## The Warmley Park School and College Maths Curriculum Intent

**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.

#### Our Intent in mathematics for pupils and students at Warmley Park School is:

#### For pupils not yet engaged in subject-specific learning, to develop and achieve:

- **Communication skills:** To **communicate** more effectively through anticipation, eye contact, tracking objects and requesting "more" or "finished" through the use of VOCAS.
- **Problem solving skills:** To **solve problems** by applying their skills to a variety of problems with increasing challenge, including breaking down problems into a series of simple steps and persevering in seeking solutions.
- Cause and Effect and exploration skills: To have an experience of early maths activities through the manipulation of concrete objects through investigation and creativity. To develop contingency awareness through trial and error, making mistakes and linking things that happen and occur.

#### For pupils working at subject specific learning, to develop and achieve:

- **Communication skills:** To develop **mathematical language** and be able to **talk about** time, measure, shape, money, number, pattern and calculation.
- **Problem solving skills:** To develop multiple methods of problem solving, mathematical thinking and resilience to make mistakes and learning from their errors.
- Early fluency and reasoning skills: To show their understanding and thinking through the use of concrete or pictorial representations or mathematical symbols.

#### For higher attainment students to:

- Become **fluent** in the fundamentals of mathematics so that they develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
- Be able to **solve problems** by applying their mathematics to a variety of problems with increasing sophistication, including in unfamiliar contexts and to model real-life scenarios.
- **Reason mathematically** by following a line of enquiry and develop and present a justification, argument or proof using **mathematical language**.
- Have an appreciation of number and number operations and show this through concrete, pictorial and abstract representations, which enables mental calculations and

written procedures to be performed efficiently, fluently and accurately to be successful in mathematics.

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

- <u>Enjoy their learning</u> have fun whilst learning, love coming to Warmley Park and feel valued as a member of the Warmley Park community.
- <u>Communication</u> to develop a communication system that they can use in different contexts.
- <u>Independence skills</u> promoting the dignity and safety of pupils by supporting them to do as much for themselves as possible.
- <u>Social skills and awareness of others</u> relationships, understanding acceptable behaviour, caring for each other and being able to work with others in a team.
- <u>Emotional development</u> to feel secure and happy in school, to be able to selfregulate their emotions and behaviour, manage assessed risk and be confident to have a go at new learning.
- <u>Awareness of safe behaviour</u> being prepared for the world beyond Warmley Park and knowing what they can do to promote this as well as asking for help.
- <u>Formal subject specific learning</u> Literacy, Numeracy, subject specific learning that can be applied in different contexts.
- <u>Life-long learning behaviours-</u> Experiencing new, deep-rooted behaviours: pride, enthusiasm, resilience, self-motivation, aspiration & respect, through adult encouragement and modelling.
- <u>Felling safe and secure-</u> through nurturing teaching styles we promote positive relationships: students are enabled to feel safe and secure, they learn to have self-esteem and self-confidence to thrive outside of Warmley Park School

## Pedagogy – Mathematics at its best at Warmley Park School!

**Communication led curriculum** - at Warmley Park, every teaching experience should be an opportunity for communication learning. Communication is the most important aspect of our teaching as it opens the door to all other forms of learning. Mathematical language can support children to make links across areas of mathematics but also across the curriculum as a whole and within real-life situations. Using mathematical vocabulary can help build children's communication and interaction skills: it helps to support questioning, logical thinking, decision making, problem-solving and reasoning to create confidence in and out of the classroom. It enables children with the skills needed to explain their thinking. Mathematical language, enquiry and questioning should be an integral part of every numeracy lesson.

"The universe cannot be read until we have learnt the language and become familiar with the characters in which it is written. It is written in mathematical language, and the letters are triangles, circles and other geometrical figures, without which means it is humanly impossible to comprehend a single word."- (Galileo Galilei. 1564-1642. Italian astronomer, mathematician, and physicist)

## "Mathematics is the language in which God has written the universe." -Galileo Galilei, Italian astronomer & physicist- (1564 - 1642)

**Personalised learning** - When we talk about personalised learning, we are referring to the relevant programmes for individual pupils which are determined by their needs, and so the focus of their curriculum will be driven by their specific requirements such as sensory or physical. This is at the heart of what we do as a special school. In mathematics we look at children's strengths, needs, skills and interests, supporting them by building on their previous knowledge, making connections to give them the best opportunities to reach their full potential so all pupils can participate, progress and achieve.

**Physical learning** - At Warmley Park School we believe there is a correlation between motorenriched learning and mathematics. Motor skills, movement and physical activity go hand in hand with mathematical teaching. We promote this by using a range of whole body and lower intensity activities in our maths lessons to help children to learn through a kinaesthetic teaching style. We incorporation a range of physical activities during the school day for ALL of our pupils.

"Motor-Enriched Learning Activities Can Improve Mathematical Performance in Preadolescent Children"- (Journal Frontiers in Human Neuroscience, February 2017 study)

Albert Einstein intuitively understood the link between physical movement and mathematics. When asked how he came up with his general theory of relativity, E = mc<sup>2</sup> (which is arguably the most famous mathematical equation of all time) Einstein quipped, "I thought of that while riding my bicycle."

**Concrete Pictorial Abstract Approach** – there are four strands of mathematical experience: concrete experiences; language; pictures; and symbols. It is the development of networks of cognitive connections between these that allow concepts of number to be developed. At Warmley Park school we use a Concrete, Pictorial and Abstract approach when teaching Numeracy to support our children across the school in their understanding of number, pattern and calculation. We strengthen children's knowledge so that they have a deep and sustainable understanding in Numeracy by moving between representations of CPA in lessons using a wide range of concrete objects, including Numicon, to support with visual and kinaesthetic learning. We make sure that we use a range of concrete objects for "hands on learning "when exploring shape, space and measure. We allow children as much time as they need to explore and play with the resources so that they can investigate, discover, make connections and problem solve. This helps children to relate to 'real life' but also stimulates creative and innovative thinking.

Hungarian Maths Professor Zoltan Dienes (1916-2014) believed that Maths could be enjoyed and understood, and that it was necessary to play and explore in order to fully comprehend its structures. **Wonder and curiosity** - Asking questions and being asked questions is essential for learning, whether through formal questioning or a basic "I wonder...." approach. It takes learning off into new learning pathways. Through curiosity, we deepen knowledge and understanding that is sparked by an initial interest.

**An Ethic of care** – Creating a caring classroom and community is at the heart of our school. We promote classroom relationships where children are confident in thinking for themselves, can ask questions and take intellectual risks. Through non- judgmental environments and open discussions, our children's motivation is increased and there is a removal of fear of failure within pupils.

**Making connections** – We believe it is vital to build on children's interests, experiences, thinking and knowledge. We use our students' thinking as a resource for further learning and misconceptions and errors as building blocks for developing deeper understandings. Our guided curriculum makes sure children revisit and review mathematical knowledge throughout the year and in each key stage. It is made up of carefully planned sequences of knowledge, concepts and procedures which means it becomes deeply embedded in pupils' memories.

**Co-construction** –In maths lessons we support children in developing their collaborative skills, as well as empathy and the need to recognise working together and the achievement of others: these are important skills that student will need later in life. We use collaborative learning, scaffolding and guided learning techniques, enabling environments and creative teaching strategies to deliver co-construction skills. This enables children to work together, reflect, problem solve and supports them to form better relationships in the classroom and life skills to thrive after education.

**Meta-cognition**- the process of thinking about thinking. With mathematics, there is inevitably a strong focus on responding and planning, and evaluating and review. 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.

# "Thinking about thinking" has to be a principle ingredient of any empowering practice of education." – (Jerome Bruner, 1915-2016)

**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 mathematics?

In the Numeracy curriculum, mastery is when a child is able to develop their mathematical fluency without resorting to rote learning and are able to solve non-routine maths problems without having to memorise procedures. Children are given time to think deeply about the maths knowledge and new concepts they are learning, they are not moved on until they are secure in their understanding of a particular concept. We support children in developing fundamental maths skills, these are the building blocks which are needed for their futures. Mastery in mathematics is an inclusive approach, and its emphasis on promoting multiple

methods of solving a problem, builds self-confidence and resilience in our pupils and a greater emphasis is placed on problem solving and on encouraging mathematical thinking. We teach children to 'speak maths' as this helps to inform us of any mistakes and misconceptions. A culture of mistake-making is crucial in a mathematics mastery classroom because it normalises mistakes as learning curves. Teaching maths for mastery offers all pupils access to the maths curriculum; differentiation using the mastery approach is offered through questioning children at an appropriate level and by exploring the concept more deeply using a range of different equipment and resources. At Warmley Park School we use a concrete, pictorial and abstract approach, introduced by Bruner as the 'Enactive, Iconic and Symbolic' developmental stages, which is key to a mastery way of learning.

Jerome Bruner (1915-2016) was an influential educational psychologist who was fascinated by learning process. For Bruner (1961), 'the purpose of education is not to impart knowledge, but instead to facilitate a child's thinking and problem-solving skills which can then be transferred to a range of situations. Specifically, education should also develop symbolic thinking in children.' In the 1960's Jerome Bruner introduced the 'Enactive, Iconic, Symbolic' phrases of learning to describe typical developmental stages in getting to grips with new concepts. He didn't intend this to be a linear journey of discovery, instead he talks of moving between representations as necessary to build **a deeper understanding and mastery.** 

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

- **1. Knowledge:** showing greater: understanding; skills; secure concepts; use and understanding of appropriate mathematical vocabulary.
- 2. Understanding: showing greater: confidence; independence; connecting ideas; conceptual understanding; use of concrete objects; comprehension of mathematical concepts; operations; relations; knowing of what mathematical symbols; diagrams; and procedures mean.
- **3.** Fluency: showing greater: number sense; recall; application of knowledge; conceptual understanding; confidence; applied learning.
- **4. Reasoning:** showing greater: mathematical language; decision making, communication; explanation; questioning; generalisations; discussion making.
- **5. Problem solving:** showing greater: working systematically; deeper thinking; conjecturing; visualising; monitoring; pattern spotting; explanation. Fluency and reasoning: which are the drivers of problem solving.

**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.

In addition, all pupils are taught about **Spiritual**, **Moral**, **Social and Cultural Education** to prepare them for life as active citizens in modern Britain. This is supported through collective worship and specific learning opportunities. Mathematics is central to this as it encourages pupils to wonder, think on a deeper level, question, reflect on their learning and have a sense of personal achievement which promotes the spiritual growth of students. Mathematics can be used to explain the world around us, it gives children a way to understand the patterns

and relationships that they see in the world, and this enhances awareness of our local, national and international community, with themselves as a member of these communities. Children look at how mathematics relates to the world around them through the use of practical and functional life skills. Children learn to work collaboratively, building positive relationships with others.

### The Communication led Curriculum- opportunities in Numeracy

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. Within lessons communication can be used for:

- Choice making (vocab board and commenting board)
- Vocabulary development (vocab boards and commenting boards)
- Describing a process (vocab boards, commenting boards, symbols)
- Planning (vocab board and commenting board)
- Preparing (pupils can state what they need for a lesson/experiment/art 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 like this because... it is bright, it is happy, I don't like. 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.

#### **Supporting Research:**

The National centre for excellence in the teaching of mathematics (ncetm), in their research report: 'Mathematics Matters' (6 Oct 2008), reviewed the reasons why maths is considered to be important: why teach mathematics? Their values echoed those found in: the Cockcroft (1982) and Smith (2004) reports and the National Curriculum Programmes of Study (QCA, 2007). Three foci were identified: The social value of mathematics, the personal value of mathematics and the intrinsic value of mathematics.

# *"Mathematics has value in enabling groups and societies to function effectively and creatively."* (R. Griffiths, P. Hough)

**The social value of mathematics** - Participants felt that mathematics continues to make a substantial contribution to the effective and creative functioning of our increasingly technological society, by equipping learners with the life skills they need at work and at home. Furthermore, mathematics can enable learners to develop the social skills they need for effective collaboration with others and to become aware of and appreciate the different perspectives they may have. Learners may also begin to develop an awareness of the historical-cultural-social origins of mathematics and its role in modern society.

"Mathematics is of central importance to modern society. It provides the language and analytical tools underpinning much of our scientific and industrial research and development. Mathematical concepts, models and techniques are also key to many vital areas of the knowledge economy, including the finance and ICT industries. Mathematics is crucially important too, for the employment opportunities and achievements of individual citizens."- (Smith, 2004 foreword, page v)

"Mathematical thinking is important for all members of a modern society as a habit of mind for its use in the workplace, business and finance; and for personal decision-making. Mathematics is fundamental to national prosperity in providing tools for understanding science, engineering, technology and economics. It is essential in public decision-making and for participation in the knowledge economy." - (QCA, 2007)

## "Mathematics enables learners to participate in life both at work and at home." (J. Back) The personal value of mathematics

**The personal value of mathematics-** Participants valued learners seeing themselves as mathematicians and appreciating the beauty of mathematics. They stressed the benefits of mental empowerment attained through cycles of abstraction and experience and the confidence gained when finding strategies to approach and solve problems. Mathematical learning was also felt to contribute to spiritual, moral and cultural development.

"Mathematics equips pupils with uniquely powerful ways to describe, analyse and change the world. It can stimulate moments of pleasure and wonder for all pupils when they solve a problem for the first time, discover a more elegant solution, or notice hidden connections.

Pupils who are functional in mathematics and financially capable are able to think independently in applied and abstract ways, and can reason, solve problems and assess risk."-(QCA 2007)

### "...learners seeing themselves as mathematicians." (S. Feller)

The intrinsic value of mathematics- Participants valued mathematics as a creative discipline in its own right. They noted that mathematics offers learners a uniquely powerful set of tools with which they can interpret, organise and sort information, analyse and solve problems and communicate with others. Mathematics was also considered to be the 'mother of all languages', a grammatology of thinking and a way of making meanings, viewing and describing the world.

"Mathematics is a creative discipline. The language of mathematics is international. The subject transcends cultural boundaries and its importance is universally recognised. Mathematics has developed over time as a means of solving problems and also for its own sake."- (QCA 2007)

## "...confidence in strategies to approach and solve problems."- (J. Golding, B. Murphy)

All of the above support our view that Mathematics is a vital aspect of the communication led curriculum at Warmley Park School and College. The skills learned in mathematics are used widely in life, future employment, and functional skills learned (from buying daily shopping to becoming an engineer) are vital in the world we live in.

## **Equality and Differentiation**

Maths is accessible to all pupils. 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." This is highly applicable to maths where sensory learning can take place through exploration, realisation, anticipation, persistence, and initiation.

Through using intensive interaction activities in maths sessions e.g. copying children's movements, gestures and vocal noises in sand or water play; children develop early communication skills: children engage and respond in interactions of communication; taking turns in exchanges of behaviour; developing shared attention, and eye contact. Tac Pack also supports our children's early communication skills through touch and music; children enjoy this sensory experience involving objects, music and pace- pupils learn to anticipate the sessions that are planned into their personalised curriculum.

In our maths guided curriculum we have included activities that help children to notice visual, auditory and tactile stimulus: children use their senses to explore and investigate in maths

sessions. We develop children's shared attention skills through musical interaction and attention autism sessions where maths vocabulary, pace, colour, pattern, size and count can be explored. Pupils are exposed to counting and mathematical language through sensory stories, songs and rhymes. We encourage sensory exploration of concrete objects helping children to experience, explore, handle and manipulate objects.

We develop children's engagement, participation and involvement skills in maths lessons. They learn to make exploratory hand and arm movements, seek eye contact with staff, other pupils or locate and follow moving objects and events, show anticipation of what might come next through vocal sounds, body movements, signing, gesturing or showing other signs of excitement. All of these are recommended activities that have been carefully planned into our Numeracy guided curriculum to provide children with a sensory based provision, supporting children who are not quite ready or not able to access subject specific learning tasks.

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

## Getting started...... "I'm not good at maths"

Do you have any puzzles, board games, dominoes, playing cards, matching games at home? Yes? Then you have an appreciation of mathematics! You chose them or they were chosen for you. Presumably you like them....!

Do you enjoy the colours you see all around you, do you have a favourite colour? Do you enjoy creating patterns at home, in art lessons, in play? Do you notice patterns in nature? Leaves, pine cones, petals, bark on a tree. Maths was invented by nature and is everywhere you look, in fact there are specific numbers we see in nature all the time, together they are called the Fibonacci sequence. The Fibonacci sequence occurs frequently in nature, for example in the number of petals on most flower and the growth of the Nautilus sea shell.

Do you notice the shapes that are all around us. What shape is your front door? The equipment in the play park you visit? Your toast or eggs in the morning? Boxes that arrive from the postman. Are they all flat or are some three dimentional with edges and angles making up the shapes?

What numbers do you see when you go out for a walk? how do we pay for our shopping? how do we know how much it costs? What bus do you get on if you need to get into town/ home, how do you know? How do you find your friends house, do you need to know what number it is? Or what their phone number is? Numbers are everywhere and make up the world around us.

So what about line, shape and form? The furniture that fits into a room, the curtains or blinds that are the right size for a window, the cup that matches the saucer, the food placed on our plate, the ripples in water when a pebble is dropped in it, the bricks in a new building.

It is all there – you just have to look around you to see all of the natural and man-made mathematical number, shape, pattern and arrangement. It is a science and an art, math is all

around us, in everything we do. It is the building block for everything in our daily lives, including mobile devices, architecture (ancient and modern), art, money, engineering, and even sports.

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.

Mathematics is an important and highly creative discipline that helps us to understand and change the world. All pupils at Warmley Park School and College are able to experience the beauty, power and enjoyment of maths and develop and sense of curiosity about maths. We foster positive attitudes to maths and believe that 'We can all do maths!' We believe that teaching for a secure and deep understanding of mathematical concepts through manageable steps supports our pupils to make meaningful progress in maths. Mistakes and misconceptions are an essential part of learning and therefore we provide challenge and emotion coaching support to build resilience when mistakes are made.

It is the right of our children and young people of Warmley Park School and College to access a curriculum that supports their progression of skills over time, so our maths curriculum is always adapted and differentiated to individual needs. We know that our children and young people are best placed to tell us what works well for them in our maths curriculum, so we believe that it is our responsibility to listen, and be responsive to their voice.

The maths curriculum has been written specifically for the pupils at Warmley Park School and College. We have considered carefully the resources and approach that work best with our pupils and these are identified clearly in the curriculum guidance. The CPA approach is implemented throughout our school and college, it is woven through our maths curriculum showing the progression and steps needed for children to succeed in learning and using abstract numbers and symbols. It goes hand in hand with the Numicon approach that helps pupils to develop a deep understanding of maths as part of mastery learning. We are committed to embedding Numicon as our main approach to Numeracy: Number, pattern, and calculation, we also use Numicon to support children's learning in geometry, measure and statistics. An Action Research project will be carried out during 2020-21 to evidence its impact on progression of skills over time. The curriculum supports pupils to explore, use their senses, be creative, ask questions, evaluate, problem solve and work collaboratively.

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

- To experience awe and wonder of maths in nature and the environment, and to engage with it and enjoy it.
- > To be able to have an appreciation for maths.
- To use maths functionally, particularly money and time, so that they are able to access community facilities as independently as possible.
- > To feel a sense of pride and achievement in their skills and achievements.
- > To continue to connect with the creative, active and sensory elements of maths.
- > To be inspired and want to keep learning about maths and improving their skills.
- To continue to see errors as opportunities for learning, not just in maths, but as a life skill.
- > For maths to be a medium for furthering their communication skills.
- To understand maths as a way of structuring and organising their lives, such as schedules, timetables, calendars.
- To know how to count in different ways, such as verbally in different languages, Makaton, using Numicon, using objects.
- To have a range of tools to use that are concrete, pictorial and abstract, to support them as they move into adulthood.
- > To have experienced persevering in maths take forward this experience as a life skill.
- To have an understanding and awareness of working collaboratively and seeing the benefits of problem solving with people, rather than alone.

## **Cultural Capital**

The <u>Cultural Learning Alliance</u> has openly stated that the loose definition of 'cultural capital' by Ofsted allows schools to develop their own interpretation of what the phrase means in a way that is best for their school and pupils. They believe schools should define 'cultural capital' in a way to *"celebrate and embrace the different backgrounds, heritage, language and traditions of all the children living in this country"*.

Ofsted's view: As part of making the judgement about the quality of education, inspectors will consider the extent to which schools are equipping pupils with the knowledge and cultural capital they need to succeed in life. Our understanding of 'knowledge and cultural capital' is derived from the following wording in the national curriculum:

'It is the essential knowledge that pupils need to be educated citizens, introducing them to the best that has been thought and said and helping to engender an appreciation of human creativity and achievement.'

## Ofsted School Inspection Handbook 2019

United Nations Convention on the Rights of the Child

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

- 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.

## What does mathematics mean for pupils and students at Warmley Park and where does it fit into Education, Health, and Care Plans?

In Early Years, we promote cognitive, physical, emotional, linguistic, and spiritual development through Mathematics. Children may start formal education with very different backgrounds and experiences. Learning is set very much through a play framework where a wide range of stimulating resources are readily available for children to interact with. At the other end of their education, students in the college are preparing for life in the wider world, with an emphasis on equipping them with communication skills that they can use functionally, independence strategies, social interaction skills, an awareness of safe behaviour, and how to look after themselves physically and emotionally. An ambitious and well sequenced curriculum that enables the broadening of knowledge, skills, physical, creative, cultural and imaginative value of mathematics is therefore enriching for all of these life essentials.

There is often talk of fostering a love of the mathematics. For pupils with SEND they may need to have this prompted by adults who believe in the richness and value of the maths. As a subject area, it lends itself well to sensory exploration which comes way before purposeful subject knowledge and should always be the starting point. As an example, some pupils may just love the feel of objects in water, it is not about the intention of counting how many objects there are, but the sensation of felling the water between their fingers and using their hands to connect with the resources in the water.

The experiences children have with auditory, tactile, visual and movement stimuluses in maths sessions help them to develop their use of the seven senses of the body: touch, sight, taste, smell, hearing, vestibular and Proprioception. Children learn to feel, investigate and explore opening up a new world of sensations on and inside their bodies. This supports children with sensory processing and sensory integration difficulties, helping to make it possible to use the bodies more effectively within their environment.

Children experience social development opportunities through play session with other peers where they can enjoy sensory play, songs and rhymes with a group of children. They learn to explore large sensory shared trays e.g. "5 little ducks with water, plastic ducks and water sprays etc. Or through sensory group stories; sharing props and taking turns to use talking

tiles, vocas or other communication devices to express or request throughout the number story.

Mathematics can be widely incorporated into Education, Health and Care Plan provision and outcomes as it enriches opportunities for development of:

- Communication
- Fine motor skills
- Hand eye coordination
- Gross motor skills
- Social skills
- Creative thinking
- Emotional expression and connection
- Mental wellbeing
- Cognition acquiring knowledge and understanding
- Sensory exploration
- Problem solving and persistence
- Collaboration and team working
- Planning and evaluating
- Observation

"Imagination is more important than knowledge." – Albert, Einstein - German theoretical physicist- (1879-1955)

"Tell me and I forget. Teach me and I remember. Involve me and I learn." – Benjamin Franklin- (1706–1790)

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

Mathematics is a creative and highly inter-connected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.

We intend to deliver a curriculum that;

- Recognises that mathematics underpins much of our daily lives and therefore is of paramount importance in order that children **aspire** and become successful in the next stages of their learning.
- Gives each pupil a chance to **believe** in themselves as mathematicians and develop the power of resilience and perseverance when faced with mathematical challenges.
- Allows children to be a part of creative and engaging lessons that will **enhance** their learning and give them opportunities to master their skills.

- Engages all children and entitles them to the same quality of teaching and learning opportunities, striving to **achieve** their potential within our school community and at each stage of their learning.
- Provides equal opportunities for all children to access maths, develop their skills and knowledge and flourish.

### Culture

Spiritual, Moral, Social and Cultural development and British Values are held as central to the curriculum for all pupils. Children and Young People at Warmley Park School participate in exploring maths in nature and the outdoors through building sculptures and structures, arts projects, numbers in the environment, shapes of buildings, symbols we see in the community, patterns from different cultures, reflection opportunities on discoveries and the use of creativity and imagination in their learning.

#### **Imagination and Experimentation**

Maths is explored by children very early on, before they come to school. They pick up, mouth, throw and drop objects, listen and take part in counting songs and have every 'first' time they do something counted! They experiment with building blocks, watch it fall, and eventually start anticipating how high they can build before it topples. They start planning for which shapes they will use to create representations of concrete objects such as houses or cars. At these early stages of imagination and experimentation children rarely have inhibitions when things don't go as they wish them to. As a school we want to harness this resilience in early maths and ensure children continue to know that they can learn through experimentation.

#### Self-esteem

As a school we want to harness the resilience that young children experience through their natural exploration of early maths. Children need assurance that they can continue to learn through a mixture of experimentation, responding to their errors and adult support. We do this through providing the tools they need, recognition of their efforts and support to build their resilience across the curriculum. All adults need to be enablers, model positive attitudes, and support mistake making as a valuable tool for learning. We want pupils to feel resilient to try out new maths concepts and share learning, including learning from mistakes, with others. Pupils are expected to work individually and collaboratively and be reflective and evaluative in their work.

#### Thinking skills

Mathematics strengthens flexibility of thinking, critical thinking and problem solving skills. Problem solving is a key task, where children inquire into real world problem or solve open tasks. However, exploring mathematical reasoning is an integral and important part of the curriculum here at Warmley Park School and College. Mathematical reasoning (mathematical thinking that creates new knowledge and understanding in mathematics and tests and validates conjectures or solutions) alongside creative and critical thinking skills enhances pupils' cultural capital in maths. In maths, creative thinking occurs when pupils generalise,

such as analysing and identifying common properties or patterns across more than on case and communicating a rule to describe the common property, pattern or relationship. Critical thinking involves pupils learning to recognise or develop an argument. Pupils use logical argument when they are encouraged to test and justify reasoning, often through the use of open ended questions. We believe that all our pupils are able to explore maths creatively and that exploring and making mistakes is essential to learning, therefore our maths curriculum is based on giving pupils the mathematical tools so that they can be critical thinkers about maths, and test their reasoning.

## **Communication, including Language Development**

Communication is an essential part of maths and maths education. Communication is a way of sharing ideas and clarifying understanding. Through communication, ideas be reflected on, discussed, refined and amended. The communication process also helps build meaning and permanence for ideas.

Mathematical language has some distinctive features;

- Specific technical terms (fraction, probability)
- Specialist use of more general terms (line, frequency)
- Mathematical terms that use everyday words (difference, area)

Maths is also symbolic, has written sentences that look very different to a sentence in written English, and has a social dimension in the way staff and pupils use mathematical language every day in the classroom ('complete the <u>following</u>', 'chairs <u>under</u> the table'). Pupils are supported by an array of maths resources, including the Numicon and CPA approaches, and individual communication support systems to help them to think and communicate about maths.

#### **Motor Skills**

There is some evidence through research that learning maths while engaging the full body through physical movement can improve maths performance. The best results are achieved when the maths and motor skills are individualised. With this in mind, our curriculum provides a high level of large scale maths requiring physical activity such as: P.E lessons that include maths games e.g. making Numicon shapes using cones; colour sorting; hopscotch. Using large Numicon pieces to create number lines in class or outside, creating 2D shapes using large concrete objects. Lower intensity activities include: board games, puzzles, manipulating concrete objects, playing cards and dominos. Additionally, we have introduced the Numicon approach to learning about number, and this is a highly tactile resources that requires the use of fine motor skills.

#### Wellbeing

Children learn best when their wellbeing is good, when they experience enjoyment, selfconfident, self-esteem, resilience, are at ease, are able to be spontaneous and are free of emotional tension. We aim to capitalise on wellbeing when teaching maths, and reduce environments that would raise maths anxiety. Resilience is key in maths as we encourage pupils to face challenges, reflect on problems and try different strategies. Resilience is important in all aspects of a child's life at school and in the future, and we believe that focusing on this aspect of wellbeing through maths is essential.

Confidence and self-regulation are also extremely important so that our pupils feel emotionally able to access maths lessons. We tailor our teaching styles according to the SEND needs of our pupils so that individual needs can be met, for example, a pupil on the autistic spectrum may be more comfortable accessing maths via pattern and logic rather than through a social context, and a pupil with complex needs may be more comfortable accessing maths via sensory experiences rather than having someone count objects for them.

Maths needs to be a cultural activity, embedded in children's experiences, rather than being about children correctly performing mathematical operations. The emphasis for our curriculum is on flexibility, skills building, critical thinking and reasoning.

## **Socialisation**

It is natural for children to be interested in what other children and adults are doing, and with the emergence of their communication skills, to engage socially with others. In this way, ideas, strategies and opinions are shared and discussed, and new learning can take place. In terms of our maths curriculum, adults play a part in determining the knowledge and skills through modelling their attitudes and actions for the children. Throughout activities, adults act as positive role models for children to support mathematical development. Maths offers lots of opportunities for working collaboratively, involving delegation of tasks, and working jointly through problem solving tasks and reasoning through their answers together and with an adult.

#### **Cognition and learning**

Maths is taught as a discreet subject and cross-curricula which enriches our pupils' experience, knowledge, skills and understanding of maths in its broader, functional application. We believe that children and young people need work within their zone of proximal development which means that our maths lessons are individualised to their needs. Within the zone of proximal development children will inevitably make mistakes and we support them to be resilient to manage their feelings towards mistakes and help them to learn from them and progress.

## A bit of basic guidance..... Aka the Warmley Park way of doing maths.

Never, ever, ever assume that children are not taking in all of the maths vocabulary, language and knowledge that is being provided around them day to day. Children can suddenly 'connect' and everything that has been taught before just clicks into place and makes sense! Make sure ALL children have the experience of a rich mathematical experience.

Never, ever, ever just use closed questioning in maths lessons, children need a variety of questions to help them to think logically and use their fluency and reasoning skills. "I wonder..." is a good starting point.

Always give children enough time to 'have a go' themselves or to respond to a question or instruction you have said. Children's individual language processing skills need to be considered in every maths session, never rush pupils to answer or finish what they are doing. Make sure visuals are used as these are needed to support language and understanding.

Always use a Concrete, Pictorial and Abstract approach when teaching Numeracy to support children across the school to explore and learn mathematical concepts and skills. We strengthen children's knowledge so that they have a deep and sustainable understanding in Numeracy by moving between representations of CPA in lessons using a wide range of concrete objects, including Numicon, to support with visual and kinaesthetic learning. Provide a range of concrete objects in your maths lessons, children should use these whatever age they are. Do not remove these concrete objects or symbolic representations from children when they get in to secondary or collage: 'Manipulatives support understanding, reasoning and conceptual development across all ages and through all Key Stages'. The mastery approach means manipulatives are for everyone to use for concept exploration. Even if children appear to have grasped an idea, manipulatives support and extend learning further. When a pupil has worked out the answer using an abstract method, we can challenge them to use concrete resources to explain why they are correct.

Always ensure language is purposefully intertwined with our teaching approach as it strengthens the learning process and, as such, further develops understanding of the mathematical ideas being explored. Mathematical ideas develop as children make connections between real objects, symbols, language and pictures. This is known as the 'Connected model of learning mathematics', represented in this diagram by Haylock and Cockburn- (1989).



Remember the '5 principle of counting'. Following research from Gelman and Gallistel-(1978), it is vital we understand the five principles that govern and define counting: **The oneone principle-**This involves children assigning one number name to each object that is being counted. Children need to ensure that they count each object only once ensuring they have counted every object. **The stable-order principle**-Children understand when counting, the numbers have to be said in a certain order. **The cardinal principle**-Children understand that the number name assigned to the final object in a group is the total number of objects in that group. (In order to grasp this principle children need to understand the one-one and stableorder principle). **The abstraction principle**-This involves children understanding that anything can be counted including things that cannot be touched including sounds and movements e.g. jumps. Finally, **the order-irrelevance principle**-This involves children understanding that the order we count a group of objects is irrelevant. There will still be the same number.

And remember have fun, be creative and imaginative in maths. Make sure you use physical activities to support learning in maths lessons, maths should be enjoyable and exciting for ALL pupils!