YEAR 6 | ENERGY

SPACE NOVA

TEACHING TOOLKIT

Australian Children's Television Foundation

CONTENTS

ABOUT THE SERIES

t's the year 2162 and life is a blast for space adventuring siblings, Jet and Adelaide Nova. Along with their parents, Josie and Hugo, these intrepid Aussies spend their days chasing rogue planets, surfing solar flares and avoiding being eaten by every kind of plantimal – all in the name of science! But what the Nova family really want to do is to meet intelligent extra-terrestrial life – something humanity has yet to do. Then everything changes... During a routine mission, the Novas stumble across an abandoned alien craft, powered by a rainbow substance that's so powerful it sends the craft zipping away at speeds humanity never dreamed possible. Although the Novas are unable to capture the craft, they now know there's a super advanced, intelligent species out there – and they're going to follow the clues to find them!

USING THIS RESOURCE

This *Space Nova* Teaching Toolkit is a science education resource for Year 6 students, with clips from the animated children's series used as provocations for a rich science learning sequence on Energy. The sequence addresses Science content descriptions in version 9 of the Australian Curriculum.

Through curated *Space Nova* clips, tangible experiences and thought-provoking discussion starters, this learning sequence will give students opportunities to critically analyse their observations and challenge their preconceptions. This approach lends itself to differentiation, as all students bring varying prior knowledge and experiences to the classroom.

Additional *Space Nova* Teaching Toolkits address key science understandings in other primary year levels. These resources focus on Living Things (Year 3), Forces (Year 4) and Science and Human Lives (Year 5). Find all teaching toolkits on the ACTF website.

To view the clips suggested in this resource, click on the timecodes provided in the PDF. Alternatively, the complete series (including the clips featured in this resource) is available to purchase in the ACTF Shop.

LEARNING SEQUENCE: ENERGY

Key Content Description: Investigate the transfer and transformation of energy in electrical circuits, including the role of circuit components, insulators and conductors (AC9SU03)

SEQUENCE OUTLINE

	Learning Tasks	Additional Australian Curriculum Links
1	Introduction to energy	
2	Movement	AC9S6I02, AC9S6I05
3	Thermal energy	AC9S6I02, AC9S6I05
4	Light	AC9S6I02, AC9S6I05
5	Sound	AC9S6I02, AC9S6I05, AC9S6I06
6	Chemical energy	
7	Electricity	AC9S6I02, AC9S6I05
8	Generating electricity	
9	Reviewing energy	

LEARNING SEQUENCE: ENERGY

LEARNING TASK 1: INTRODUCTION TO ENERGY

Clip: Episode 1, 14:55 - 15:55

In this clip, the Novas discover a new and very powerful form of energy. In a class discussion, ask students to define energy. How do we use energy? How do we make energy? Ask students to point to something in the classroom that uses energy.

Individually or as a class, construct a TWLH chart for energy (see Additional Resources for guidance). Fill in the T (Think I know) and W (Want to learn) sections to document what students already know about energy and what they would like to learn. Keep a note of what students want to learn and make links to these whenever applicable throughout the unit.

Brainstorm as a class some things electricity is used for in students' homes. Write down student responses, then sort these according to their functions. For example, heating (including cooking), viewing, listening, or more. Then ask students to brainstorm additional ways to create each function (e.g., heat) with or without electricity. Add these ideas to the sort.

Explain that there are many different types of energy. Some can be used to generate electricity, or they could be generated by electricity. The world always has the same amount of energy: we can't create or destroy energy; we can only change it. Energy can be sourced from a variety of places. Let's explore some of the different types of energy.

Please note, it is common for students to think of energy as a substance. This comes from phrasing such as 'We are using electrical energy in a toaster'. It is more accurate to say: 'A toaster transforms electrical energy into heat'. Slowly introduce students to this more accurate phrasing through modelling and explicit teaching.

LEARNING TASK 2: MOVEMENT

Clip: Episode 18, 1:10 - 2:45

In this clip, Adelaide uses a drone to throw balls. The drone is giving the balls movement energy so that they fly towards Sol. When the drone gets clogged, all the energy builds up and it explodes.

Explain to the class that things have energy when they are moving. This concept may be familiar to students: they could have been told they have a lot of energy when they are moving frequently, or that they have run out of energy when they feel tired and need to be still after a long day or after exercising.

Clip: Episode 2, 13:00 - 15:00

In this clip, Jet, Adelaide and Sol are racing through the asteroid belt. They are moving very fast, which takes a lot of energy. More energy can make things move faster, like these racing ships.

Have students practice throwing a ball as fast as they can against a wall. Their body is giving it movement energy. The more energy they give it, the faster it moves.

Another way to start objects moving is to drop them or roll them down a ramp. Have students construct a ramp from classroom materials and then place a ball to start it rolling at various points. Fix the ramp in place so that it won't move, with the lower end close to the ground. Build a net or barrier to catch and stop the ball around a metre or two from the end of the ramp. Students will drop the ball from three different heights on the ramp and time how long the ball takes to hit the stop.

Ask students to predict whether the height the ball is dropped from will affect how quickly it gets to the barrier, and why. Then ask them to test their predictions and record the results. Ask student to explain what they observed and whether the results confirmed or challenged their predictions. If time and resources allow, this task could be extended to create a whole ball run. See Additional Resources for tips.

Explain to the class that when things fall from a greater height they get more movement energy, which makes them move faster. This results in the ball reaching the barrier fastest when it is dropped from the highest point on the ramp.

Clip: Episode 22, 15:35 - 16:15

In the above clip, Sol put a lot of energy into making the heavy equipment move. Heavier things require more energy to get them moving.

Give students an opportunity to throw a ping pong ball, a tennis ball, a football and a shot-put ball. Help them to notice that it takes more energy to throw a heavy ball than it does to throw a light ball.

LEARNING TASK 3: THERMAL ENERGY

Clip: Episode 2, 2:05 - 2:55

In this clip, we see Adelaide lasering the rock. This gives the rock heat energy, and it starts to glow red hot. These rocks explode when they get too hot.

Ask students to rub the palms of their hands together quickly. Do they feel it warming up? They are changing movement energy into heat energy.

Clip: Episode 14, 5:45-6:35

In this clip, G9 explains that the Goldilocks Zone is the distance from the sun where the temperature is 'just right' to produce life.

Students might have heard the story of Goldilocks and her search for the porridge that was the perfect temperature. Temperature is how thermal energy is measured. Did students know we also use the term Goldilocks to refer to planets that are just the right temperature for living things? Scientists were inspired by the fairy tale when they established this term.

In a class discussion, ask students how we can generate heat energy. How do you make something warmer? How do you make something cooler? Do some materials heat up faster or more easily than others? What material do we use when we are cooking? Why?

Explain that metal pans are used for cooking because metal conducts heat and thus gains thermal energy more quickly. It also cools down quickly for the same reason. We use plastic and wooden utensils because they don't conduct heat. This means we don't accidentally gain too much thermal energy in our hands and burn ourselves.

Experiment: Water temperature and dye dispersion

You will need:

- Two clear cups per group
- Cold water
- Something to stir with
- Hot water
- Food dye

Prepare many clear cups of water at the same temperature. Divide students into pairs or small groups and give them two cups each. Ask students to predict what will happen when they add food colouring to each cup and then stir just one of the cups. Will they look the same? Ask students to explain why they think this will happen, then have them drop an equal amount of food colouring in each cup and stir just one of them. After 60 seconds, ask students to draw the two cups of water. Students can then compare their prediction with their observation and try to explain what they observed.

Explain that the colour will have spread much further in the stirred water because the particles of water were moved around and the particles of dye were taken with them, spreading them out equally through the water.

Now prepare a clear cup of hot and another cup of cold water for each group. Students are going to add food dye to each cup but not stir either. Make sure students predict what they think will happen, then ask them to add equal quantities of food colour to both cups. Students should draw the cups immediately, then watch how the dye moves. After 60 seconds ask students to draw the cups again and notice how they have changed over that time.

In a class reflection, ask students whether the cups in the experiment changed in the same way. Did they look the same? Ask students to explain what they observed.

Explain that the dye spread out further in hot water because the particles of hot water have more energy, making them move more. As the water particles move, they take the dye with them. This is the opposite of what happened when students rubbed their hands together: heat energy was changed into movement energy.

LEARNING TASK 4: LIGHT

Clip: Episode 8, 7:50 - 9:30

In this clip, we see that Adelaide has designed suits that make her and Jet invisible.

In a class discussion, ask students how our eyes see. Explain that our eyes detect light, but they can't detect all kinds of light. One example is the light that causes damage when you spend too long in the sun and get burnt: ultraviolet (or UV) light. Humans cannot see UV light, but some animals can. We call the light that human eyes can detect 'visible light'.

Clip: Episode 7, 12:40 - 14:00

In this clip, Adelaide and Jet discover plants that glow. These plants can do something called bioluminescence. This is when living things create light. They do it by changing the energy in chemicals into light energy. Jet and Adelaide's suits can make light energy from electrical energy.

In a class discussion, ask students how we make light. What can you think of that creates light energy?

Clip: Episode 14, 9:20 - 10:00

In this clip, we see a place where it is always afternoon because the light energy from the nearest star (sun) is always directed at the same part of the planet. On Earth, the planet rotates into and out of the Sun's light, giving us day and night.

Explain that the Sun has a lot of energy and that its energy reaches Earth. The energy coming from the Sun is light energy. It is collected by plants so that they can grow and produce food (a chemical energy) for animals. The process that plants use to get energy from light is called photosynthesis.

As a demonstration, arrange crayons in order from brightest to darkest and glue them onto a canvas. Leave the canvas in bright sunlight for a few hours. Ask students to draw a before diagram and predict what they think they will see. Then students should draw a new diagram every 30 minutes if possible. Give students a chance to explain their observations. (If this experiment cannot be done at school, see Additional Resources for a time lapse video.)

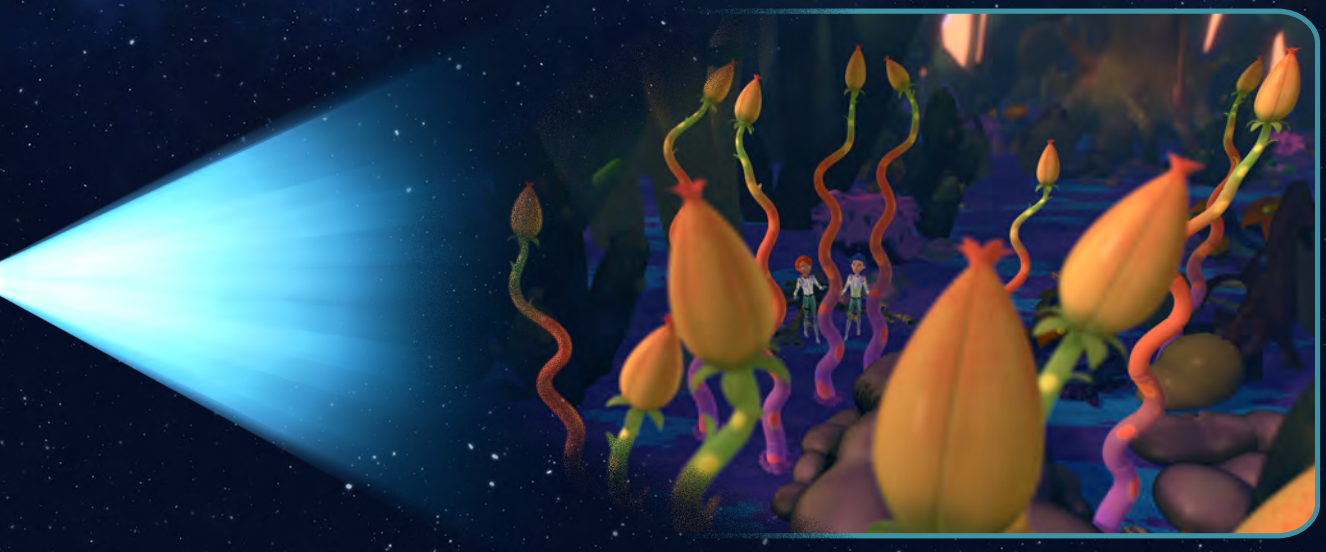
Explain that different colours absorb different amounts of light energy. When they absorb the light energy, this is turned into thermal energy. That means the more light they absorb, the more they heat up. When the wax of the crayons heats up, it melts and turns into a liquid. The darker colours melt first because they absorb the most light energy.

LEARNING TASK 5: SOUND

Clip: Episode 14, 10:00 - 10:35

In this clip, we see plants that generate sound energy. They make different musical notes when Josie covers certain holes. Different notes have different amounts of energy.

Give students a cup and help them to cover the top with plastic cling wrap. Sprinkle a little salt on top of the cling wrap and ask students to predict what will happen to the salt when they make a loud sound near the cup. Take students outside so they won't disturb others, then ask them to sing or yell over the cup. What to students observe? Does changing the pitch or volume change the effect? Ask students



to try to explain what they saw. They can then experiment with other sounds and observe how it affects the salt on the cling wrap.

Explain that sound energy is actually the same as movement energy. It involves moving the air backwards and forwards, which means it is vibrating.

Clip: Episode 23, 10:00 - 10:45

In this clip, G9 has to change the frequency of the sounds that the Yowies are making because the sound is too high pitched for humans to hear. Explain that the human ear can only detect sounds within a certain energy range. Notes with too much or too little energy (too high or too low pitched) cannot be heard by humans.

As a whole class activity, use the following website to play sound frequencies and survey the class to find out how many people can hear each note. Create a graph to present the data.

https://onlinetonegenerator.com/

LEARNING TASK 6: CHEMICAL ENERGY

Clip: Episode 9, 7:10 - 8:00

In this clip, Adelaide finds a powerful battery which she uses to recharge G9. In a class discussion, ask students to list some items we can power with batteries. What different types of batteries do they know of?

Explain that batteries store energy in chemicals that can be converted to electrical energy. The electrical energy can then be changed into many other kinds of energy, such as the sound of G9's voice or the lights of his eyes. Food also stores energy in chemicals. When we eat food, our bodies can take that chemical energy and use it to keep warm or move around.

Light a match or a candle and ask the class what kinds of energy are involved in burning. Explain that there is also chemical energy inside wood and wax, which is changed into heat and light energy when it is burnt.

LEARNING TASK 7: ELECTRICITY

Clip: Episode 4, 14:00 - 14:50

In this clip, the Novas and Yangs run from a storm that is producing lightning. (Note: there are no gravity storms in reality – this is just some fun imagination.) Explain to the class that in nature we see electrical energy in lightning. The clouds build up electrical energy and then when it moves through the air it changes into light and sound energy.

Clip: Episode 1, 11:50 - 12:15

In this clip, Adelaide and Jet become very cold because their suits are running out of power. Explain to students that the Nova's space suits have been using electricity from batteries to generate thermal energy which keeps them warm. When they run out of battery, there isn't any energy left to turn into thermal energy. We often transform electrical energy into other kinds of energy, and we can also generate electricity by converting other types of energy into electrical energy. We can use electricity to turn on a light, and we can also use light to generate electricity. It just involves changing or transforming the energy.

Clip: Episode 9, 3:55 - 4:45

In this clip, Adelaide connects G9 to the cube using a wire, and the electricity that powers G9 is transferred to the cube. We use wires to carry electricity.

Give students a battery, two wires and a light bulb and ask them to figure out how to use these materials to turn on the light bulb. When they are successful, have students draw what they have made and explain why it works.

Ask students to remove one of the wire connections from the battery and have them draw the circuit again. Give students time to explain what they observe when only one wire is touching the battery. Explanations can be discussed and then written down.

Explain that electrical energy moves from one end of the battery through the light bulb and into the other end. We say it is 'flowing'. It needs to move past the light bulb in order for the electrical energy to be converted into light energy, and it only moves past when both wires are connected. This makes a full loop that is called a circuit.

As a whole class activity, have students role play the electrons in a circuit. (See Additional Resources for detailed instructions.) Nominate one student to play the 'battery' and one to play the 'light bulb'. These students stand a few metres apart, while another 10+ students (electrons) complete the circuit. Give the student playing the battery a supply of jellybeans to be handed to others throughout the activity.

Nominate a direction for the current to flow in, and then the electrons move around the circuit. They collect two jellybeans (energy) from the battery each time they pass it. As the electrons flow towards the light bulb, they are carrying energy. They hand the jellybeans to the light bulb each time they reach it. The light bulb keeps the jellybeans

(consuming the energy) and performs a movement to indicate the action of a light turning on, such as jumping or lifting their arms. The electrons continue moving around the circuit, collecting and transferring energy. The cycle continues until there is no energy left in the battery (i.e., the jellybeans have run out).

(This activity is a useful and fun way to model concepts, but it is worth noting its limitations. It wrongfully represents energy as a physical substance and insinuates that the energy disappears, when in fact energy is conserved – only changed into light.)

Explain that the motion of a bicycle chain can also be used as a metaphor for current in a circuit. The moving chain transfers energy from the pedal to the back wheel. Encourage students to identify what is useful about this metaphor for electric circuits. Ask students which parts of the circuit this model represents. (The pedal is the battery, the gear chain is the wires, the wheel is the light bulb / what is being powered) What is not accurate or clearly explained by this scientific model?

Return to the real circuit that students made and swap out one of the wires for a range of other materials to test whether the circuit is still connected. Students could record their results in a table, documenting which materials they tried, what they predicted would happen and what they observed when they tested it. (Students will find success with pencils, play dough, foil, paper clips and water but should be encouraged to try any object or material they find.)

Return to the original circuit that connects wires to a battery and lights a light bulb, then swap out the battery for ones with different voltages. Students can predict what effect they think this will have before observing and attempting to explain their observations.

LEARNING TASK 8: GENERATING ELECTRICITY

Clip: Episode 9, 3:55 - 6:05

In this clip, G9 doesn't have enough power to operate the cube, and it has also used up all of the ship's power. The cube needs a lot of energy to operate, even more than the Nova's ship Eureka can provide. G9 gives all his energy to the cube and then needs to be recharged.

In a class discussion, ask students where we get electricity from. How do we make more when we need it? How do we replenish the electrical energy in an appliance?

Ask students to research how electricity is generated in Australia and what source of energy we rely on the most. They may choose to compare and contrast their state with other Australian states (see Additional Resources). They may also like to research ways that electricity can be produced that Australia is not currently using.

LEARNING TASK 9: REVIEWING ENERGY

As a whole class activity, have students work together to establish: 'What's my rule?' Begin by introducing the class to this strategy with two familiar groupings, such as 'primary colours' and 'secondary colours' or something else that will be familiar to your students.

You will have two lists of words, but you will not reveal what is common to each word in the lists. Add one word to each group then give students time to attempt to figure out the pattern or 'rule' for each group. Add another word to each group after some thinking time. After a few examples, students who think they understand can suggest other words to go in each group (but not reveal the rule). Confirm whether these suggestions fit in the group, but not why. This is about spotting the difference between groups and the similarities within groups.

For example, as an introduction to this activity show the following groups of words by adding one word to each group and then providing time for students to notice the rule.

Once students understand this activity, you can repeat the process – this time with the groups being 'sources of energy' versus 'types of energy'.

Sources of energy	Types of energy
Coal	Movement
Wood	Heat
Chocolate	Chemical
Wind	Sound
Solar	Light
Battery	Electrical

Ask students to draw a sequence of diagrams (like a storyboard) showing how energy changes forms in given scenarios. Suggestions are provided below, but students may like to choose their own scenario as energy is a part of every moment of their lived experiences.

- A glow stick being snapped (chemical energy is converted to light energy)

- Burning a candle (the chemical energy in the wax is changed into light and heat energy)
- Boiling water (heat energy changes into movement energy as the water particles move around quickly; eventually fast enough to change states into a gas)
- Pushing a wheelbarrow (the person gets their energy from food and converts that chemical energy into movement energy as they push the wheelbarrow)
- Lighting a match (friction generates heat which prompts the chemical energy in the match material to change into light and heat)
- A plant growing (light energy from the sun is converted into chemical energy by photosynthesis)
- Playing a drum (the person gets their energy from food and converts that chemical energy into movement energy as they hit the drums. This gets converted into sound energy – which is actually still movement energy, as it is moving / vibrating air)
- A person playing football (the person gets their energy from food and converts that chemical energy into movement energy as they kick the ball. The kick generates some sound energy and also movement energy. Extension: as the ball goes higher up it slows downs as the movement is changed into gravitational potential energy. Once it stops moving at its highest point, the gravitational potential energy is changed back into movement energy until hitting the ground stops it moving. At that point, the movement energy is turned into the sound of impact and a little heat from friction as it landed.)

Go back to the TWKH chart you started in Learning Task 1 and complete the K (now I Know) and H (How I know) sections to document students' changed understandings of energy.

EPISODE SYNOPSES

EPISODE 1
STAR DUST

The Novas, a family of maverick space explorers, make an interstellar discovery that could change the course of history. Armed with knowledge that they have come across an alien space craft powered by a rainbow substance they have never seen before, they set out to find where the space craft and its ethereal substance – Star Dust – has come from.

EPISODE 2
OVER BEING A NOVA

Bored with searching rocks for evidence of their recent findings, Adelaide accepts Sol's challenge to a 'space-off' in the asteroid belt. But when Sol gets into trouble, Adelaide and Jet perform a heroic rescue and rediscover what being a Nova is all about.

EPISODE 3
BLACK HAMSTER

When Jet creates a nutrient-dense super pickle, it attracts a space hamster that Jet calls 'Pickles'. Pickles' survival instinct allows it to turn into a small black hole, throwing Luna Port into chaos. Will Jet be able to keep his new friend – or will he have to free him for the good of Luna Port?

EPISODE 4
ESCAPE FROM TR-227

While travelling to complete a supply drop off at a research facility, the Novas crash land on the planet. They are confronted by a deadly gravity storm that threatens not only their lives – and the lives of the researchers they find there – but also their life-saving work!

EPISODE 5

SEAWEED SAMBA

When the Nova's mission to what they believe is a Star Dust Planet goes horribly awry, they find themselves held underwater by a sentient seaweed plant. Meanwhile Aubrina, determined to learn what the Novas are up to, sends son Sol to find out – undercover.

EPISODE 6

STEEL COMET

When a large comet appears on a collision course with Luna Port, the Novas take a huge risk to divert it. They realise it's no comet at all, but a frozen-over spaceship presumed lost for over 100 years!

EPISODE 7

FRIENDS IN DARK PLACES

When the Novas investigate a system based on data they obtained from the 'Eagle' (the frozen spaceship from 'Steel Comet'), they find a planet that appears uninhabited – until they fall through quicksand to the caverns beneath! Meanwhile, Aubrina continues to keep a close eye on the Novas – often popping up on comms at the most inconvenient times!

EPISODE 8

INVISIBLE SIBLINGS

When G9 malfunctions at the Luna Port centennial celebrations, Aubrina takes him into custody and seeks to reprogram G9. Jet and Adelaide go on a mission to save their favourite robot, stumbling across a library of hidden alien artefacts inside a locked room owned by Aubrina – including a mysterious alien tech cube!

EPISODE 9

STEAM SHIP

When the Novas are forced to land on a junk planet for repairs, they come face to face with Old Phil and his dog Calisto. Phil claims to enjoy solitude and quiet, but he may know more than he is letting on – especially after he takes the Novas' cube!

EPISODE 10

GRAFTER

Sol's attempt to win at the science fair by sabotaging all of the other projects goes drastically wrong when the Nova's project – a giant half plant half animal – kidnaps him. Even stranger, on analysis it seems Sol was responsible for the creature's sudden transformation – and this transformation was caused by alien DNA!

EPISODE 11

GHOST STATION

It's Josie's favourite holiday, Halloween, and to celebrate she surprises her sceptical family by booking a 'ghost tour' of a spooky space station. When they receive a distress call from the station and land there, even the most sceptical Novas start to believe!

EPISODE 12

THE JUMP

After the Novas help expose Aubrina for her wrongdoing and have the Star Dust Crystal returned, they're ready to make their first Star Dust 'jump' and explore parts of space that humanity has never seen before. Aubrina, meanwhile, isn't going down without a fight, and enlists a shadowy figure to stop the Novas at all costs!

EPISODE 13

FINALLY AN ALIEN

With the Novas now able to jump millions of lightyears in minutes, their quest to find Star Dust Aliens kicks into high gear. But after Sol demonstrates unexplained super strength in a Grav Ball game, Jet and Adelaide realise that their search for aliens might take them closer to home.

EPISODE 14

THE GOLDILOCKS ZONE

Having learned where the Tychon was being taken on the day Sol was discovered on as a baby, the Novas take Sol on a mission to a planet inhabited entirely by mega-flora – then Sol goes missing.

EPISODE 15

ROGUE PLANET

When the Novas research drones send them an image of what looks like a Star Dust Ship, the Novas and Sol go to investigate. In the process, however, they become trapped on a tiny rogue planet full of adorable insects – and the planet is heading directly towards the system's sun! Meanwhile, Aubrina has plans of her own – to get her own Star Dust Crystal and gain the power of 'jumping' for herself.

EPISODE 16

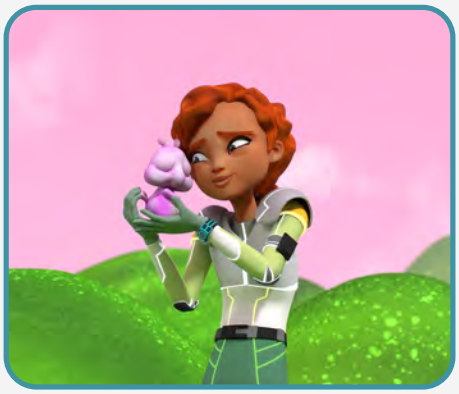
THE PUZZLE

The Novas investigate a planet millions of lightyears from known space that appears to have pyramid-like temples that may have been created by intelligent beings. Soon, however, they find the pyramids ARE the intelligent beings – and these aliens aren't the type looking for a friendly chat!

EPISODE 17

A BLACK HOLE ATE MY HOMEWORK

When Jet and Adelaide realize they have too much work and reading to get through in one night, they devise a plan to slow time by taking Adelaide's flyer to the very edge of a black hole in order to slow down time.



EPISODE 18

WHITE HAMSTER

After detecting human technology in a far-flung region of the universe previously inaccessible to humans, the Novas excitedly head out to examine it – only to find that it is the escape pod that Jet used to evacuate his space hamster, Pickles. When they finally catch up with Pickles, however, he – and his family - need their help more than ever.

EPISODE 19

PAMELA BARNACLE

With Luna Port's security system malfunctioning (and no longer responding to orders), the Novas journey to visit the ex-president of Luna Port, Pamela Barnacle, the system's creator. When they arrive, however, they find Pamela is even more under the same system's control – and soon, so are the Novas!

EPISODE 20

SHORE LEAVE

After a series of dead ends in their search for Star Dust, the Novas spot a planet that looks like paradise itself and decide to visit it for some much-needed R&R. Soon, however, their dream getaway turns out to be just that – and one that they're unable to wake up from!

EPISODE 21

ALIENOSAURS

The Novas head to an Earth-like planet, hoping to find the Star Dust aliens. Instead, they find highly evolved and aggressive alien dinosaurs, and they find out what it's like when humans are at the bottom of the food chain!

EPISODE 22

COLLISION COURSE

Jet, Adelaide, Sol (and a visiting Marcie Yang) are thrown together to represent Luna Port in a Grav Ball game for visiting delegates – they just aren't the best team. Then, in the middle of the game, Luna Port faces a catastrophic shut-down and blackout. Now this not-so-awesome foursome really must learn to work together – and the stakes couldn't be higher. Meanwhile, Aubrina goes in search of plans for the Star Dust cube to create her own!

EPISODE 23

YOWIE!

While on the lookout for intelligent life on the other side of the universe, one of the Novas' drones delivers footage that will make them question everything they know about Aliens – blurry video of what appears to be a real live bigfoot!

EPISODE 24

SWEET DREAMS

After Sol starts to have vivid dreams about his home world, the Novas enlist the help of the 'energy creature' from Shore Leave to help uncover the details of this planet. Things take a turn, however, when Sol's brain refuses to release him from the dream state – and not even the powerful energy creature can stop him!

EPISODE 25

DARK ICE

Following Sol's vision, the Novas journey to a what they believe is Sol's home planet – only to discover that it is completely frozen over. On closer inspection, they realise the planet may hold the answers to all of their questions - and they must journey below the ice...

EPISODE 26

STAR DUST ALIENS

The Novas finally locate another Star Dust alien rock ship and set off to finally make first contact. When they arrive, however, the ship's engines explode. They uncover Sol as a stowaway and find out that Andy, who accompanied them, is a robot in disguise – all part of Aubrina's plan to stop the Novas in their tracks and make first contact with the aliens herself. Will the Novas lose their chance to make real contact with the Star Dust aliens forever?

THE MAKING OF *SPACE NOVA* BY SLR PRODUCTIONS

The science fiction genre presents a great opportunity to wonder 'What if?' in an imagined futuristic world with human dynamics we can all relate to. At the core, the Novas are like most families: full of love and support, with the occasional sibling rivalry, shenanigans and plenty of dad jokes. But what if this is an intrepid family of intergalactic explorers in search of alien life in the year 2162? Now we're talking! We jumped at the opportunity of creating a unique, exciting show.

Animation lends itself to boundless imagination and creativity since every frame has to be created from scratch – literally. The stories were crafted around classic science fiction tropes in a world full of exciting possibilities. *Space Nova* allowed us to push the limits of imagination in every aspect of life in space: family and home, friendship and play, school and work. And when work involves discovering Star Dust, a powerful rainbow substance powering a rock ship, launching an epic alien quest across the universe, more than just a job, this becomes the adventure of a lifetime.

The *Space Nova* world was created with a base in science and a healthy dose of imagination. Extensive research was carried out on space exploration and the latest technological advancements. Their home, the Luna Port international space station, is based on structures that are capable of generating artificial gravity with and added touch of wow factor which makes it inviting and special. The characters wear high-tech, insulating suits with glowing LED lights and self-propulsion based on future trends of comfort and functionality. We took the possibilities of 3D printing into creating nutritious, delicious food. The Grav Ball game was born out of the combination of zero gravity and team sports such as basketball.

Space Nova presents a hopeful, aspirational take on the future which informed the look of the show in every aspect. Their world is bright, colourful and friendly. Organic shapes like curves and swirls dominate the design as opposed to straight lines and harsh angles. Surfaces are smooth and warm instead of sleek and cold. And since the Novas are a family of Australian astronauts, an Aussie flavour is interspersed in their palette with greens and golds. Their spaceships also have echoes of Australian fauna (the cicada and sugar glider) which was also carried through to the sound design. G9, the lovable family bot, resembles an adorable marsupial.

Space phenomena in itself is spectacular proving that nature is indeed the best inspiration. Planets, celestial butterflies, comets, black holes, supernovas, nebulas and galaxies, all presented incredible story and visual opportunities where we had to look no further than the latest findings on space exploration. Serendipity came knocking when NASA released the first ever image of a black hole just as we were in the middle of production. Needless to say, we gladly took visual cues in our design from this historic moment.

From the outset, the Novas discover the first ever proof that humanity is not alone in the universe setting in motion a thrilling saga across the cosmos. Along the way, we visit planets with different alien life forms where we let our imagination run wild along with interesting scientific ideas. To name a few: hamster-like aliens capable of creating black holes; a cross between a plant and an animal resulting in plantimals; sentient, bioluminescent seaweed with their own unique visual language; bismuth formations come to life, while dinosaurs evolve on another planet! Once again, nature provided the source material and we just had to add inventiveness and have fun with it.

Space Nova was produced with the latest CGI technology, a medium which perfectly suited the epic scale of the show as well as the subtle emotional needs of character animation. A very successful blend of artistic and technical skills; every design and storyboard was initially crafted by hand and then fully realized through computer animation to reach our screens (something that was considered science fiction not that long ago!). The result is a rich, vibrant world that draws us in, we can feel it and almost touch it.

We had the ride of our lives making *Space Nova* and hope the show will be enjoyed by all for years to come. The universe keeps surprising us in this new frontier for exploration and we can't wait to find out what's in store in the future. Reach for the stars!

CHARACTER BIOGRAPHIES

ADELAIDE NOVA

13-year-old Adelaide Nova is a keen adventurer and scientist with a special passion for technology, robotics, and flying spacecraft. In fact, as excited as she is at the prospect of encountering intelligent extra-terrestrial life, an equal priority on her list is finally earning her large ship pilot's license!

When she's not taking lessons, Adelaide can usually be found in her lab or the cargo bay tinkering with her latest invention. Whether it's creating camouflaging meta-fabric to turn into 'invisibility suits', creating nano-technology that can repair an entire eco-system, or simply upgrading her VR gear, Adelaide always has a technological hack up her sleeve.

Due to her affinity with tech, it's also no wonder Adelaide is especially close to the family robot, G9, and always giving him special upgrades (with varying levels of success!).

JET NOVA

The youngest of the intrepid Nova family, 12-year-old Jet has a passion for space exploration, Grav Ball, astrobiology and – most importantly – aliens!

Whether at home or in his lab on the family's starship, Jet is surrounded by all manner of plants, both from Earth and beyond. He especially likes doing experiments with his specimens. Whether it's creating a super sticky plant-based glue, or a flower designed to explode on impact, the rest of the Nova family often find themselves test subjects for Jet's latest biological masterpiece!

Jet has even created a specially designed chart, which he uses to track the various 'levels' of lifeforms he and the Nova family encounter on their missions. He just hopes that, now the Novas are on the trail of the first confirmed alien spaceship sighting, he can finally fill the chart all the way to the top!

JOSIE NOVA

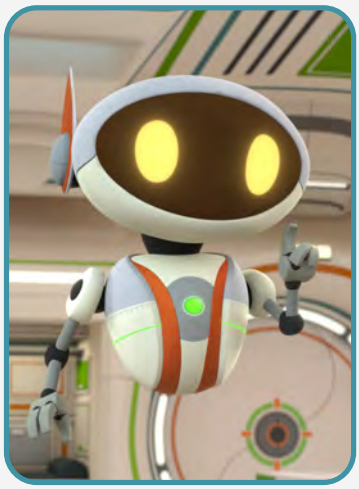
Josie Nova is both an intrepid astrobiologist and an ecologist. Mother of Adelaide and Jet Nova, she has a lot to teach her kids about seeking out adventure! Tempering her passion for adventure is her love of nature. Josie is an expert on all things in the natural world. In other words, she doesn't mind getting her hands dirty when it comes to the search for extra-terrestrial life!

A respected scientist on Luna Port – especially when it comes to space exploration – Josie is also well known for her 'can do' attitude. And this attitude certainly comes in handy when dealing with bureaucrats like the Luna Port President, Aubrina Eridani, who seems determined to restrict the Novas' 'frivolous' scientific missions. Between Josie and Hugo, Josie is the risk taker and has a 'devil-may-care' attitude when raising her children. As long as they are good and have fun – she doesn't mind too much what they do.

HUGO NOVA

Like the rest of his family, Dr. Hugo Nova has a passion for unlocking the secrets of the universe. One of the best astro-geologists (and pilots) on Luna Port, Hugo spends most of his time collecting, examining and thinking about rocks – after all, they're core building blocks of the universe. Just don't try to tell him geology is boring: in his own words, 'rocks rock!'

Still, Hugo is more than just a scientist. Hugo is also a great chef (he even uses old-fashioned 20th century implements), a student of history and a great dad. Compared with wife, Josie, Hugo is also the more over-protective parent. If anyone is going to be a little conflicted when it comes to taking Jet and Josie on their away missions, it's Hugo. Still, space will always be an unpredictable place, and the kids wouldn't have it any other way!



G9

The family's 'pet' robot, G9 is the 5th member of the family. With databanks full of useful info, G9 is a real asset to the Novas' missions. He's also a favourite of Adelaide, who is constantly working on new 'upgrades' for the robot, improving his intelligence, pumping up his strength, or even teaching him to play the ukulele at parties!

If there's one thing Adelaide can't 'fix' about G9, it's that he can be a terrible worry wart, and will often be the first to hide when danger rears its head – and thanks to the Novas' missions, danger is never far. After all, he may be nuts and bolts, but G9 still fears the 'big reset'. Still, when his 'humans' are really threatened, G9 can find extreme courage deep within his circuits. He's quite attached to the Novas – they're not bad for a bunch of irrational humans!

SOL ERADANI

Found by Aubrina as a baby on an abandoned exploration ship, Sol has grown up the spoiled child of the most powerful person on Luna Port – it's really gone to his head! Aubrina is such a workaholic, he still often feels that he comes second behind her job and is always keen to earn her attention and love. From everyone else on the station he not only expects but demands respect – and most give it to him.

In fact, the only kids who don't seem to respect this 'power' are Jet and Adelaide Nova, who think he's a bully and a joke. Jet and Adelaide never have to fight for their parents' attention, and this annoys Sol. He takes every opportunity to take the Nova kids down a peg and show them who's the true 'top dog' on the port. As such, Sol easily latches onto the Nova family's eccentric reputation to ridicule them.

AUBRINA ERADANI

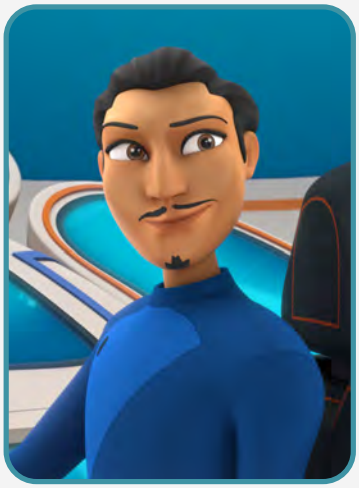
Aubrina Eradani was once a young explorer out to make a name for herself. Then, just over 13 years ago, she discovered a baby on an abandoned space cruiser – and an unidentified craft shooting out streams of a strange rainbow substance and disappearing at an incredible speed! Aubrina raised Sol as her own and waited for Star Dust to appear again.

She became Luna Port's president after clawing her way to the top. It's from this position that Aubrina wields the control and power she thinks she deserves. Still, the Novas refuse to toe the line. When she suspects this same family may have sighted HER discovery, she's determined to take the spoils for herself – at any cost! If she's going to take what's hers and discredit the Novas, she's going to have to do it quietly and carefully!

JANALI BANKS

Like the Novas, Janali works for the Australian Space Association and is Head of the E.M.U. telescope which sits above Luna Port. Janali is an Indigenous Australian astronomer from Gamilaraay. She was also a child prodigy who could have done anything, but, like the Novas, believes there are still great mysteries left to be uncovered out there.

As such, she is a great champion for the Novas and their more 'maverick' methods. So, when the Novas tell her about their discovery of Star Dust she is keen to help – and determined to keep a watchful eye out for anything that might help them on their quest. A former babysitter to Jet and Adelaide, Janali also has an important 'big sister' relationship to the siblings, and they often go to her for advice and guidance.



ANDY LING

A beloved figure on Luna Port, Andy is both the head of the Australian Space Association and one of four international members on the Luna Port Council. Most importantly, he is a big supporter of the Novas and their covert quest to find Star Dust and Star Dust aliens.

This means he is walking the fine line between allowing the Novas to bend the rules and actively bending the truth to the Council and Aubrina. Even though Aubrina and Andy are technically equals on the council, if he is found to have broken the rules, it might endanger his position – and therefore ASA's ability to continue doing any missions in deep space.

GLOSSARY

Circuit	A complete course of conductors through which electric current can travel.
Energy	The ability to do work. Energy comes in many different forms and changes forms through forces.
Heat	The quantity of energy that has been transferred during the heating process.
Particle	A small portion of matter, often referring to a single molecule.
Photosynthesis	The process by which green plants and plant-like algae use sunlight, together with carbon dioxide and water, to make their own food.
Thermal energy	The energy in a body due to its temperature. This takes into account the type of material and mass of the body. (For example: 10 ml of 40°c water has half the thermal energy of 20 ml of 40°c water.)

ADDITIONAL RESOURCES

LEARNING TASK 1: INTRODUCTION TO ENERGY

See the following link for guidance on creating TWKH charts:

https://www.primaryconnections.org.au/resources-and-pedagogies/strategies/using-twlh-chart-document-inquiry

LEARNING TASK 2: MOVEMENT

See the following link for tips of creating a marble run:

https://www.youtube.com/watch?v=zTTuB_afFyQ

LEARNING TASK 4: LIGHT

Watch a time lapse of the melting crayons experiment here:

https://www.youtube.com/watch?v=wDp7mXoVxEQ

LEARNING TASK 7: ELECTRICITY

The link provides instructions for students to 'act out' a circuit:

https://www.education.vic.gov.au/school/teachers/teachingresources/discipline/science/continuum/Pages/jellybean.aspx

LEARNING TASK 8: GENERATING ELECTRICITY

This website can help to start your research on Australia's energy sources:

https://www.originenergy.com.au/blog/electricity-generation-in-australia/

This site has information on other energy sources:

https://www.eia.gov/kids/energy-sources/

ACKNOWLEDGEMENTS

SPACE NOVA EDUCATION RESOURCE DEVELOPED AND DISTRIBUTED BY AUSTRALIAN CHILDREN'S TELEVISION FOUNDATION.

Space Nova is an SLR Productions programme for the Australian Broadcasting Corporation, presented by Screen Australia and Nine Network Australia in association with Giggle Garage, Screen NSW, Australian Children's Television Foundation, ZDF Enterprises GmbH and Super RTL.

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