

LESSON PLAN

Operation: Neko Prime

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A lesson in coding, communication, collaboration and problem-solving

OVERVIEW

Engage students' imaginations and 21st Century skills with this space-themed activity. Students will put their communication and collaboration capabilities to the test as they problem-solve through this scenario-based project.

SETTING UP AND GETTING STARTED

The core objective of this activity is to get students to work together to find solutions, with minimal supervision from you. Depending on the age of your students, you may choose to offer additional guidance to what is provided here or otherwise adapt this activity.

To add a bit of fun and set the scene, you may choose to brief the students about the project already in 'story mode' using the scenario and mission brief provided. If you think it will benefit your students, feel free to explain the project and your expectations a bit more directly before you set the scene.

A note about the rules:

The rules provided in these instructions create the limitations that make this project a challenge.

The rules assume the following things:

- There are two separate rooms being used.
- Students are divided into three groups.

If your set-up differs from the above, you will need to adjust the rules to suit your set-up. You may want to print out or post the rules for the students to reference during the project as well.

THE SCENARIO

The students are all part of The Galactic Unification Fleet (GUF for short). GUF has recently opened a space station in a new sector of the Andromeda Galaxy and is now establishing research bases on some interesting planets. Alpha Squad, the squad all of the students are on, is responsible for one of these planets, called Neko Prime.

Alpha Squad is made up of three teams: the surface team, the shuttle team and the space station team. Each team has a critical role to play to enable Alpha Squad to complete its mission of establishing a secure supply line on the planet's surface.



THE MISSION BRIEF

While GUF is dedicated to scientific discovery and the improvement of life for all its members, there are others in the area with less noble intentions. Roving bandits have been making attacks on other planets, stealing the precious cargo being moved about on some of the planets' surfaces and disrupting operations at research bases. To prevent that from happening on Neko Prime, Alpha Squad's supervisors have decided to put in some safety measures:

1. The launch pad for the shuttle will NOT be next to the research base. That way even if bandits spot where the shuttle is landing and taking off from, they won't know the location of the research base.
2. An unmanned vehicle will be used to transport the materials from the shuttle pad to the research base, minimising the risk of personnel being hurt if there is an attack outside the fortification of the research base. An orange robot has been chosen because it blends into the orange surface of the planet. This robot can be programmed to drive between the shuttle pad and the research base without a driver, so it is perfect for this task.
3. The path that the robot will take from the shuttle pad to the research base will not be direct and obvious. Instead, it will move around various natural obstacles, making it harder to spot and track while helping to conceal the location of the research base.

THE RULES AND REQUIREMENTS

The best way to run this activity is to use two separate rooms, which are located close enough to each other for the shuttle team to move between them. One room will represent the space station, the second will be the surface of Neko Prime.

Split the students into three teams: the surface team, the shuttle team and the space station team. Explain that each team has different responsibilities, abilities and requirements. Depending on your students, you may choose to make sure all students know the roles and rules for each team, or just the ones for their own team.

As a first step, get the surface team into the Neko Prime room, provide them with the obstacle course materials, and explain their responsibilities and their rules. You can either do this in person, or provide them with a dossier of information to read on their own.

The other teams will need equivalent set up. If you are explaining what to do in person to each team, start with the surface team so that they can get started designing the obstacle course. You can also opt to set up the course for the students in advance to save some time, if you want.



THE SURFACE TEAM

The surface team will be in the Neko Prime room for the whole activity. This team is responsible for:

- Deciding the location of the research base. (The shuttle launch pad must be at the door/entry of the room.)
- Designing the protective pathway for the robot to take from the shuttle pad to the research base, including the placement of the 'obstacles' that help obscure the path.
- Explaining the pathway and the robot's movement along the pathway, including issues, to the shuttle team.
- Adapting the pathway in accordance with the rules.

The first task the surface team need to do is design and set up the obstacle course pathway. Make sure the team have seen the Edison robot before they go into the room, but the team should not have the robot in the room with them when they set up the obstacle course (because the shuttle team won't have brought it down to Neko Prime's surface yet).

Once the surface team have designed the pathway, they will need to signal the shuttle team they are ready to begin the robot testing sequence. To limit the chances of bandits spying while Alpha Squad are getting set up (not to mention keeping mission costs down), make sure all of the teams know that they should be aiming for as few trial runs as possible. (You can choose to set a trial limit if you want.)

The surface team need to stay in the fortification of the research base as much as possible (it is a good idea to have some 'research tasks' they need to complete during the activity as well to ensure that there's plenty to do while this group is waiting). Therefore, they should limit the amount of time they spend at the launch pad (the doorway) and along the robot's pathway.

This team does need to communicate the pathway to the shuttle team as well as explain what went well or poorly about each trial. The shuttle team cannot leave the launch pad – they need to protect the shuttle and be ready for a quick get-away if required. The shuttle team can peer at the course and research station location from the launch pad and the surface team can come to the shuttle pad.

THE RULES: SURFACE TEAM

- The surface team cannot leave Neko Prime.
- The surface team cannot change the pathway once they have set it until after they run at least one trial with the robot.
- The surface team may always fix any obstacles that are knocked over, but must return them to their original position – they cannot change them 'for free'.
- The surface team have a limited number of 'fixes' they can spend. (Try 5 or 10.) The surface team can spend any number of these after any robot trial. Each fix allows the team to improve the course by adjusting an obstacle, or changing the pathway to better enable the robot to get through. Once the fixes are used up, however, that is it. Use them wisely!
- The surface team can manually transport the robot back to the shuttle team at the end of each trial.



THE SHUTTLE TEAM

The shuttle team will spend their time moving between the Neko Prime room and the space station room.

This team is responsible for:

- Coordinating Alpha Squad's efforts and trying to maximise the effectiveness of the mission (e.g. limiting the number of trips needed between the space station and Neko Prime).
- Protecting the shuttle (which is why they cannot leave the shuttle pad on Neko Prime or the docking port on the space station).
- Explaining the pathway and the robot's movement along the pathway, including issues, and any other communication from the surface team to the space station team.
- Explaining any programming limitations or other communications from the space station team to the surface team.
- Transporting the robot between the space station and the surface.

The shuttle team are in charge of keeping the costs of this mission down, which means making as few trips between Neko Prime and the space station as possible. They are the team most responsible for ensuring good communication and coordination of efforts across the whole of Alpha Squad.

The shuttle team should be in 'low orbit' while the surface team design the pathway. Once the surface team have designed the pathway, they will need to signal the shuttle team they are ready to begin the robot testing sequence. The shuttle team may land (e.g. enter the doorway) but cannot leave the launch pad. The shuttle team can peer at the course and research station location from the launch pad and the surface team can come to the shuttle pad. The shuttle team and the surface team need to work together so that the shuttle team has the information needed to explain the pathway to the space station team.

After the initial visit to the surface, the shuttle team will move back and forth between the two locations, transporting the robot and communicating what each team needs to do next to accomplish the mission. The shuttle team can disembark briefly, but cannot leave the shuttle pad on Neko Prime or docking station on the space station. (You may want to have some 'research tasks' the team need to complete during the activity to ensure that there's plenty to do while this group is waiting at either port, but this group will generally be busy communicating the entire time.)

THE RULES: SHUTTLE TEAM

- The shuttle team can disembark briefly, but cannot leave the shuttle pad on Neko Prime nor the docking station on the space station.
- The shuttle team can manually transport the robot between the other two teams, but cannot program or run the robot.



THE SPACE STATION TEAM

The space station team will be in the space station room for the whole activity. This team is responsible for:

- Programming the robot using the station's built-in computer system (i.e. a laptop or tablet).
- Explaining any programming limitations to the shuttle team.
- Adapting the robot's program in accordance with the rules.

The space station team are in charge of the robot and the computer system that is used to program the robot. This team will need to work with the shuttle team to understand the pathway on Neko Prime, program the robot to drive the pathway, and keep iterating until the mission is a success.

None of the space station team nor the programming equipment can leave the station, so this team must work closely with the shuttle team to understand the pathway and get the robot to drive it successfully. Once the shuttle team docks to the station after their first visit to Neko Prime, the space station team can write a program for the robot and send it off with the shuttle team to try it out. The space station team will then need to tweak the program and download a new version into the robot following each shuttle team visit to complete the mission.

It is a good idea to have some 'research tasks' this team need to complete during the activity while they wait for the shuttle team to come back. You may also want to ensure the space station team uses pair programming (see tips and tricks) to keep the whole space station team engaged.

THE RULES: SPACE STATION TEAM

- The space station team cannot leave the space station.
- The space station team cannot send the computing equipment outside of the space station.
- The space station team cannot change the program once they have set it until after Alpha Squad runs at least one trial with the robot.
- The space station team have an unlimited number of 'fixes' they can apply to their program.
- The space station team can only use the robot to download programs into it.



SOME TIPS AND TRICKS

You know your students best. This activity will be most successful when adapted to your students' abilities and temperaments.

- Depending on your students' comfort with coding, you can scale the coding requirements up or down. You can run this activity with any of the Edison robot programming languages, however the precision control and ease of use provided by EdScratch makes it the recommended choice for this activity. See all the languages at www.meetedison.com/robot-programming-software/
- If your students are new to coding with Edison in EdScratch, writing a program that uses just 'Drive' category blocks to navigate the course will be challenge enough. If, however, your students are more familiar with coding, you may want to encourage them to include additional elements, such as loops, if appropriate. For students who have already studied Edison's sensors, obstacle detection and conditionals might be options to try as well.
- Pair programming is a great way to keep the communication flow going and get all members of the space station team participating more equally. Pair programming is a technique in which two programmers work together at one computer. The 'driver' writes code while the 'navigator' reviews and advises on code as it is created. The two programmers switch roles frequently.
- You can increase or decrease the challenge of this activity many different ways. For example, you can allow teams to swap a member with another team if multiple attempts have already been made with no success. Alternatively, you might want to have some special 'help we are stuck!' dossiers that kids can open after a certain number of attempts which give some suggestions of things to try or other 'bonuses' to assist.
- How the students are allowed to communicate from team to team is up to you. You can leave this completely open, letting students come up with solutions on their own. To make things easier, try offering suggestions (draw a picture, write down pseudocode of the steps, etc). You can set limits and make things more challenging by banning specific ways of communicating (no mobile phones, no photos, etc).
- While the main goals of this project are communication and collaboration, if you want to give everyone a chance to try out the different roles, try switching up the members of each team and running the scenario again.

BONUS EXTENSIONS

You can easily link additional tasks to this activity to make it a cross-curricular project. A few ideas:

- Research more about the Andromeda Galaxy. Create a multi-media presentation about the galaxy to share with others.
- Tie in some creative writing. Students could write 'day-in-the-life' journal entries from the point of view of GUF officers, create stories that take place on Neko Prime once the research base is established, or make a play about the adventure Alpha Squad had establishing the supply line.
- Create an artistic representation of Neko Prime. Students can draw, paint, sculpt or use multi-media to express what they believe the planet looks like.



SUPPLIES

Required:

- Two rooms or separated spaces
- Objects to use to create the obstacles on the pathway
- 1 Edison robot
- 1 computer or laptop
- Access to one of Edison's programming languages. EdScratch www.edscratchapp.com is the recommended choice for this activity.

Recommended:

- 'Research tasks' for groups to work on while they wait on the other teams. This could be additional group challenges, worksheets tied in thematically, one of the bonus extension projects or anything else you like.

Got more than 1 Edison robot? Perfect!

Too many students on each team can make it hard for everyone to have a fair turn, so if you have more than one robot, split groups up into multiple squads. As the goal is communication, be sure to have plenty of opportunity for collaboration on each team, as well as across teams. You will want each squad to have at least six members and each team to have at least two people to keep things challenging but fun.

NOTES: