going for a hike while bouncing around ideas. You know, to get those creative juices flowing. The following topics are just some suggested angles of attack. Eventually, they will start thinking outside of the box on their own.

Problem Focus

One thing we are always thinking about is..."what is a problem that we find frustrating?" For us, anytime we come across a problem that we find frustrating, or are curious about, we jot it down in our log. We hope you encourage your kid to do so as well.

For example, we came across a problem the other day when we were camping. When we camp, we like to build a fire. We also worry our fire will get out of control and start a forest fire when we aren't paying attention. We then thought this could be a bigger problem, especially in areas where people need to keep fires going all night for warmth. We didn't have a solution, but just jotted it down in our Log

Experience Focus

We also like to toss around and discuss what we learned. Think "How could what we learned be useful?" We will throw out any and all ideas.

For example: maybe after completing the Robot Mechanic Simulator you think of a couple of ways you could use a circuit. One way might be that you could use a simple circuit as some sort of simple alarm...

Implementation

This is where they get to start bringing their idea to life. Somewhere, a problem and what you learned will meet and you can begin to think about an innovation. This is where the fun begins. Let them go as in depth as they want. At a minimum, encourage them to draw what they think the finished design will need to look like and label all the parts it will need.

If they are really gung ho, encourage them to make it. If they want help, let us know.

Maybe investigate CAD. We build all our projects using a free, internet based CAD program called OnShape. It is free and incredibly powerful. You can start by exploring some of [our models](#). Next encourage them to try making their own model of something. They have some wonderful tutorials [HERE](#).

Reporting

Here, all we expect is for them to outline the problem, what they need to solve the problem, a simple sketch of the design labeling the components and any challenges they may face. If they need help, let us know.

How To Follow

Just like before. Week 9 is an innovation week. It occurs after the hydraulic crusher build is completed. We want to see if they can figure out another way they can use hydraulics. You will notice Days 1 and 2 aren't divided. This is because the ideation phase is really difficult to fit in a box. They might find the experience first method works best, but they might also prefer another method. Be flexible and have fun!

Possible Weekly Topics

You can use the table at the end of this guide as a way to turn the Mission To Mars into a year long science curriculum. You can follow it as loosely as you would like.

Week #	Activity	Week Type	Goal	Possible Investigations	Research Topics	Exploration Topics	WormHoles	Relevant Links
1	Guitar Details: Guitar Steps 1-5 of comic	Build	Invent a single string guitar w/o the body. Stop @ Step 5 Investigate, Research and Reconcile per the Build week schedule	<ul style="list-style-type: none">• What is pitch?• How can you affect it?	<ul style="list-style-type: none">• Sound• Pitch and frequency,• Amplitude and volume	<ul style="list-style-type: none">• What happens when you take a slow motion video of the string?• Can you learn a simple song?• Good vibrations: how they are useful.• Bad vibrations: How they hurt us.• Resonance and the Tacoma Narrows Bridge.	History Of Music/ Guitars	
2	Guitar Details: Guitar Steps 5-8 of comic	Build	Another easy intro reinforcing build week structure. This week add the body and explore adding more strings. Investigate, Research and Reconcile.	<ul style="list-style-type: none">• What does the body do?• Have you learned other ways to affect pitch?				

For example: Week 1, they start out on the first challenge. They are working to invent a guitar. Following the Build Week Structure, the first week they can spend a few days making and investigating a simple guitar. Then for the next couple of days they can research the science behind it and reconcile their research with their investigations. Also, we have given you topics that they might want to investigate or research, along with exploration topics, wormholes and a few relevant links.

The exploration topics are useful for when they are exceptionally curious about a topic. You can also use them for filler material when a week runs a little short. You could also move on to the next week instead.

If your kid wants to skip a topic, we recommend you do. Make a note and circle back. If there is one topic in particular that isn't clicking. Let us know, we are happy to help!

Boom! That's It!

It can require a good bit of your involvement at first but once they get up and going, they will have a awesome set of mental tools that they can use to crush any problem life brings their way.

Please, if there is an aspect to one of the weeks that your child is not interested in, move on, you can come back to it later. We really want to avoid a "bad science experience" which turns them off to science as a whole. Be flexible and know when to push and when to pass. If you need help with any of this please send us an email at Rumble@RumbleLab.com

Thank you

Seriously.

We're on a mission to change education. Change it from this assembly line approach, where every unique kid is processed and stripped of any curiosity and uniqueness. To one that is more individualized. One where kids are passionately curious and are serious about trying to solve interesting problems. So we thank you, because none of it would be possible if you weren't serious about their education.

Let's do this!

Possible Weekly Topics

Week #	Activity	Week Type	Goal	Possible Investigations	Research Topics	Exploration Topics	WormHole	Relevant Links
1	Guitar <u>Details:</u> In Comic: Steps 1-5	Build	Invent a single string guitar w/o the body. Stopping at step 5. Investigate, Research and Reconcile per the Build week schedule	<ul style="list-style-type: none"> • What is pitch? • How can you affect it? 	<ul style="list-style-type: none"> • Sound Pitch and frequency, Amplitude and volume • Can you learn a simple song? 	<ul style="list-style-type: none"> • What happens when you take a slow motion video of the string? • Good vibrations: how they are useful. • Bad vibrations: How they hurt us. • Resonance and the Tacoma Narrows Bridge. 	History of the guitar.	RumbleLab Guitar and Sound YouTube Playlist
2	Guitar <u>Details:</u> In Comic: Steps 5-8	Build	This week add the body and explore adding more strings. Steps 5-8 Investigate, Research and Reconcile.	<ul style="list-style-type: none"> • What does the body do? • Have you learned other ways to affect pitch? 				
3	Circuits <u>Details:</u> Simple circuit, Parallel circuit and Series circuit in Survival Guide	Build	Complete simple circuit activities in survival guide. Try making a motor spin. Figure out how to make it spin the opposite direction. Can you bring two motors to life? Investigate Series and parallel circuits	<ul style="list-style-type: none"> • How does a series circuit behave differently from a parallel circuit? 	<ul style="list-style-type: none"> • Series and parallel circuits • Open, closed and short circuits • Voltage, current, resistance, Ohm's law • How an electric motor works. • How friction works. 	<ul style="list-style-type: none"> • The history of electricity. • The development of electrical components. • The history of the automobile 	History of Electricity	RumbleLab Electricity YouTube Playlist
4	Electric Racer <u>Details:</u> Wiggle Car in comic	Build	Apply circuit learning and invent an electric car (wiggle car in comic.)		<ul style="list-style-type: none"> • Investigate different pulleys 			Howstuffworks: Electricity
5	Electric Racer	Re-Engineer	To Make our car better first decide... What is better? How could we measure better? How do you think you could make it better?		<ul style="list-style-type: none"> • Increasing traction • Changing pulleys 			

Week #	Activity	Week Type	Goal	Possible Investigations	Research Topics	WormHole	Relevant Links
6	Hydraulic Thumb War In Survival Guide(SG)	Build	Play hydraulic thumb war.	<ul style="list-style-type: none"> What affects mechanical advantage. 	<ul style="list-style-type: none"> Fluids Pascal's law Pressure Force Mechanical advantage Area and volume 	<ul style="list-style-type: none"> The history of hydraulics Where are hydraulics used Different types of pumps Hydraulic inventions 	Mechanical advantage works because of area which can lead to a lesson about area and geometry.
7	Pump In Survival Guide	Build	Use check valves to invent a pump.	<ul style="list-style-type: none"> How could this be useful? 			You also need to know algebra to figure out geometry and area so this could also serve as a wormhole to algebra.
	Hydraulic Crusher In Comic	Build	Invent a crusher using mechanical advantage and your pump.	<ul style="list-style-type: none"> How is the pump working? How do the check valves work? 			
8							
9	How else could you use hydraulics	Innovate	How else could you make use of hydraulics	NA			
10	Simple Robot Mechanical(RMS) Simulator In Comic Steps 1-7	Build	Make a simple version that sets off the buzzer when the trip wire is touched.	<ul style="list-style-type: none"> Can you figure out a different way to hook up the circuit? 	<ul style="list-style-type: none"> Series and parallel circuits Open, closed and short circuits Voltage, current, resistance Ohm's law 	<ul style="list-style-type: none"> History of electricity How a buzzer works 	Ohm's law to algebra
11	Parallel Circuit RMS In Comic Step 8	Build	Add a vibrating motor so that the simulator vibrates and the buzzer goes off	<ul style="list-style-type: none"> What happens if you hook the motor up in parallel 	<ul style="list-style-type: none"> • Ohm's law • How an electric motor works 		
12	Innovate	Innovate	Apply circuits				

Week #	Activity	Week Type	Goal	Possible Investigations	Research Topics	Exploration Topics	WormHole	Relevant Links
13	Paper Planes In SG	Build	Try folding different planes and learning how to tweak them to control their flight.	<ul style="list-style-type: none"> How does weight affect the plane How does surface area affect flight. Try graph paper to easily figure out wing surface area. 	<ul style="list-style-type: none"> How planes work How center of gravity affects paper plane flight 	<ul style="list-style-type: none"> How are hydraulics used in flight History of flight Developments in flight 		RumbleLab Paper Airplane YouTube Playlist
14	Plane Launcher In Comic	Build	Use what you learned with circuits to invent an electric paper airplane launcher.	<ul style="list-style-type: none"> How can you increase the range 				RumbleLab Airplanes and Lift YouTube Playlist
15	Re-Engineer	Re-Engineer	What is the max distance you can get out of your launcher?	<ul style="list-style-type: none"> Friction Plane design for launcher 				
16	Gear Spinner In SG	Build	Introduction to gears and how they work.	<ul style="list-style-type: none"> How a simple gear train works How a compound gear works 	<ul style="list-style-type: none"> Torque and speed Mechanical Advantage How a simple gear train works 	<ul style="list-style-type: none"> Where gears are used Different types of gears History of gears Power generation 	Torque to algebra	RumbleLab Gears YouTube Playlist
17	Hand crank generator In SG	Build	Apply gears/intro to energy	<ul style="list-style-type: none"> Is the hand crank more difficult to turn with the LED? 	<ul style="list-style-type: none"> How a compound gear works Energy Vibrations in gears 			
18	Muscle Car In Comic: May be called "Gear Car"	Build	Apply gears	<ul style="list-style-type: none"> How slow can you go? Bad vibrations: How they hurt us? 				
19	Improve Muscle Car using Scientific Method	Re-Engineer	What is the maximum amount of weight your car can pull?		<ul style="list-style-type: none"> Friction Center of gravity Torque and speed 			

Week #	Activity	Week Type	Goal	Possible Investigations	Research Topics	Exploration Topics	WormHole	Relevant Links
20	Mechanisms In SG	Build	Learn about mechanisms and the motion they can produce	• How could these different types of motion be helpful?	• How mechanisms are used • Robotics • How basic logic works	• Find a four bar • Try using CAD to make a simple 4 bar.		RumbleLab Mechanisms YouTube Playlist
21	Crushing Machine In Comic: Steps 1-11	Build	Combine your crusher, with a mechanism and some gears so that you can crush a can by flipping a switch	• Why does the pump seem to struggle once every time around.				
22	Crushing Robot In Comic: Steps 12-14	Build	Add a limit switch so the motor runs until the crusher has traveled all the way to the bottom	• How else could you use a limit switch				
23	Improve Crushing Robot	Re-Engineer	How can you improve the crushing robot?	• Can you make it faster • Can you make it more robust and reliable • How many cans can you crush per battery				
24	Innovate	Innovate	How could you use what you learned to solve some sort of problem?					

Week #	Activity	Week Type	Goal	Possible Investigations	Research Topics	Exploration Topics	WormHole	Relevant Links
25	Electric Coil Winder/ Electromagnet In SG	Build	Invent a magnet that you can turn on and off	How would you make the magnetic force stronger. How could this be useful?	• Electromagnetism • Sound waves • How speakers work • How Microphones work	• Other types of speakers • Converting motion to electrical energy and vice versa		HowStuffWorks: Electromagnetism
26	DIY Speaker/ speaker In SG	Build	Make your own speaker and compare it to the speaker that came with your crate	How could you make your speaker better?	• How a guitar pickup works • How an amplifier works			RumbleLab Electromagnetism YouTube Playlist
27	Amplifier/Spy speaker In SG	Build	Learn about amplification and alternative speakers	How is the motor creating sound?				
28	E Guitar In Comic	Build	Learn about pickups and hack your guitar to make it electric	Why do we need to secure the magnet inside the pickup and the pickup inside the guitar neck?				
29	Gravity Light In SG	Build	Use what you have learned to invent a device that generates electricity using gravity	• How can we make the gravity light brighter? • How do we make it light up for longer?	• Energy	• Hydroelectric power		
30	Tops	Build	In SG					
31	Top Launcher	Build	In SG					
32	4 Wheel Drive Racer	Build						
33	Racer Alternative power	Build						
34	Catapult	Build						
35	Friction Tester	Build						

