

WAKARI SCHOOL BOARD OF TRUSTEES

Science Education Curriculum Review

Term 4, 2016



2016 Review Focus

The New Zealand National Curriculum outlines the following around Science

What is science about?



Mā te whakaaro nui e hanga te whare;

mā te mātauranga e whakaū.

Science is a way of investigating, understanding, and explaining our natural, physical world and the wider universe. It involves generating and testing ideas, gathering evidence – including by making observations, carrying out investigations and modelling, and communicating and debating with others – in order to develop scientific knowledge, understanding, and explanations. Scientific progress comes from logical, systematic work and from creative insight, built on a foundation of respect for evidence. Different cultures and periods of history have contributed to the development of science.

Why study science?

Science is able to inform problem solving and decision making in many areas of life. Many of the major challenges and opportunities that confront our world need to be approached from a scientific perspective, taking into account social and ethical considerations.

By studying science, students:

- develop an understanding of the world, built on current scientific theories
- learn that science involves particular processes and ways of developing and organising knowledge and that these continue to evolve
- use their current scientific knowledge and skills for problem solving and developing further knowledge
- use scientific knowledge and skills to make informed decisions about the communication, application, and implications of science as these relate to their own lives and cultures and to the sustainability of the environment.

Learning area structure

The fundamental aims of science education are expressed as a series of achievement aims, grouped by strand. (For these, see [Science curriculum achievement objectives](#)) The achievement objectives at each level are derived from the aims and are similarly grouped by strand.

The **nature of science** strand is the overarching, unifying strand. Through it, students learn what science is and how scientists work. They develop the skills, attitudes, and values to build a foundation for understanding the world. They come to appreciate that while scientific knowledge is durable, it is also constantly re-evaluated in the light of new evidence. They learn how scientists carry out investigations, and they come to see science as a socially valuable

knowledge system. They learn how science ideas are communicated and to make links between scientific knowledge and everyday decisions and actions. These outcomes are pursued through the following major contexts in which scientific knowledge has developed and continues to develop.

The **living world strand** is about living things and how they interact with each other and the environment. Students develop an understanding of the diversity of life and life processes, of where and how life has evolved, of evolution as the link between life processes and ecology, and of the impact of humans on all forms of life. As a result, they are able to make more informed decisions about significant biological issues. The emphasis is on the biology of New Zealand, including the sustainability of New Zealand's unique fauna and flora and distinctive ecosystems.

The **planet earth and beyond** strand is about the interconnecting systems and processes of the Earth, the other parts of the solar system, and the universe beyond. Students learn that Earth's subsystems of geosphere (land), hydrosphere (water), atmosphere (air), and biosphere (life) are interdependent and that all are important. They come to appreciate that humans can affect this interdependence in both positive and negative ways.

Students also learn that Earth provides all the resources required to sustain life except energy from the Sun, and that, as humans, we act as guardians of these finite resources. This means knowing and understanding the numerous interactions of Earth's four systems with the solar system. Students can then confront the issues facing our planet and make informed decisions about the protection and wise use of Earth's resources.

The **physical world** strand provides explanations for a wide range of physical phenomena, including light, sound, heat, electricity, magnetism, waves, forces, and motion, united by the concept of energy, which is transformed from one form to another without loss. By studying physics, students gain an understanding of interactions between parts of the physical world and of the ways in which they can be represented. Knowing about physics enables people to understand a wide range of contemporary issues and challenges and potential technological solutions.

The **material world** strand involves the study of matter and the changes it undergoes. In their study of chemistry, students develop understandings of the composition and properties of matter, the changes it undergoes, and the energy involved. They use their understanding of the fundamental properties of chemistry to make sense of the world around them. They learn to interpret their observations by considering the properties and behaviour of atoms, molecules, and ions. They learn to communicate their understandings, using the symbols and conventions of chemistry. Using their knowledge of chemistry, they are better able to understand science-related challenges, such as environmental sustainability and the development of new materials, pharmaceuticals, and sources of energy.

The core strand, Nature of Science, is required learning for all students up to year 10. The other strands provide contexts for learning. Over the course of years 1–10, science programmes should include learning in all four context strands.

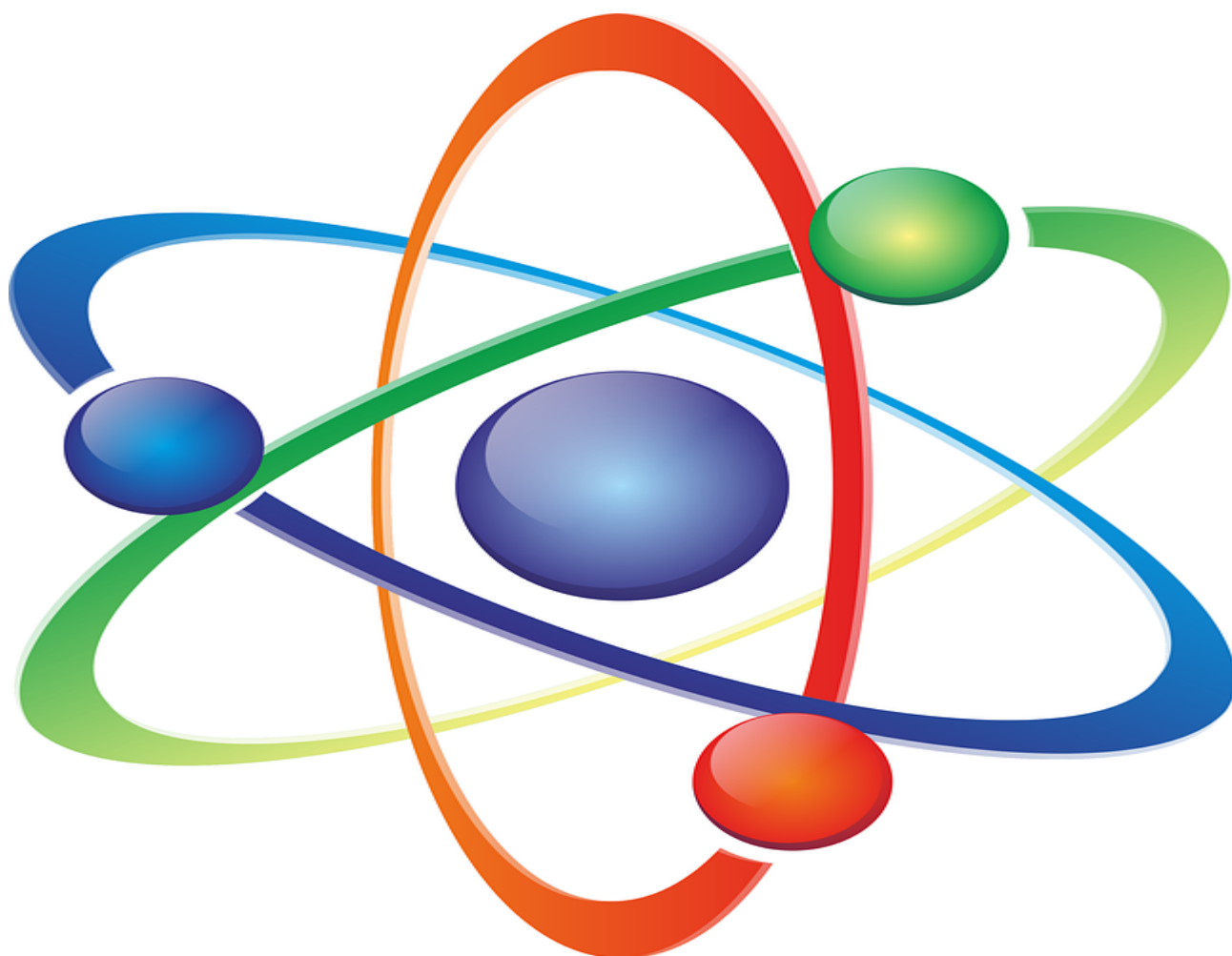
Students in years 11–13 are able to specialise in one or more science disciplines, depending on the choices offered in their schools. The achievement objectives in the context strands provide for strand-based specialisations, but a wider range of programmes is possible; for example, schools may offer programmes in biochemistry, education for sustainability, agriculture, horticulture, human biology, or electronics.

The Wakari School Curriculum Plan states

In science education, the focus of learning is on investigating and explaining our natural, physical world and the wider universe, through scientific processes of generating and testing ideas, gathering and examining evidence from observations and investigations, and communicating findings, ideas and understandings

Our Goals are

1. Recognise that all groups of living things have life processes, common and unique requirements, and adapt to and interact with their environment in particular ways (**Living World**)
2. Describe and group materials based on properties and recognise permanent and temporary changes in materials in everyday situations (**Material World**)
3. Have explanations for a variety of physical phenomena such as light, sound, heat, magnetism, motion, energy (**Physical World**)
4. Have understandings about the natural processes on Earth (erosion, weather systems) and the solar system (day and night), and the interdependence of land, air, water, and life (**Planet Earth & Beyond**)



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Community Consultation

The following questionnaire was given to 40 families of the Wakari community. These families have not supplied email addresses to the school so the questionnaire was physically sent home. There were also reminders in the school newsletter but unfortunately we had no replies.

“How well do we achieve the goals for Science Education at Wakari School?”

FOR GOALS 1,2, 3, and 4...Rate how well do we achieve the goals for Science at Wakari School	Poor	Fair	Good	Very Good	Great
Goal 1. Recognise that all groups of living things have life processes, common and unique requirements, and adapt to and interact with their environment in particular ways (<i>Living World</i>)					
Goal 2. Describe and group materials based on properties and recognise permanent and temporary changes in materials in everyday situations (<i>Material World</i>)					
Goal 3. Have explanations for a variety of physical phenomena such as light, sound, heat, magnetism, motion, energy (<i>Physical World</i>)					
Goal 4. Have understandings about the natural processes on Earth (erosion, weather systems) and the solar system (day and night), and the interdependence of land, air, water, and life (<i>Planet Earth & Beyond</i>)					
Q 4. Do you think that the above objectives are still appropriate?					
Q 5. Do you wish to suggest any changes/additions/deletions?					
Q 6. Do you have any other comments you wish to make about the Science programme?					

Summary of Community Responses.

Of the **40** questionnaires sent out to the community, there were **0** responses.

In 2015 Andrea Benwell was awarded a Royal Society of Science Scholarship. Part of this scholarship involved her interviewing a selection of children and their parents over a period of approximately ten days. While Andrea's consultation was broad and her focus questions were different to the questionnaire that we sent out, we believe that some of her findings are relevant to this Science Curriculum Review.

If you walked into your child's/ children's classrooms and saw them doing a science lesson, what would you hope to see?

The most common themes among all parent responses included;

- Students are engaged in what they're doing.
- Participating in hands on experiments.
- An air of curiosity, wonder and excitement is created.
- Students learn basic science methodology: scientific method, the skills of 'question or observation', 'hypothesis', 'experiments' and 'conclusion'
- Students are happy and have smiles on their faces.
- Activities relate to everyday life/ the students experiences.
- Students are encouraged to ask questions.
- Students are having fun.
- Students learn why something happened, they gain information.

Please list community, local, national or global science issues, you would like your child/ children to explore.

The specific local issues our Community you would like to see explored include:

- Sand disappearing on St Clair beach
- Orokonui Sanctuary
- 'Science included in our community'.

The most common general local and national issues our Community would like to see explored include:

- Exercise/ health/ nutrition
- Biology – plants
- ❖ The most popular theme was based around sustainable living.

The specific local issues our Community you would like to see explored include:

- Sand disappearing on St Clair beach
- Orokonui Sanctuary
- 'Science included in our community'.

The most common general local and national issues our Community would like to see explored include:

- Exercise/ health/ nutrition
- Biology – plants
- ❖ The most popular theme was based around sustainable living.

The global science issues our Community you would like to see explored include:

- Sustainable living.
- Pollution
- Climate change
- Global warming

- Recycling
- Renewable energy
- Water quality

Click here to read the full findings of Andrea Benwell’s Science Survey

[Andrea's Science Survey 2015](#)

STAFF Consultation

All teaching staff were invited to comment on Wakari’s Curriculum Plan Goals for Science and to answer six questions about this from the perspective of their own teaching in the areas of Science Education. There were **15 responses** to the survey.

QUESTIONNAIRE:

“How well do we achieve the goals for Science Education at Wakari School?”

FOR GOALS 1,2, 3, and 4...Rate how well do we achieve the goals for Science at Wakari School	Poor	Fair	Good	Very Good	Great
Goal 1. Recognise that all groups of living things have life processes, common and unique requirements, and adapt to and interact with their environment in particular ways (<i>Living World</i>)	0 (0%)	0 (0%)	1 (6.7%)	11 (73.3%)	3 (20%)
Goal 2. Describe and group materials based on properties and recognise permanent and temporary changes in materials in everyday situations (<i>Material World</i>)	0 (0%)	0 (0%)	4 (26.7%)	8 (53.3%)	3 (20%)
Goal 3. Have explanations for a variety of physical phenomena such as light, sound, heat, magnetism, motion, energy (<i>Physical World</i>)	0 (0%)	1 (6.7%)	7 (46.7%)	4 (26.7%)	3 (20%)
Goal 4. Have understandings about the natural processes on Earth (erosion, weather systems) and the solar system (day and night), and the interdependence of land, air, water, and life (<i>Planet Earth & Beyond</i>)	0 (0%)	0 (0%)	2 (13.3%)	6 (40%)	7 (46.7%)
Q 4. Do you think that the above objectives are still appropriate?	15 teachers - yes				
Q 5. Do you wish to suggest any changes/additions/deletions?	<p>12 teachers - no 3 teachers made individual comments -The Science PD we had previously was fantastic and kept me motivated and excited about teaching Science. It was practical and engaging. With PD dropping off momentum has dropped slightly. -I think the Science PD last year was great, but this year we have lost the mojo and hasn't been as prominent. It</p>				

	<p>was very motivating to teach while it was the hot topic and we had momentum. The Science Scholarship is great for anyone with a passion for Science and has a great flow-on affect for Staff PD and kids learning.</p> <p>-No, I think if we tried to change the language from what it is currently then the meaning of what we're trying to do will get lost.</p>
<p>Q 6. Do you have any other comments you wish to make about the Wakari Science programmes?</p>	<p>Please see comments below</p>

Individual Staff Comments

Do you have any other comments you wish to make about the Wakari Science programme?

- I think with Andrea's PD that we had last year following her scholarship has re-ignited our staff's interest in how to teach Science in an engaging way. It will be good to keep this momentum going and continue to provide a variety of learning experiences for the children. I think that we are well-resourced and there are still many resources that are easily accessed that will support our teaching, eg You Tube, websites.
- While we don't cover a huge number of topics I think we do a good job of what we do. We are trying to include Science in Friday Projects so kids get Science more frequently. It would be great to continue the Science experiments that were started by Andrea as it was really motivating. Kids at Wakari are generally very interested in Science.
- It's frustrating to go and use the experiment resource kits and find that stuff hasn't been returned and or ingredients replaced.
- Where have the science resources disappeared to? It is important resources are respected/returned/replaced so others can use them too and all kids can enjoy them.
- Science PD was amazing last year and really built confidence and motivation in teaching science but with PD dropping off momentum has died off. Awesome learning hands-on, practical things to teach the kids which they love. Who is passionate about science in Wakari that would be willing to do this again?
- I think it's quite important for teachers to return the resources they have borrowed from the experiments boxes that were made last year and that if you use all of the materials then you replace them for the next people using them.
- Does not seem to be focused on with Professional Development so would love to see more teaching around it.
- Last year when we looked at science expts the children were very excited and were showed great awe at just really simple things. also had great response from parents saying that children were very enthusiastic and wanted to become scientists. Successful rotation in juniors - sparked their interest.
- This is a curriculum area that is very engaging for both the children and the teachers. It was great doing science rotations with the entire syndicate earlier in the year so that the children got to experience a variety of experiments/learning opportunities.
- Children have a high level of enthusiasm and engagement in our Science programmes. Children have opportunity to learn about Science through hands on activities. Our recent PD about the Nature of Science was wonderful. Resources created were Andrea well used. The Junior Syndicate recent topic on the Physical World gave children the opportunity to experience many different phenomena rather than focusing heavily on one phenomenon.
- There is a great variety of activities within the school. The kits from Andrea were amazing. The children love exploring all aspects of science.
- We have a great range of activities that are very engaging for the children. The Nature of Sciences were fantastic. It is great to have some new equipment.
- The juniors had fun learning about the physical world in term 2. Us teachers had a topic each (e.g one teacher taught force) and each class had 2-3 lessons on each topic.
- Feel we have made some great progress in the way we can teach Science. Would be great to see the momentum continued.

Summary of STAFF comments





- All staff commented on the great professional development we had last year from Andrea as part of her Science Fellowship and how this has re-ignited the interest and 'buzz' around Science with both children and teachers. It was acknowledged that it will be important to continue with this momentum.
- Three comments were made around the frustration if resources weren't returned/updated/replaced.
- There is a great variety of Science taught throughout the school and in the Juniors it worked well having a rotation around different Science activities.



STUDENT Consultation

A random sample of 65 Year 3-6 children were asked to respond to a questionnaire about what they thought about the teaching of **Science** at Wakari School.

Children's Questionnaire

	 Not much/ Not good at it	 OK/ a bit	 Like/ Good/ Often	 Really like/ Really good at it/ Always
1. How much do you like learning about Science at school?	6%	6%	42%	46%
2. How good do you think you are at Science?	5%	21%	59%	15%
3. How much do you think you learn about Science at school?	5%	32%	34%	29%
4. How often does your class do really good things in Science?	15%	17%	46%	22%
5. How do you feel about doing things in Science you haven't tried before?	3%	12%	19%	66%
6. How much do you like learning about Science in your own time (not at school)?	19%	12%	31%	38%

	Less	About the same	More
7. Would you like to do more or less Science at school?	9%	25%	66%
	No	Maybe/ Not sure	Yes
8. Do you want to keep learning about Science when you are older?	11%	52%	37%

The following questions were filled in by the teacher with the whole class contributing...

1. What do you want to tell us about Science at Wakari School?

- We all enjoy doing science, especially the experiments.
- I feel like it's my favourite thing to learn about because it's really fun. It's really interesting and you get to learn about new things. Science helps us learn by showing us how things work. You get a lot of surprises when you finish an experiment.
- It's interesting. It's fun learning about plants.
- Science is all around us. Science is fun. The flaming teabag experience was funny and awesome. We remember all of the activities that we do because they are fun and because they're new. There are all types of sciences - like biology, astronomy, astrology and chemistry Science is interesting. Science can be explosive.
- Science is cool and I want to do it more often.
- I want to learn more about science. We haven't done it in a while.
- Do more experiments.
- Enjoy the Science we do at Wakari School.
- I don't enjoy the Science we do at Wakari School.
- Science is exciting, fun we all like doing it.
- The coke and mentos experiment was fun. Doing experiments outside is fun.
- We do fun stuff in Science.
- It's about making stuff with liquid. Creating things that explode. Experimenting. Making new things. Using liquid to make things smokey. Making things out of rubbish. Lighting a tea bag on fire-it floats.
- The Seniors are starting to look at more advanced science in the Friday project. We have visited places such as the rocky shore, the Orokonui Sanctuary, the Otago Museum. We have had visits and fun experiments with Dave from the University. We did various kitchen chemistry experiments.

2. What things in Science have you enjoyed and why?

- Doing the experiments because you get to blow up things, learn stuff, and you get to use your brain. You get to use different ingredients. I enjoyed when we tried to save the gummy bears from the ice. I enjoyed creating electricity with balloons and our hair.
- I liked learning about rock pools and the creatures that live there. Magnets , colour mixing with milk and dye, electricity, floating and sinking.
- Discovering new things. Visiting OBHS to take part in the science programme. All the different experiments at OBHS. Learning the process of how the plants grow. Planting our own plants.
- The milk and food colouring experiment because it was amazing seeing all of the colours blending together. Doing the elephant toothpaste because there was such a big reaction. The actual experiments are fun. Science can be making observations. I like watching when things happen. Science Dave - fire on our hands, dry ice, liquid nitrogen, acids and alkalai - because it was new and exciting. Science experiment book because it has lots of different things in it and they are cool because we haven't seen them before. Paper towel/food colouring experiment because it was interesting to see how the paper towels sucked up the water. Glue goo was fun because the texture was smooth and gooey/slimy. Milk and dishwashing liquid experiment because of the patterns we could see. M&Ms in milk Visiting OBHS was fun
- I liked learning about acids and chemicals.
- I liked putting food colouring in ice because it looked cool.
- I liked the 'Exploding Bag' experiment because I like stuff that explodes.
- I like all of it because we get to learn new things.
- I liked the 'Flaming/Flying Tea Bag' because it floated and I didn't expect it.
- I like learning about chemical reactions because I like seeing what will happen.
- I like the 'Skittles Colouring Water.' I liked it because the skittles lost their colour and they disappeared.
- We like doing experiments and hands-on activities.
- I liked doing the trapped lolly in the ice experiment. I liked when it dissolved.
- I liked the 'Floating Balloon' experiment because we got to see it float in the air.

- I liked the 'Dancing Raisins' because you can't normally see food dancing.
- Doing experiments , making the bubble rocket with coke and mentos. Making the tea bag float. The Science Guy when he came to school.
- The milk and colours, because we took a photo. The coke and mint because it exploded.
- We like learning about minibeasts. We like doing experiments like the floating tea-bag. We liked learning about the human body in Discovery. We like learning about Space. We like learning about plants and watching our seeds grow and looking after them. We like to learn new things and do experiments. Looking at dry ice.
- Flying tea bag, Mentos in the Coca Cola bottle-it explodes. Chemical reactions. Marine biology. Melting jelly babies out of ice. Making food. Dissecting. Space.
- We did the flaming tea bag experiment, it was fun the way it went up in the air and came down. The lava lamp experiment because of the bubbles going up and down. Some went to Otago Boys to look at DNA testing and burning metals. We enjoyed the kitchen chemistry because it was hands on.

3. What types of activities in Science do you like to do in your own time?¹

- Experiments. Going to university, museum and discovery world.
- Making elephant toothpaste with my dad who is a scientist. Looking at rocks and crystals. I like cracking open rocks to see what is inside them. Learning about animals and making posters.
- Mixing things together and seeing what they turn out like.
- A fire tornado. Dissections Coke and mentos experiment getting messy blowing things up Soda water and raisins Bottle tornado Shrinking chip bag baking soda and vinegar Vinegar, baking soda and a balloon Making a mini-volcano
- Chemistry
- Exploring Minibeasts
- Using Science Sets - mixing water, cornflour and red food colouring.
- Watching siblings use Lucky Book Orders - making crystals
- Tarantulas and Tropical Forests
- Helping siblings make glue
- The exploding volcano. I rub the balloon on my head to make electricity. Collecting bugs and insects.
- Sometimes mixing things. Lucky Book Club things with mum.
- I like making creatures. At home I take some toilet paper and the roll and make puppets. I do kitchen experiments. I do baking experiments with food. Seeing the scientists at the Museum, Going to Discovery World. Growing crystals with blue solution. Looking up the internet for science experiments. Getting books out of the library that are Science.
- Doing experiments Putting stuff on the trampoline and seeing what happens Putting a bar of soap in the microwave Chemistry Recycling
- Researching diseases, astronomy, zoology, immunology. I like making bag bombs. Reading books about science.

4. What other activities in Science would you like to learn about at school?

- The water and oil thing Chemistry Explosions Blowing things up
- Animals like rabbits, snakes and chickens. Fossils Animals that live in the sea. How vehicles work. Bones and skeletons.
- Food experiments. Baking. When liquids react to different liquids.
- Explosions. Meteorology. Earth. Chemistry.
- Using dry ice Kebab stick with a balloon
- Setting a balloon on fire Learning air
- How the world was created
- Water and cornflour
- Using microscopes
- Food science
- Nature and bugs
- Chemistry, Chemicals, Acids, Dry Ice

- Fossils, Bones - Dinosaurs - Nature
- Birds, Plants, Bugs
- Marine Biology - Animals, Mammals
- Motors
- Potions
- Cooking/Baking
- Zoology
- Materials
- Doing more experiments. Learning about dinosaurs, more about electricity. More about the stars and the milky way and different planets and aliens. Growing and learning about crystals.
- More things that explode. The stuff when things turn into something else.
- Sharks Spiders Hot and Cold experiments Animals Plants Crystals
- Animals How they make toys in discovery world Astronomy Archaeology Palaeontology Volcanoes Robots Future
- Atoms and molecules, astronomy, physics, biology and more chemistry.

Summary Of Children's Responses

- Children enjoy taking part in hands on practical Science activities.
- Children's attitude towards learning about Science is positive and they find it enjoyable.
- Children enjoyed having experts of the local Science community come in and teach them about Science.
- Children's responses and interest mainly fell within The Material World and Living World Science Curriculum strands.
- 66% of children really like learning about new things in Science which shows that they are enthusiastic about their learning in this area.
- Overall, 66% of children would like to do more Science at school.

Recommendations

- 1. Science Curriculum team need to maintain the current enthusiasm of teachers and children by providing some more learning activities/resources that can be easily accessed. This could be done in short 'snippets' at Staff meetings.**
- 2. Consumable resources will be checked and replenished by the end of 2016.**
- 3. Staff need to accept responsibility for the returning of Science resources as soon as they are finished with them. Where resources need to be replenished then a teacher should inform a member of the Science team that this is needed.**
- 4. Low returns of parent consultation questionnaires is a trend across all curriculum reviews. A recommendation is that we invite children and their parents to participate in the review process together. The specified review team would be present to facilitate this process. This could possibly happen prior to 3pm pick-up time which is a time a lot of caregivers will be present at school.**
- 5. To continue to utilise local experts and resources in our Wakari Science programmes.**