The Warmley Park School and College Science Curriculum

Our Vision

Aspire, Believe, Enhance, Achieve

We believe and value every individual and what they can aspire to. We will inspire them to do this by enhancing learning and encouraging everyone to achieve together.

Curriculum Intent

The Warmley Park School and College Curriculum is the planned and powerful framework for learning that offers exciting opportunities, and prepares for new learning by building on prior knowledge, skills and understanding. Our approach to learning is through a communication led curriculum, as we acknowledge this is the foundation of all aspects of life. The Science curriculum is focused on enquiry skills that can be applied across the different strands of Science, but also provide a skills based approach that can be used in other curriculum areas. We have themed our Science curriculum units so that they attract a high level of buy in and engagement.

For pupils and students at Warmley Park, our aims are for them to achieve their best in the following areas:

- **Enjoy their learning - have fun whilst learning, love coming to Warmley Park and feel valued as a member of the Warmley Park community.**
- **Communication - to develop a communication system that they can use in different contexts.**
- **Independence skills - promoting the dignity and safety of pupils by supporting them to do as much for themselves as possible.**
- **Social skills and awareness of others - relationships, understanding acceptable behaviour, caring for each other and being able to work with others in a team.**
- **Emotional development - to feel secure and happy in school, to be able to self-regulate their emotions and behaviour, manage assessed risk and be confident to have a go at new learning.**
- **Awareness of safe behaviour - being prepared for the world beyond Warmley Park and knowing what they can do to promote this as well as asking for help.**
- **Formal subject specific learning - Literacy, Numeracy, Scientific Enquiry Skills, and subject specific learning that can be applied in different contexts.**

Pedagogy - The Art of Teaching

Our Science curriculum is enquiry based. The reason for this is that it can be differentiated so well, for example, using a movement consistently to engage a reaction, then further exploration of that action, then changing the variables and making a prediction with a why, how can I make it better. This lends well to Biology, Physics and Chemistry.

We would expect a strong Science lesson to be at least 90% practical hands on learning in most cases. The units are planned so that they are fully inclusive and can be access at a

sensory, early developmental level for pupils working on the engagement scales, through to a higher level academically based approach. We expect this to fire up a love of finding out and questioning that can be a sound basis for learning in other areas.

Another reason for Enquiry Skills being the focus is that we see the link with memory. Ofsted say "If nothing has altered in long-term memory nothing has been learned."
The aim of our Science curriculum is not just to teach facts or single events, but to teach skills. Skills that are memorised and therefore can be applied to different elements of the Science curriculum, and also to other subjects.

Communication led curriculum - The Science curriculum is ambitious in promoting communication as it is highly practical and enables students of all different learning abilities and styles to share experiences, interact with peers and staff, comment on the activities both verbally or through personalised communication aids/methods, ask questions, make choices and explore changes and reactions together. As well as scientific language, it opens up enquiry skills- what, why, how, where, when, who, predict, hypothesise, try, change…. Pupils will communicate through different strategies to indicate their response, and this may be entirely practical demonstration of knowledge that are promoted through opportunities to engage.

Personalised learning - Practicals and activities are adapted to ensure that the needs of each individual remain a focus. They are sometimes aimed at encouraging students to experience different materials and physical or chemical changes with others, or support them to use new vocabulary and begin to comment on what they experience. For other students it is more appropriate to encourage them to develop problem solving and teamwork skills. Resources are used to enable access to learning, for example, equipment to facilitate physical access such as a ramp, for an activity.

Wonder, curiosity and enquiry - Asking questions and being asked questions is essential for learning and this is a huge part of the science curriculum. Students are encouraged to make predictions and embrace an "I wonder…" approach when provided with new materials or processes to explore. Practical activities are designed to promote curiosity and the activities then often become more student-led and flexible as students find new questions they want to answer. At Warmley Park we share the expectation identified in the 2013 publication, Maintaining Curiosity: a survery into science education- ***first maintain curiosity***
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/379163/Maintaining_20curiosity_20a_20survey_20into_20science_20education_20in_20schools.doc

Whilst it might seem like a simple expectation, we believe it is the key to our pupils developing, not only a love for Science, but also an enquiring mind that will open up so many other learning opportunities for them in their lives. This publication puts scientific enquiry at the heart of Science teaching.

Co-construction – Science is the perfect platform for open ended learning which enables pupils to take control of the direction of their learning based on the development of an investigation. Materials and the use of different equipment is modelled by staff then students

are encouraged to explore items and resources themselves with prompts and support as appropriate. Another effective approach is to give students new items and state "I wonder how we use this… I wonder what this is for" then students are encouraged to investigate themselves; this leads to some great ideas and experiences being shared. Team work is very much encouraged in Science lessons as students develop more confidence and a better understanding of what they are learning when they are discussing and sharing thoughts and experiences with others.

Meta-cognition- the process of thinking about thinking. Science as a subject lends itself to meta-cognition very well; students are encouraged to practically experience and investigate resources and processes then reflect on their practise and explore how they could make changes to make an experience better; more accurate, more fair or appeal to more senses/give better stimulation to more sensory learners.

- The concept of "plan, monitor, evaluate" is already a core value in Science; students are asked to be involved in the planning of their own investigations then reflect on and evaluate their experiences and results to improve future learning.
- When teaching Science, staff model their own meta-cognitive thinking "what do I already know about these materials? How have I used these pieces of equipment before" to help students plan investigations/experiences
- Practical work and planning/reflecting on experiences is appropriately challenging to all students. Staff differentiate work and reduce the need for scaffolding as a student demonstrates that they can be more independent in their learning.
- Staff encourage students to draw on prior knowledge when introducing a process or concept… what do we already know? Students are then encouraged to engage in some independent exploration before reflecting together with other peers and/or staff.
- The Science curriculum is designed to be appealing to the students' curiosity. If they are interested in the resources and activities shown then they will be more motivated to accept a challenge.
- With Science, there is inevitably a strong focus on exploring, planning, evaluating and reviewing. The Education Endowment Foundation in their report *Metacognition and Self-Regulated Learning: Guidance Report*, highlight a number of recommendations,

- *Self-regulated learners are aware of their strengths and weaknesses and can motivate themselves to engage in, and improve, their learning.*
- *Developing pupils' metacognitive knowledge of how they learn- their knowledge of themselves as a learner, of strategies, and of tasks is an effective way of improving pupil outcomes.*
- *Explicit instruction in cognitive and metacognitive strategies can improve pupils' learning.*
- *While concepts like 'plan, monitor, evaluate' can be introduced generically, the strategies are mostly applied in relation to specific content and tasks, and are therefore best taught this way.*
- *A series of steps— beginning with activating prior knowledge and leading to independent practice before ending in structured reflection—can be applied to different subjects, ages and contents.*

- *Modelling by the teacher is a cornerstone of effective teaching; revealing the thought processes of an expert learner helps to develop pupils' metacognitive skills.*
- *Teachers should verbalise their metacognitive thinking ('What do I know about problems like this? What ways of solving them have I used before?') as they approach and work through a task.*
- *Scaffolded tasks, like worked examples, allow pupils to develop their metacognitive and cognitive skills without placing too many demands on their mental resources.*
- *Challenge is crucial to allow pupils to develop and progress their knowledge of tasks, strategies, and of themselves as learners.*
- *However, challenge needs to be at an appropriate level.*
- *Pupils must have the motivation to accept the challenge.*
- *Tasks should not overload pupils' cognitive processes, particularly when they are expected to apply new strategies.*
- *As well as explicit instruction and modelling, classroom dialogue can be used to develop metacognitive skills.*
- *Pupil-to-pupil and pupil-teacher talk can help to build knowledge and understanding of cognitive and metacognitive strategies.*
- *However, dialogue needs to be purposeful, with teachers guiding and supporting the conversation to ensure it is challenging and builds on prior subject knowledge.*
- *Teachers should explicitly support pupils to develop independent learning skills.*
- *Carefully designed guided practice, with support gradually withdrawn as the pupil becomes proficient, can allow pupils to develop skills and strategies before applying them in independent practice.*
- *Pupils will need timely, effective feedback and strategies to be able to judge accurately how effectively they are learning*.

At Warmley Park, we consider these features to be central to outstanding teaching and learning.

Mastery - A child's ability to skilfully apply their learning in more in-depth ways is called Mastery. Mastery is not just knowing a fact, but it is using that fact in increasingly more complex situations to extend their learning. Mastery also enables children to work in ways which show a deeper understanding of a given task. Breaking down skills into individual components enables the identification of specific skills that can be addressed one at a time. The rate of progress will vary from pupil to pupil, and the time required to consolidate learning can be altered by external factors such as health. However, small step progress is progress.

What is Mastery in Science?

In the Science curriculum Mastery is when students are presented with a question and they are able to use skills and apply concepts from different areas to answer that question. Students may take different pathways and may sometimes arrive at different answers but if they have been able to incorporate skills and concepts effectively then they would have mastered that concept. These students would be able to plan and carry out their own investigations to find their answers, displaying a high level of technique and accuracy during practical work. When they evaluate their work students that have mastered a concept would

be able to effectively reflect on their investigations and suggest ways that they could improve their techniques.

How would a child's Mastery of Science present itself?

1. **Generating Ideas**: Sharing prior knowledge effectively; greater observational skills; ability to draw on previously learnt skills and ideas of different concepts. This is through hypothesising, estimating, predicting, and using prior knowledge to fill in any missing gaps in new knowledge, for example, understanding that the a tadpole turning into a frog means that changes will take place over a period of time in certain conditions and without these conditions the process cannot take place. Pupils don't need to know the anatomy of the frog in detail to observe that over time the tadpole's features change but there is a point at which the tadpole resembles a frog more than a tadpole and they will use their knowledge of what a frog looks like to draw this conclusion.

2. **Process:** Applying a range of skills confidently and consistently during practical sessions, showing resilience and problem solving abilities when tasks are challenging or don't go as expected. Also applying fair testing so that the results are accurate. This might mean consistent repetition of the process to be sure of the outcomes- will ice turn to water faster or slower when heat is applied compared to when it is not?

3. **Evaluating:** Confidently using knowledge of concepts and processes to explain their results, reflecting on their practise and identifying areas to improve, independently re-visiting ideas and processes whilst applying these improvements. This can be through reviewing the outcomes, but also importantly interpreting them to form a conclusion- understanding that a spoonful of baking soda (sodium bicarbonate) in vinegar will create a reaction, but adding a spoonful of salt (sodium chloride) does not produce a reaction.

4. **Knowledge:** Effectively applying learning to other areas, making connections between concepts and processes, able to explain their understanding to others. This could be through repeating the process with adaptations to test further theories- for example when putting one bulb in a circuit, this will be brighter than adding several bulbs to a circuit when the battery is the same in both circumstances.

5. **Reflection** - Reflecting on learning prepares pupils to take it forward to the next level. Quality teaching should always identify the intended learning outcomes which are communicated to pupils and can then be evaluated with them as the learning progresses. This is a vital part of learning for pupils to understand what they have done well, build their confidence, and know what the next step is. The teaching of Science can be used to support awareness and appreciation of our world this by encouraging students to think about the environment and habitats around them and the effects that our actions have on these. The curriculum also focuses on our use of different resources and materials and how we can be more energy efficient and have a positive impact on our local and wider communities.

The Communication led Curriculum- opportunities in Science

Communication is the core focus of our teaching and we should always aim to give our pupils the opportunities to communicate in a variety of ways in every aspect of their day. We are using the core scientific vocabulary from the key stage 1 list from STEM https://www.stem.org.uk/elibrary/resource/34636 Within lessons communication can be used for:

- Choice making (vocab board and commenting board)
- Vocabulary development (vocab boards and commenting boards)
- Describing a scientific process (vocab boards, commenting boards, symbols)
- Planning an investigation (vocab board and commenting board)
- Preparing (pupils can state what they need for a lesson/experiment/activity)
- Commenting on the activity or their own work (commenting board)
- Questions (commenting board)
- Evaluating their work (commenting board)

Pupils should be able to use the communication method they are familiar and competent with to access communication within the various subjects they take part in. All subjects will lend themselves through a range of communication routes including speech, signing, communication grids, real objects, symbols and text. Communication can be used through low tech and high tech strategies. An example being; a vocabulary grid on an iPad using Grid as well as a commenting board (this is discussed next).

Pupils will be given a word bank at the start of a unit which contains all the key vocabulary for that unit and pupils will be exposed to new vocabulary. At the beginning of the lesson, the word bank can be used to explore the vocabulary needed for that lesson and previous lessons. The word bank can be used to assess the understanding of pupils and pupils can contribute by finding the definition or explaining the word to a peer. This will be a communication strategy for some pupils, for others this will be a prompt to use new vocabulary. Pupils are then able to explore the new language, use it in context and find the definition of words and concepts by finding synonyms.

To extend the communication further, each pupil should have access to a commenting board for each subject, this will include statements such as; I see this because… it is bright, I hear this because… it makes a loud bang, I choose this because… it is strong. The commenting board will also include questions to ensure the pupils are able to ask these using their preferred method of communication. It will include; why, what, where, who, when, how and which. Therefore pupils will be able to fully immerse themselves in the lesson.

For each unit in the curriculum there should be a vocabulary board and a commenting board.

Safeguarding through Science

The Science curriculum provides the biology aspect of Relationships and Sex Education which includes reproduction and contraception. This part of the curriculum is a statutory requirement.

- Reproduction as one of the characteristics of living things*
- The human reproductive system including reproductive organs and fertilisation*
    - Puberty and adolescence and the physical and emotional changes that accompany them*
    - The study of the development of the foetus in the uterus and birth
    - Hormonal control of puberty and the menstrual cycle*

*N.B. parents cannot withdraw pupils from these lessons as they are part of the national curriculum.
All of the above topics are taught with an emphasis on Human reproduction within a long-term stable relationship. The Science content of Relationships and Sex Education will be differentiated to ensure that pupils can access it at a level that is relevant and meaningful for them.
The Warmley Park Safeguarding Tool Kit includes a focus on equipping pupils with communication so that they can express if something is wrong and this includes body parts. We refer to body parts by their correct anatomical name to avoid confusion with more informal names which may not have a consistent definition.
During PSHE lessons students will be taught practical steps they can take in a range of different contexts to improve or support respectful relationships, coercive control, what constitutes sexual harassment and sexual violence.

Progression of the Science curriculum

Communication skills ⬇	Enquiry skills ⬇	EYFS and Key Stage 1- scientific investigation	Differentiated for inclusion ⬇
		Key Stage 2- exploration and building skills	
		Key Stage 3- problem solving, question based	
		Key Stage- 4 project based linked to real life scenarios.	

We have made our Science curriculum highly interesting, motivating, real, and dynamic to draw in the interest of pupils regardless of their age. We believe that to get high levels of engagement and motivation pupils need hands on experiences in Science.

This is through context based units. For example

Key Stage 1	Unit- Materials	Firing up the curiosity- 3 Little Pigs	Testing houses made from different materials to see which is stronger, waterproof, windproof.
Key Stage 2	Unit- Life cycles	Firing up the curiosity- Pond dipping at Willsbridge Mill	Investigating and recording pond life. Understanding the process of tadpole turning into frog.
Key Stage 3	Unit- My changing body	Firing up the curiosity- selection of body care products from Lush and the Body Shop.	Making and testing own body products using home made ingredients and testing their effectiveness.

Key Stage 4	Unit- Energy	Firing up the curiosity- a day without electricity.	Alternative sources- water, solar and wind. Building turbines and testing.

To facilitate high levels of interest we are using our local community which offers a rich abundance of resources- Willsbridge Mill, Grimsbury Farm, Golden Valley nature reserve, and the cycle track.

The Bristol context offers Rolls Royce, British Aerospace, Concord museum, Bristol Zoo, the Clifton Suspension Bridge, Avon Valley Park, community farms, M Shed, We The Curious and Planetarium, and Bristol Aquarium.

We have allocated a budget for extended visits so that during key stage 4 every student will have the opportunity to visit a Scientific learning site- Kew Gardens, the Eden Project, or the Natural History Museum London.

To kick start the learning we feel that the introduction to a unit at the beginning of a term should be highly engaging, so that it sets the scene, allows for assessment of a baseline against prior knowledge, and the expectations. Therefore we encourage a big launch for any Science unit.

Supporting Research:

Science has been a core subject since the introduction of the National Curriculum (in 1989). It has provided a distinct area of learning and development, one that is necessary to prepare all pupils for continuing education, training and living in a technological society.

In the recommendations report *Primary Science: Is It Missing Out?*, from the Wellcome research foundation, the vast benefits of effective and powerful Science teaching were summarised:

- Science provides a 'motivating context' for pupils to develop and improve skills in many areas, including literacy and mathematics.[1]
- Early experiences with Science will lay the bedrock for their future studies, enable them to make well-informed decisions in our increasingly hi-tech world and give them access to a wide range of rewarding careers.
- The future economy will require a larger proportion of the workforce to possess high levels of scientific and technological skill.[2] We will need more students to continue to study science subjects beyond the statutory curriculum and move into related employment.

[1] Ofsted. Maintaining Curiosity: A survey into science education in schools. Manchester: Ofsted; 2013; 7. ofsted.gov.uk/resources/maintaining-curiosity-survey-science-education-schools.

[2] Department for Business, Innovation and Skills. The Future of Manufacturing: A new era of opportunity and challenge for the UK. London: Department for Business, Innovation and Skills; 2013. www.gov.uk/government/publications/future-of-manufacturing

If a 2010 report entitled *Science and mathematics education 5-14* from The Royal Society, the importance of early education in Science were also briefly explained:

- Extensive research shows beyond doubt that children arrive at their own ideas about the natural world in their early years, whether or not there is science in the curriculum. These intuitive or naïve ideas are often in conflict with scientific ones and, if taken into secondary school, may inhibit effective learning.
- There is widespread international recognition that understanding in science develops through the use of enquiry skills.[3] These skills determine the ideas that children develop in their exploration of the natural world.
- It is well established that attitudes towards science form early and have already become less positive when children reach the end of primary school. But there is evidence that the decline is less pronounced when pupils are engaged in scientific activity.

Equality and Differentiation

Science is accessible to all pupils at Warmley Park as it is experiential. All our pupils are able to engage with scientific learning through the use of their senses. Consider how we teach about forces- the physical action of pushing and pulling enables pupils, through the actual experience, to feel the concept through vestibular awareness. Plants- the water to keep them alive, the feeling of the soil, and the texture of leaves, can all be experienced through tactile exploration. Colour changes as chemicals are mixed together can be observed and indicate that a reaction is taking place. Going back to our principle of first maintain curiosity, this starts at a sensory level.

The Rochford Review (2015) identified that some pupils, such as those with profound needs will not engage in subject specific learning and that "*there may be a period of lateral progress, in which, for example, a pupil does not gain new concepts of skills, but learns to apply existing concepts or skills to a broader range of contexts."*

With Science, sensory learning can take place through exploration, realisation, anticipation, persistence, and initiation. At Warmley Park we have adopted the definitions as detailed in Engagement Model Guidance https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/903458/Engagement_Model_Guidance_2020.pdf

Technology has made teaching and learning of Science even more accessible to pupils. For example, the use of time lapse photos in recording an investigation, iPads to remote control sensory room resources, virtual reality scenarios, online videos from anywhere in the world.

[3] For example, the IAP Science Education Programme, see http://www.interacademies.net/CMS/Programmes/3123.aspx

Why is Science part of the curriculum at Warmley Park School and College?

Getting started…… "Science is too hard"

If you like to engage with the environment around you and explore and discover new experiences then you are already a scientist!

Science contributes to all areas of our lives… monitoring and keeping us healthy and providing for our basic needs such as clean water, healthy foods, energy and communication. Scientific processes enable us to do lots of fun activities such as cooking, gaming, travelling, listening to music and playing sports.

What weather do you like the best? When it is freezing cold and snowing or when spring arrives and beautiful new plants begin to grow and new life arrives? What signs can you spot when you go for walks that a new season has started – what has changed?

Do you like visiting the zoo, the farm, the aquarium or how about spending time in the garden, going for walks or a trip to the seaside? What does each environment look/feel/sound like? What animals and plants can you see there? Why do you think they live there?

Do you like playing games online and chatting to friends on the phone? How about watching TV or using your Ipad? What materials do we need for these devices? How do they work?

When you look up at the sky what can you see? Why do we get clouds and why does it rain? Can you spot any stars or maybe see some other planets? When might you see a rainbow and why do we get them?

Science is all about asking questions and exploring the world around you; trying new things and reflecting on what worked the best and how it worked. You use science all the time without even realising it by experimenting and exploring to get answers…

- which recipe will give the best flavours and textures when baking?
- what temperature gives the best bubble bath?
- which mobile phone has the best battery life?
- which clothes are the most comfortable for playing sports?
- which songs gets people up dancing at a party?

Science helps us make sense of the world around us and feel connected to it; science helps develop our problem solving skills, improves our ability to make choices and share new ideas.

We see = we recognise, we learn, we remember, we judge, we associate.

We touch = we trigger a response, we connect, we explore.

We question = we open new thoughts, we compare, we formulate an answer.

We plan = we imagine, we interpret, we find inspiration, we select a process, we review.

We create = we express, we define, we represent, we experience, we inspire, we learn.

We evaluate = we see, we touch, we question, we plan.

What do we want for our young people when they move on from Warmley Park? How does this link to Science?

- To experience awe and wonder.
- To have a desire to explore new things.
- To ask questions about the world around them.
- To be confident at problem solving in terms of not being afraid to try different ways of doing things to get the best result.
- To be able to reflect on experiences and plan how to make them even better next time.
- To share problems and ideas with others.
- To have used Science to further develop their communication skills.
- To feel more connected to their community and how they can make good, sustainable choices.
- To have a better understanding of their own bodies and how to keep themselves safe and healthy.
- To have a connection to their past and how ideas have evolved over time.
- To consider the Science that they come across in their daily life.
- To apply their knowledge of science processes to assist them in everyday life e.g. when cooking, when choosing appropriate materials to design their own space or when gardening or looking after pets.
- To be confident to try using new equipment and to reflect on this.
- To have an understanding of the processes involved in the practical activities that we engage with.
- To have a sense of persevering and working on a project, learning new techniques, modifying those which are familiar.
- To have an understanding and awareness of collaborative exploration - working within a team to be able to investigate, fix or create something new.
- To seek out Science in the community, online, and in the environment.
- To observe, to comment on and to reflect on different experiences.
- To be inspired and feel passionate, the motivation to find out more.
- To want to create, have fun and to keep learning.

United Nations Convention on the Rights of the Child

We are a Rights Respecting School. Our Science curriculum acknowledges the following articles:

- Article 23- Every child should enjoy the best possible life in society.
- Article 29 - Education must develop every child's personality, talents and abilities to the full. It must encourage the child's respect for human rights, as well as respect for their parents, their own and other cultures, and the environment.

- Article 30 - Every child has the right to learn and use the language, customs and religion of their family, regardless of whether these are shared by the majority of the people in the country where they live.
- Article 31 - Every child has the right to relax, play and take part in a wide range of cultural and artistic activities.

At Warmley Park we want our pupils to have that First Maintain Curiosity element throughout their learning so that they are interested in the natural world- their world, as well as forming opinions about their world. This means they ask the questions, they understand why we put food out for birds in the winter, the amount of time a plastic bag takes to degrade compared to a paper bag, the process of boiling water and what is needed, how materials repel water, how our bodies take in oxygen, what that oxygen then does, and how carbon dioxide is expelled, what foods make stronger bones, what are the effects of deforestation, what is climate change doing to our world? These are the ethical questions that we want our pupils to ask to make the world a better place for their own future.

What principles is the Science Curriculum at Warmley Park based on? What does the content reflect in terms of our values and aims?

Spiritual

Our natural world gives us the most extensive opportunities for awe and wonder- trees, night sky, oceans, beaches, patterns, colours, textures, life cycles. To appreciate fully we need to teach pupils to observe in a distraction free setting. Religion and Science have parallels through life and death, the provision for our needs from the natural world, and with both seeking answers. Art and Science bring opportunities for investigation, representation, and sensory awareness.

Moral

Science raises moral issues- where there is a solution to a problem, another problem may arise, for example, we know that electric cars are better for the environment, but they cost more to buy. Plantations for palm oil and intensive cattle farming mean the rainforest is being destroyed. Unicef identify that 1 in 3 people globally do not have access to clean water. Science is about finding solutions to make the world a better place.
Science can be controversial and provides opportunities for debating. As part of our integrated PSHE curriculum, we encourage pupils to challenge any views or practice that they feel are unjust. Fair testing needs to be taught explicitly, for example, someone having an obvious advantage in an investigation.

Social

Finding solutions to make the world a better place, solve problems to improve quality of life. This includes understanding how Science has changed our lives for today through medicine, inventions and engineering, and our life chances.
Science can fulfil our understanding of healthy lifestyles- why they are important and what we can do. Through taking care of our world we have a purpose, and become aware of what is happening around us. When pupils work in a class setting either independently or

collaboratively, it is natural for them to look at what others are doing. Sometimes this will change the direction of their work. Science also offers potential for working on a shared project that can involve delegation of tasks, consideration of joint problem solving, and collaborative planning.

Cultural

We live in an amazing country with so much natural and made beauty. Because Science requires sensory learning such as sight, sound, taste and smell, the synapses in the brain of a small child fire away as they experience situations that immerse their senses and further encourage their creativity. The developing brain creates connections with every bit of new knowledge it is exposed to.

Self esteem

We want our pupils to see themselves as Scientists. They need to see the work of other successful people including female role models- Marie Curie (Physicist), Anna Atkins (Botanist), Georgina Mace (Ecologist), Tiera Guinn (Space engineer) "You have to look forward to your dream and you can't let anybody get in the way of it," she said. "No matter how tough it may be, no matter how many tears you might cry, you have to keep pushing. And you have to understand that nothing comes easy. Keeping your eyes on the prize, you can succeed."

As a young child starts to realise that they can create, and they attribute meaning to their work, their self-esteem will begin to flourish. Added to this the recognition given to them by adults, they feel more confident to extend their work. Adults must model this positive attitude and be prepared to work alongside pupils. We want pupils to feel resilient in trying new techniques and to have the confidence to want to share their work with others. Pupils are expected to be reflective and evaluate their work, thinking about how they can make changes and keep improving as well as being encouraged to take risks and experiment and then reflect on why some ideas and techniques are successful or not.

Imagination and experimentation

Imagination is the ability of the mind to be creative or resourceful. Changing the gradient of the ramp for a car to go down so that it increases speed.

Hypothesising- a supposition or proposed explanation made on the basis of limited evidence as a starting point for further investigation. Asking questions, what would happen if, why is it like this, how did this happen. Why doesn't the car move on a flat surface but does on a gradient?

In early cause and effect, the action (cause) that informs the reaction (effect) has to catch the attention of the pupil. It has to get a response of awareness that something has taken place before the adult supports learning through scaffolding (Vygotsky). We equip our pupils with the knowledge and skills they need to feel confident to start their experimentation- the adult naming the cause, the process, the effect, the components.

A bit of basic guidance….. aka the Warmley Park way of doing Science.

Never, ever, ever concede or agree that science is a difficult subject or that it can be boring! Science lessons should always be practical and focused on exploring and experiencing; don't be afraid to be led by the students as they discover new ways to use the resources.

Never, ever, ever tell the students' what they should be finding out; discovering things for themselves and finding out "why" or "how" something happens is so important. Discussions and reflections as the students investigate are great but let them find their own conclusions.

As an adult, it is important that you model how to use unfamiliar pieces of equipment or resources; it can be useful to film yourself doing this and display the video on the IWB. Students often find it easier to focus this way and can replay the video if they need more guidance.

Think very carefully about the resources you use; it should be possible for all students to access and explore the concept being studied. Science lessons lend themselves well to incorporating different textures, sights, sounds and tastes and you should be ensuring that students' can participate through these more sensory techniques.

Science lessons should be practical and engaging; students should see the resources and want to actively join in with the activity. Students' learn best and are able to recall better when they have had fun and fully engaged with the lesson. Remember that mess can be cleared up! Mess can be cleared up by students!

Science is not all about getting the right answer all the time; it is often more of a problem solving subject, requiring students' to reflect on their work, suggest improvements and determine how these would lead to a better experience or a more accurate result next time.

Process and time – Investigating different scientific concepts is an exploration which begins with finding out what we already know, then planning and testing/experiencing the materials, before reflecting on how we could make that process even more enjoyable, more accurate or fairer.

Encourage students' to apply their learning…. What else would react like that? What other material could we try? Do other substances behave that way?

Go- have some fun, ask questions, find out why, find out how, think about the outcomes, consider the consequences, work out how it works, make connections, understand processes, demonstrate knowledge, make mistakes, try again, show off Scientific skills, but above all have some fun so that you can build that love of Science!