# Prologue

Hello,

If you are reading this then you are about to embark on a wonderful exploration into space sciences with your cub scout den, patrol, or pack. I have put together this document to outline what you can cover, who you can reach out to, and how to make it fun. I hope your experience is a success and that the youth come out of this with a newfound love for science and the tools we use to explain the world we live in and beyond.

If you are new to the STEM/NOVA program with BSA, let me just cover some of the basics. STEM stands for Science, Technology, Engineering, and Mathematics. They are the core components in logic and deductive reasoning in our world today, a skill that has been lost by most. For generations the US was the leader in many of these fields, but we have begun to stray from this path and it only hurts us as a nation. Children, myself included, were raised to believe that science and math were hard and that they weren’t important and nothing could be further from the truth. The BSA has always incorporated STEM components in their merit badges and advancement criteria, and the NOVA awards utilize those existing awards as well as some additional steps. **Swing** focuses on Engineering, and more specifically Levers. All NOVA awards follow these basic requirements:

1. Research for an hour. It doesn’t matter how (reading, video, movie etc), but it should be specific to the subject.
2. Earn one of the related rank’s elective Adventure loops or pin, or do a group activity supplied. Adventure Loops earned for another award should not count.
3. Engage in a learning activity. This may have one or more facets, but is designed to involve the youth in research, critical reasoning, and presentation of their discoveries.
4. Visit somewhere where the subject in question is being used or performed.
5. Follow up with the NOVA counselor on what was learned.

I have incorporated a slideshow presentation and handouts for the youth that will cover every requirement of every question. For **Swing**, you will perform all of steps 1 and 2, 3, and 4. The following pages will help you to talk about the different subjects, provide questions that you can ask to get the youth thinking, and help to answer questions that may be asked.

NOVA awards, on average, should be accomplished in about a month’s timeframe. This gives the youth a chance to do their research, create their presentations, and discuss what they are learning along the way. Engage the youth in whatever activities you would like to in an environment that works for them, but they will learn best by doing. Follow the Leading EDGE and Teaching EDGE philosophies. I wish you the best of luck in your adventure.

Corey Peoples

Pack 455, NSC, C250-17-1

# Slide 1 - Beginning

Introduce yourself and the excitement with the youth. Why did you choose to lead this award? What’s your passion for engineering?

# Slide 2 - Agenda

Read verbatim or paraphrase:

The goal of this STEM course is to teach us how levers can be used for everything from construction to play to even how you move! We will start off by selecting a book from the library, or watch a movie [akela, you decide]. Then there is a group activity we will perform. We will learn all about Levers and the different ways they are classified. Then finally, we are going to visit somewhere that levers are used. Throughout it all, let’s keep discussing what you are learning.

# Slide 3 – Learn for an Hour

Read verbatim or paraphrase:

Our first requirement is going to be to learn for an hour. I would like everyone to [Join me in watching a TV show or movie | Select a book from the library | select from some mathematics Youtube videos]. During this learning process, I want you to tell me about what levers you see and how they benefits the people using it.

# Slide 4 – Group Activity – Rank Adventure

If you are doing a rank adventure, use this slide. If the rank adventure does not work for your group because it was already earned for another award or your group is of mixed ages, move on to slides 5 or 6.

Read verbatim or paraphrase:

We are also going to earn an adventure loop. There are a few to choose from, but the adventure loop we selected is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ for you. That will be done (now, later, on another day, at home, etc). While we work on this adventure loop, I want you to keep in mind what engineering is used in it.

# Slide 5 – Group Activity – Breakdown

Read verbatim or paraphrase:

I have here an old electronics device called a \_\_\_\_\_\_\_\_\_\_\_\_. What we are going to do today is use tools to take it apart and look at the inside of it. We want to see if we can identify how some of the components work, and list off at least 5 things that we can notice in here.

Things that are built like this usually don’t have any serviceable parts, meaning there isn’t a reason to take them apart in order to fix them, so please leave the taking apart of things to this old box, instead of trying to take something apart like your TV. Some things, especially if they were recently plugged in, may still hold an electrical charge, and touching the wrong thing can cause that charge to end up in you. It could be a small static shock, or it could be a very large one. That’s why, for safety, we always use grounding straps.

Akela, the item that you choose to take apart will have different safety and tool requirements, be sure to research it before this exercise, so that you can know what some of the components are.

# Slide 6 – Group Activity – Team Spirit

I would recommend this take place after the learning activity on slides 7 through 13 take place. Read verbatim or paraphrase:

Let’s play a game! I’ve brought some game tools for us to play 2 games that use levers. As we play these, I want everyone to think about what class of levers we are using, and where our fulcrum, load, and effort are being used.

# Slide 7 – Learning Adventure Intro

Read verbatim or paraphrase:

Levers are an engineering marvel. They allow us to move heavy things or allow us to apply force to a task without much effort. Levers aren’t just used to lift stuff off of the ground, though, we use levers every day.

# Slide 8 – Explore how Levers Work

Read verbatim or paraphrase:

Every lever consists of 3 components. The first is the load. This is what you are trying to move with your lever. The second part is the fulcrum. This is the pivot point, or what moves around. And finally there is the effort, or where the pushing/pulling happens to move the load. The math behind how much effort is needed based on the length of the lever and the size of the load is too complex for us to work on today, but we can at least learn what the levers can do, and when you get to High School Physics classes, you’ll already be ahead of the class!

# Slide 9 – Class 1 Levers

Read verbatim or paraphrase:

When you think of Lever, you are thinking of a class 1 lever. This is where of the 3 components, the fulcrum is in the middle of the lever. It can be used to lift a weight off of the ground, but it can also be used as a seesaw (where one person is the load and the other has to put in Effort to make them go down, or a pair of scissors where the cut is the load and the effort is squeezing the handles together. Can you think of other things that resemble a class 1 lever?

# Slide 10 – Class 2

Read verbatim or paraphrase:

Class 2 levers are different. Of the 3 components, this one has the load in the middle. The most common example of a class 2 lever is the Wheelbarrow. It’s fulcrum is the wheel and the effort is the handles. It’s still a lot of work to use this, but you can easily move it around and the bulk of the weight is supported by the fulcrum, especially if the load is closer to the fulcrum. A stapler is another example, where the load, in this case the staple, is between the fulcrum and where you push. Can you think of another example like this?

# Slide 11 – Class 3

Read verbatim or paraphrase:

If the fulcrum in the middle was class 1, and the load was class 2, what do you think class 3 is? Effort! This is where you would push or lift in the middle. A tweesers is this example, where you have fulcrum on one side and load on the other, so the only place for effort is the middle. Your arm is another example, where your muscles pull up on your forearm to make it move. Can you think of any other examples?

# Slide 12 – Sketch it Out

Read verbatim or paraphrase:

I’ve got some examples up here of various levers. Let’s see if we can draw out on of each class of levers and mark where the components are

|  |  |  |
| --- | --- | --- |
| **Item** | **Class** | **Reason** |
| Bike Break | Class 1 | Fulcrum in the middle |
| Nutcracker | Class 2 | Load in middle |
| Fishing Rod | Class 3 | Effort in middle of fulcrum (hand) and load (hook) |
| Hammer pounding | Class 3 | Effort in middle |
| Nail Clippers | Class 3 | Effort in middle of load (fingernail) and fulcrum (rivet) |
| Hammer clawing | Class 1 | Fulcrum between effort and load |
| Seesaw | Class 1 | Fulcrum in middle |
| Pantograph (heart) | Class 3 | Effort is in middle (red heart) to fulcrum (point) and load (green heart) |

# Slide 13 – Sketch it out

Read verbatim or paraphrase:

Pick one last thing, anything, that could act like a lever and sketch it out. What class is it? Where are the components of the lever?

# Slide 14 – Visit

This has to be arranged ahead of time, and some research should be done. Discussion with an expert is not required, but always fun if the option is available. Levers are used everywhere if you know where to look. A lightswitch, for example, would count. I took my crew to a part and we looked at the levers of the playground equipment. Kitchens, construction yards, library backrooms, etc. Make sure to know which items would fit the various classes and call them out if the scouts don’t. Also be sure to let the scouts know to obey the leaders and safety rules given by the location chosen.

Read verbatim or paraphrase:

Our last thing we have to do is go somewhere that levers are used. I have arranged for us to meet at \_\_\_\_\_\_\_\_\_\_ to see how all 3 classes of levers are used at that location.

[If the visit requires special access i.e. not a public area] Because this is a business and we are being allowed to see this, please remember to obey all safety rules that our guide tells us. Remember, we are representing scouting to these folks.

# Final Thoughts

Akela,

Thank you so much for running this. I hope that you have had as much fun as the youth. Be sure to turn in whatever documentation is required to your advancement chair so that the youth earn both their NOVA award and their adventure rank.