STEM
OCEAN ACADEMY

Purpose:
The purpose of this document is to outline the intent and implementation of the STEM curriculum at Ocean Academy. In response to the growing importance of science, technology, engineering and mathematics in the modern world, our curriculum has been reviewed to ensure it offers the best possible education and opportunities for our pupils. STEM at Ocean Academy develops children's curiosity, creativity, resilience, and collaboration skills through meaningful and practical projects. It ensures consistency and high expectations across the school, so all learners experience rich, engaging, and progressive STEM education.

Underpinning evidence:
- National Curriculum: Science, Mathematics, and Computing
- The forgetting curve, Ebbinghaus
- Cognitive Load Theory, Sweller
- Principles of Instruction, Rosenshine
- Metacognition and Self-regulated Learning, EEF
- Feedback, EEF Teaching and Learning Toolkit
- Mastery Learning, EEF Teaching and Learning Toolkit

Introduction and aims

STEM is an exciting, hands-on approach to learning that allows children to apply scientific knowledge, technological skills, engineering principles, and mathematical understanding to real-life challenges. Through purposeful projects, pupils work collaboratively to design, create, test, and evaluate, developing the ability to problem-solve and innovate.
At Ocean Academy, we aim to ensure that all pupils:
- Develop the technical, digital, and practical skills required to engage confidently with STEM challenges.
- Apply knowledge from multiple disciplines to solve problems in creative and resourceful ways.
- Experience and use a wide range of resources, materials and digital platforms.
- Build resilience and perseverance through repeated practice, testing, and refinement of ideas.
- Develop teamwork, communication, and leadership skills.

- Recognise the role of STEM in shaping the modern world and begin to explore STEM-related careers.

Intent – Sequencing and planning

At Ocean Academy, our curriculum is carefully sequenced to ensure:

- **Progression of challenge:** Each year group engages with a different STEM project that develops skills and understanding over time.
    - *Year 3:* Frisbee Challenge, Stop Animation
    - *Year 4:* Golf Challenge, Lego Electronics
    - *Year 5:* Car Challenge, Urban Art (TinkerCad)
    - *Year 6:* Bridge/3D Design, Battle Bots
- **Clear knowledge and skill development:** Pupils are explicitly taught the scientific and mathematical principles underpinning each challenge (e.g., forces in the Car Challenge, accuracy and measurement in Golf Challenge, digital modelling in Urban Art).
- **Integrated digital literacy:** Pupils learn to use technology effectively (e.g., Stop Animation apps, Lego robotics, TinkerCad CAD design).
- **Revisiting and building on prior learning:** Each project links to previous skills, allowing pupils to apply and extend their knowledge in new contexts.
- **Collaborative working:** All projects require teamwork, communication and problem solving. Pupils are supported to value each other's contributions and build collective solutions.

Build and apply knowledge and skills

At Ocean Academy, our curriculum ensures that:

- Pupils are given **real-life design challenges** (e.g., creating a vehicle to travel specific distances, programming a robot to navigate terrain).
- Time is provided for pupils to explore, design, create, test and evaluate, with opportunities to refine their designs.
- Pupils apply scientific principles (forces, friction, balance, energy transfer) and mathematical skills (measurement, accuracy, estimation, data collection) in meaningful contexts.
- Digital design tools (TinkerCad, Stop Animation, Lego Apps) are taught and used as part of problem solving.
- Pupils record and communicate their ideas in a variety of ways (sketches, prototypes, digital designs, presentations).

Critique, evaluate and reflect

At Ocean Academy, our curriculum ensures that pupils:

- Test their designs against clear success criteria (e.g. accuracy, distance, durability, creativity).
- Reflect on both process and outcomes, identifying what worked well and what could be improved.
- Develop the resilience to learn from failure and see mistakes as valuable stepping stones.
- Evaluate their own work and that of peers constructively, using key vocabulary and agreed design criteria.

- Recognise the wider impact of STEM on society and the environment, connecting their projects to real-world innovations.

Implementation – Pedagogy

STEM projects are planned and delivered in progressive blocks, allowing pupils to immerse themselves in hands-on learning. Each project is structured to provide:

1. **Introduction & context** – Key ideas, real-world examples, and background knowledge are introduced.
2. **Research & exploration** – Pupils investigate existing products and explore possible approaches.
3. **Explicit teaching of skills** – Teachers model specific techniques, breaking them down into manageable steps.
4. **Practice & application** – Pupils practise skills before applying them to their challenge.
5. **Design, build, test** – Pupils create prototypes, test them, and gather feedback.
6. **Evaluation & reflection** – Pupils critique their work and refine their outcomes.

Key features of pedagogy include:

- **Effective modelling and demonstration** (e.g., showing how to animate a Lego model or balance a car chassis).
- **Sequential practice** so learning builds logically across year groups and challenges.
- **Repeated practice** with opportunities to trial, adapt and improve designs.
- **Purposeful feedback** to guide pupils' improvement in skills and design thinking.
- **Maximum engagement in hands-on tasks**, ensuring children spend the majority of project time experimenting, building, testing, and refining.

Assessment

Assessment in STEM focuses on:

- Practical skill proficiency (e.g., construction, measurement, digital design).
- Application of scientific and mathematical knowledge in context.
- Ability to collaborate and problem-solve.
- Reflection and evaluation of both process and outcome.

Self-assessment, peer feedback, and teacher observations are used to track progress, supported by recorded evidence of learning (photos, videos, digital designs, and STEM journals).

SEND and inclusion

At Ocean Academy, STEM projects are planned and delivered to be accessible to all pupils, including those with additional needs. This includes:

- Adapted resources and tasks to support access and participation.
- Clear modelling and scaffolding to reduce cognitive load.
- Opportunities for all children to contribute within a team according to their strengths.
- Collaboration with the SENCO and external agencies where appropriate.

Monitoring and evaluation

STEM teaching and learning is monitored regularly to ensure consistency, high standards, and pupil progress. This includes:

- Learning walks and observations.
- Pupil voice to evaluate engagement and enthusiasm.
- Staff discussions to reflect on project successes and areas for improvement.
- Reviewing outcomes of projects (e.g., prototypes, animations, digital models).

Review

This policy is subject to yearly review by the STEM lead and SLT. Upon review, amendments will be made in line with the Academy Improvement Plan and shared with all staff.