Meadowside Community Primary & Nursery School

A Member of **The Challenge Academy Trust**

Science Curriculum Policy

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'Where Learners Grow'

Science Curriculum Policy

Multi Academy Trust Curriculum Intent

As a TCAT academy, our curriculum is designed based upon the principles set out in the OECD Learning Framework 2030. We will help every young person:

- develop as a **whole person**
- fulfil his/her **potential**
- contribute towards a future built upon the social and economic **well-being** of the **individual, the local community and the wider world**

Academies within TCAT will provide a broad and balanced curriculum which prepares young people for the social, economic and environmental challenges of modern living. We will encourage our young people to value individual and collective **well-being**, **prosperity** and **sustainability**.

We will promote the knowledge, skills, attitudes, beliefs and values necessary to support future ready young people who are able to exercise **'learner agency'** and to take responsibility for their own education and to **participate positively in the world**. We will do this by providing a **solid foundation** of language development which ensures literacy, numeracy, general knowledge, digital/technological competence, physical health & well-being and enable them to mobilise disciplinary and inter-disciplinary knowledge, cognitive and social skills and attitudes and values to meet complex demands.

Our Curriculum Intent

1. **Language Development**

Our curriculum aims to be talk and vocabulary rich to help counter inequality, widen access to learning and improve life opportunities [1]. Therefore, Language Development is key to the curriculum at Meadowside. Research has shown a language and communication deficit for some pupils, particularly pupils from low-income households. Our school has a higher level of deprivation among our pupils (see IDACI rating) and therefore language development is key to the educational success of our pupils. If we are to achieve our mission statement, ensuring that they fully access their next steps in education and go on to engage in the wider world work and to build a better future individually, locally and for the wider world**,** then language development must be central. Our curriculum aims to be talk and vocabulary rich to help counter inequality, widen access to learning and improve life opportunities. Talk can also foster empathy and understanding contributing to the development of our attitudes and values shown below.

- **Teaching of Oracy** is key to this language development**.** 'Great speakers are made, not born' (Gaunt and Stott) [2]. We aim to employ strategies throughout the curriculum to develop the physical, linguistic, cognitive and social and emotional aspects of learning.
- **'Dialogic teaching** harnesses the power of talk to engage interest, stimulate thinking, advance understanding, expand ideas, and build and evaluate arguments, empowering students for lifelong learning and democratic engagement.**'** (Alexander) [3]
- **Vocabulary Development** "By closing the vocabulary gap for children within our classroom with their peers, we can offer them the vital academic tools for school success, alongside the capability to communicate with confidence in the world beyond the school gates" (Quigley) [1]. Vocabulary development is pivotal to our curriculum and it is planned, sequenced and explicitly taught.
- **Reading** Dickenson et al [4] suggests that "reading offers our children the opportunity to hear new vocabulary items embedded in varied grammatical sentences. Books written for children use well-formed, relatively short sentences that are rich in varied vocabulary. Furthermore, books often use the same words in diverse grammatical constructions, offering implicit lessons in how words are used. The texts of books tend to have more low-frequency words than does spoken language [5] and books encourage use of a wider range of words than would occur in everyday conversations. Senechal and her colleagues [6], consistently finds that "parent reports of shared reading were a robust predictor of children's receptive and expressive vocabulary" (page 179). "

2. **Knowledge**

- The teaching of **knowledge** is central to our curriculum. Throughout the curriculum, both substantive and disciplinary knowledge is specifically chosen and deliberately sequenced to ensure retention over time. The teaching of knowledge is spaced and revisited in order to have long term impact, in line with the research of Foot-Seymour and Wiseheart [7]: 'If the goal is for students to retain as much information as possible, teachers need to be aware of **cognitive strategies** like the spacing effect so they can make small changes to their teaching practice to help students become more successful.'
- The curriculum is organised to enable children to build webs of knowledge (**schemas**), with explicit links being drawn between new and existing knowledge [8].
- According to Blooms, the teaching of knowledge underpins **critical thinking** and a child's ability to go deeper in their learning [9]. When knowledge is secure and links have been made, children are encouraged to take this knowledge deeper and apply this critically in different situations. Oracy development then allows children to express their thinking and views.

[1] The Vocabulary Gap, Chris Quigley
[2] Transforming Teaching and Learning Through Talk, Amy Gaunt and Alice Stott
[3] http://robinalexander.org.uk/dialogical-teaching (July 2020)
[4] How Reading Books Fosters Language Development and the World (November 2011)
[5] Beginning Literacy and Language: Young Children Learning at Home and School, D.K. Dickenson and P.O. Tabors (2001)
[6] A model of the concurrent and longitudinal relations between home literacy, M Senechal in Handbook for early Literacy Research, S.B Neuman and D. K. Dickinson (2011)
[7]Judging the credibility of websites: an effectiveness trial of the spacing effect in the elementary classroom, Foot-Seymour and Wiseheart (2022).

3. **Skills**

- **Cognitive and Meta cognitive strategies** are used by staff in delivering the curriculum, as we believe that the children need to know how best they learn in order to improve learner agency. Therefore, ideas such as cognitive load, working memory etc. are taught throughout the curriculum so that they can develop this understanding.
- While the teaching of disciplinary knowledge is key to progress in subjects, children require the opportunity to turn this knowledge to **practice and apply** skills. Our Curriculum planning ensures that these opportunities are embedded for all children.

4. **Attitudes and Values**

Personal

- Developing **growth mindset** [10]. Rather than simply praising success, we praise effort and persistence. We believe the best thing to do is to teach children to love challenges, be intrigued by mistakes, enjoy effort and keep on learning. For children who find work easy we make sure they encounter more difficult tasks. Our children recognise that effort, persistence and good teaching are what help them improve.
- Developing **intrinsic motivation** and **self-efficacy** [11]. Throughout the curriculum we aim for the children to see themselves as readers, writers, mathematicians, artists, musicians etc. We want their motivation for them to work in this way to be down to their understanding of themselves and the potential they have.
- We recognise the responsibility we have for the **physical development** and the **well-being** of our pupils. Our approach to our curriculum aims to build self-esteem, a respect for self and others, kindness and resilience, with staff modelling across the curriculum how to deal with challenge and adversity. We also have a role to ensure that pupils learn about what they can do to maintain positive mental health, what affects their mental health, how they can help reduce the stigma surrounding mental health issues, and where they can go if they need help and support. British Values permeate through the curriculum.
- Both the teaching of oracy and knowledge underpin the children's ability in **critical thinking** [9].

Local, Societal and Global

- As an Inclusion Quality Mark flagship school, **inclusivity** is key to our culture as a school. Within the curriculum, we aim to celebrate difference and **diversity**.
- **Sustainability** is one of the key themes that is going to prepare our children for life in the future. Key questions about sustainability form central parts of our curriculum.
- The **Rights Respecting** agenda plays a key role in school life at Meadowside and provides a strong ethos to foster purposeful learning attitudes and positive relationships. This initiative underpins the school's aims to provide a values-led curriculum. The children learn about their own responsibilities, through learning about their own rights and the rights of others, as set out by the United Nations Convention Rights of the Child (UNCRC).

5. Developing a love of science

At Meadowside, through quality first teaching, we apply a progressive model of science teaching, through which children develop a broadened scientific understanding of physical processes; properties, uses and changes of everyday materials and life processes of living things. We aim to enable pupils to develop a deeper understanding of a range of scientific ideas allowing children to explore and talk about their ideas; ask their own questions about scientific phenomena; and analyse functions, relationships and interactions more systematically. We aim for all our children to explore different ways of working scientifically by asking and answering scientific questions; evaluating evidence, and presenting their conclusions clearly and accurately; comparing and grouping; identifying and describing patterns; planning and carrying out scientific investigations, using equipment (including computers) correctly. Through working scientifically, we aim for them to understand more about the world we live in and develop a sense of excitement and curiosity about natural phenomena.

Within our science curriculum, we want to foster an enjoyment of the subject and love of learning about science. We believe that it is crucial that children are given the opportunities to ask questions and explore scientific concepts.

[8] Making Kids Cleverer, David Didau
[9] Taxonomy of Educational Objectives, BS Blooms (1965)

[10] Mindset, How you can Fulfil Your Poptential, Dr Carol S Dweck (2006)
[11] Toward a Psychology of Human Agency, Bandura, A (2006)

Implementation

Our Science curriculum is planned and sequenced so that new knowledge and skills build on what has been taught before. We recognise that new learning is fragile, so our approach is generative and sticky, enabling our pupils to make links between new and existing knowledge to aid long term retention. Learning is sequenced to ensure that there are opportunities for spaced learning and links between curriculum areas are explicit allowing children to build a detailed schema for across scientific disciplines and also across other subjects.

In Key Stage 1 and 2, Science is taught throughout the year in stand-alone lessons, with each year group completing one topic per half term. Each term is planned to include five 1 hour and 15-minute lessons and a full Science Day. Additional opportunities (such as British Science Week) are planned throughout the year for the enrichment of our curriculum. Within the curriculum, the key knowledge and skills for each year group can be seen in our progression maps. These have then been broken down into topics in our long and medium term planning, which class teachers then use to plan progressive and engaging lessons. Our medium-term planning ensures each session follows a sequence of learning that encourages our children to engage, explore, explain, elaborate and evaluate.

1. **Language development**

Within science, oracy opportunities are planned into the curriculum that allow children to develop the physical, linguistic, cognitive and social and emotional aspects of learning. Opportunities are planned that allow children to debate, present, explain, discuss key aspects of science and be able to give their opinions on all aspects of physics, chemistry and biology covered.

Dialogical teaching empowers students to challenge each other's views, expand ideas and build and evaluate arguments. We want the children to challenge each other's views that will lead them to a deeper understanding of the topics we are teaching. Group work is planned in and central to our teaching of science.

Development of vocabulary in science is vital in them closing the vocabulary gap to their peers from more affluent areas. Vocabulary is explicitly planned, taught and assessed, ensuring a thorough grasp of new language. Display boards within all classrooms are added to progressively from lesson to lesson in topics with key vocabulary. These can then be referred back to in the next lesson to promote sticky learning and to scaffold all children in retaining key language and information

Reading is a crucial part of the development of vocabulary and of language development. High quality texts and extracts of these texts are planned into our science curriculum and support a deeper understanding of new vocabulary within context. Well chosen, science-based texts are also used throughout the curriculum as class novels, guided reading texts and as part of science lessons as a basis for learning. A wide range of extracts from quality text-based sources are used to enhance science lessons across the school, enriching the children's experience and to promoting the application of reading skills where possible.

2. **Knowledge**

Our approach throughout the curriculum is generative, enabling pupils to make links between new and existing knowledge to aid retention. By the end of year 6, pupils will have a broadened scientific view of the world around them through biology, physics and chemistry. Development of both disciplinary and substantive knowledge is well sequenced to ensure that children know and remember more. This is shown within our progression maps for Science.

New knowledge is organised in such a way that ensures cognitive strategies, such as spaced repetition, are well thought through and planned. Following our whole school model for high quality teaching and learning (Appendix 1), we ensure that teaching strategies allow the children to learn more and remember more. The curriculum is organised to enable children to build webs of knowledge (schemas), with explicit links being drawn between new and existing knowledge. These links are highlighted within medium term plans to ensure that staff explicitly make these links when planning lessons.

When knowledge is secure and links have been made, children are encouraged to take this knowledge deeper and apply this critically in different situations. Assessments are made using open ended assessment tasks that allow children to take learning deeper, demonstrating their critical thinking skills.

Low stakes quizzes are used regularly to ensure that knowledge is remembered and retained. These form part of our assessment for learning in Science.

3. Skills

While the teaching of disciplinary knowledge is key to progress in subjects, children require the opportunity to turn this knowledge to practice and apply skills. Our Curriculum planning ensures that these opportunities are embedded for all children.

Scientific enquiry is planned in a progressive sequenced way through exploring, talking about, testing and developing ideas about everyday phenomena and the relationships between living things and familiar environments, and by beginning to develop their ideas about functions, relationships and interactions.

Children are encouraged to ask their own questions about what they observe and make some decisions about which types of scientific enquiry are likely to be the best ways of answering them, including carrying out simple comparative and fair tests and finding things out using secondary sources of information. They should draw simple conclusions and use some scientific language, first, to talk about and, later, to write about what they have found out. Pupils should draw conclusions based on their data and observations, using evidence to justify their ideas, and using their scientific knowledge and understanding to explain their findings

4. Attitudes and values

To develop the children's growth mindset, rather than simply praising success, we praise effort and persistence. We believe learning should be a challenge and within science, our children are allowed to make mistakes and learn from them. In science, we want learning to be challenging and encourage the children to take risks. Our approach to our curriculum aims to build self-esteem, a respect for self and others, kindness and resilience, with staff modelling across the curriculum how to deal with challenge and adversity.

We want our children to see themselves as scientists and develop self-efficacy and intrinsic motivation in science. From EYFS through to KS2, we give the children opportunities to be scientists and discuss the scientific skills that they are using to investigate and explore. We want children to celebrate the successes of making discoveries.

Local, Societal and Global

- As an Inclusion Quality Mark flagship school, **inclusivity** is key to our culture as a school. Within the curriculum, we aim to celebrate difference and diversity. Key scientists from a range of backgrounds are celebrated from a range of backgrounds and children are encouraged to find out more about them. Strategies are used (As highlighted below) to ensure that all children can make good progress in science. British Science Week will be a focus point across the school each year to promote the importance and potential of Science to our pupils. Our Science curriculum aims to promote diversity. We encourage pupils to discover more about famous scientists from a variety of cultural backgrounds.

- **Sustainability** is one of the key themes that is going to prepare our children for life in the future. Key questions about sustainability form central parts of our science curriculum.
- Teachers apply a range of strategies within lessons to enable the children to become invested in their education. Practical investigations and LYFTA sessions are selectively used by teaching staff to provide a purpose and structure for curriculum learning. We believe that it is vitally important for children to develop their own opinions and voice about science, the impact that key scientific findings have upon the world, how this relates to the children's own lives today and future developments.

5. Developing a love of science

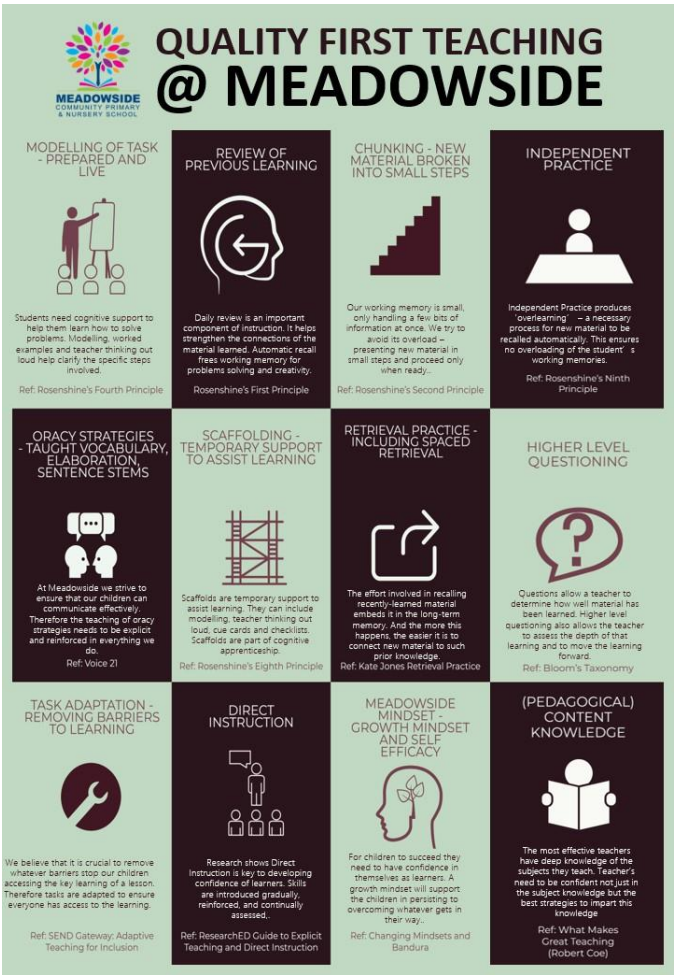
Opportunities to develop cultural capital are embedded into the curriculum so that children visit science museums and observatories at the right stages in their developments. Extra-curricular activities for specific year groups are planned such as visits from scientific experts or to places of scientific interest.

Children often find joy in their discoveries in science. Giving them opportunities to ask questions and explore their findings is key to this.

Additional enrichment opportunities are provided during British Science Week. Opportunities to further explore science. Links are made with other STEM subjects that allow the practical application of Science in other areas.

Quality First Teaching

Quality first teaching is central to the teaching of all subjects at Meadowside. Our understanding of cognitive science and research-based strategies means that we ensure these strategies are used in the teaching of science.



Assessment

Formative assessment is an integral part of daily lessons and is first and foremost the essence of helping making our pupils make instant progress in their scientific knowledge and in their skills. This is done through a mixture of high-level questioning, discussion, Oracy activities and written work.

We use live marking and feedback to enable teachers to target next steps for pupils effectively (See Feedback Policy). Opportunities for children to review and improve their learning are embedded into each lesson. Children are given the opportunity to evaluate their own work, and that of their peers. During and on completion of a piece of work, the teacher responds, identifying areas for development. Children's work is valued, celebrated and displayed around the class and school.

At the end of each term, a written report is given to parents that show whether a child is achieving the required standard in science, and these are discussed with parents with strategies to move learning forward being discussed and support for how to close gaps to age related levels if needed.

Each unit is assessed to show whether a child is at age related levels, exceeding, meeting or having not yet met these criteria. These provide a 'snapshot in time' of pupils' understanding related to age related expectations, help us to analyse current trends and also hone in on vulnerable groups that might require further support. If a child is working below, specific areas are fed back to parents to support learning and also highlighted in the assessments so that future teachers know what areas need more work to ensure a solid foundation to new learning.

Tracking of key groups allows for a better understanding of the ways that we structure to learning for the class ensuring that all groups are engaged in lessons and well supported.

SEND and Inclusion

At Meadowside we have high expectations of all our pupils. However, we recognise that for some pupils, additional support is needed to ensure they can access tasks and so that they can retain key learning. Tasks are adapted or scaffolded in such a was so as to ensure that they are provide suitable challenges that focus on the scientific learning and remove any barriers for learning that stop learning in science. Teachers use their pupil passports and appropriate assessments to help inform their planning. This way, a person-centered approach ensures progress is made and makes their learning a personalised experience.

At Meadowside, we want all learning to support independence wherever possible. Teachers will plan lessons so that pupils with SEND are able to successfully access the key content of the Science curriculum and ensure that no ceiling is placed on their learning and what they can achieve. Promoting independence, we allow the children to feel a sense of equality and belonging in their classroom environment.

Where appropriate, the following strategies could be used for pupils with SEND:

<u>Task Adaptation</u>

- Opportunities for overlearning key knowledge.
- Technology used for recording information. Video recording of work if writing is an issue/use of speechnotes programme or Clicker 7/a scribe/dictation tool on ipad.
- Web based learning for practice and learning of key knowledge.
- Use of concrete resources
- Voice recordings of step by step instructions
- Voice recordings of responses.
- Screen shots and photographs
- Voice recordings

Scaffolding

- Modeling of work specifically for a small group of children.
- Vocab mats highlighting specific vocabulary for a task
- Broken down instructions for a task.
- Sentence stems from board/worksheet
- Task organiser
- Use of concrete resources
- Further questioning
- Additional focused explanations
- Precision teaching of key knowledge.
- Additional oracy opportunities.
- Peer support.

Additional strategies for pupils will be highlighted as a part of the SEND strategy meetings and in consultation with other professionals. These form part of a child's pupil passport and support teachers in removing barriers for learning.

Where a child struggles with key aspects of learning, it is crucial that we highlight what is key knowledge for a child to move on with their learning. Progression maps highlight which knowledge is the basis for other knowledge later on within the science curriculum. Staff therefore provide time for overlearning of this key knowledge where it is deemed appropriate for these children. Support and CPD is given to staff to ensure they have a good understanding of what learning is key to move on. These children are discussed regularly with the SENCo.

Higher Attainers

Opportunities for higher attainers to take learning deeper are planned throughout the curriculum. Open ended tasks and high quality first teaching ensure that learning is taken deeper. Enrichment opportunities are planned throughout the year. Opportunities for children to explore careers in STEM are planned into the curriculum and accessed where appropriate. Visiting speakers, particularly those from similar backgrounds to our pupils are encouraged to come in and support classes in delivering key areas of science.

CPD for staff

CPD is planned for staff throughout the year and opportunities are planned into our yearly training in line with our school development plan. Staff are encouraged to also complete their own research. Medium term planning includes "Mastery For Teaching" recapping subject knowledge that will be needed to take learning deeper in science. Where appropriate, staff will also find this out by asking questions to staff. Over the past few years we have had support from the Science Learning Partnership at the the STEM Centre to ensure that Pedagogical Content Knowledge is well developed.

Monitoring of Science

The monitoring cycle is set out by the senior leadership team at the beginning of each academic year. Monitoring includes book looks, lesson visits, learning walks, pupil/staff voice surveys. Links with the high school are used to moderate and work is completed with the SLP (Science Learning Partnership). All monitoring undertaken serves to improve our practice, with the aim of bettering the outcomes for our pupils.

Transition to KS3

At Meadowside, we work closely with our feeder secondary schools to ensure a quality of provision that gives our pupils firm foundations for year 6. Pupils in Year 5 and 6 regularly access science transition lessons at the high school that allow them to show the knowledge that they have learnt and to ensure that learning in KS3 successfully builds on the foundations laid at KS2. A STEM curriculum hub ensures collaboration between these settings.

Impact

At Meadowside, we ensure that all students are exposed to rich learning experiences that:

● Enable all students to make good progress in their scientific knowledge, skills and vocabulary from whatever the students starting point may have been. We define good progress as knowing more and remembering more. It is the widening of knowledge, skills, understanding and behaviours.

● Children have self-efficacy and see themselves as scientists. They take an interest in the sciences which enable our children to develop a fascination of the world around them.

● We aim to inspire our children to become the next generation of scientists, engineers and environmentalists who love, look after and respect themselves, their communities and the world around them.10

● Our pupils experience a language rich Science experience which enables them to apply their knowledge as articulate citizens of the future discussing research, knowledge and developments.

● for our pupils to be resilient when exploring concepts and learning new scientific information.

● for pupils leaving us to be well prepared for the next stage in their lives, particularly for the further study of Science at KS3.

● for pupils to apply their knowledge in their own lives to enable them to have a good level of physical and mental well-being.