England - Computing and technology KS2 Curriculum For Sustainability Complementing the KS2 Framework

Computing/ Design and Technology

Computing:

Learn about computer hardware, software, algorithms, and data representation.

Develop coding skills through programming activities, learn about internet safety, digital citizenship, and ethical considerations related to technology use.

Design and Technology (D&T):

Engage in designing, making, and evaluating products using a range of materials and tools.

Learn about the design process, including research, planning, prototyping, and refinement, and develop skills in problem-solving, creativity, and critical thinking.

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The Sustainability Curriculum Headings

Understanding Sustainability **(SUS1)**	Environmental Awareness **(SUS2)**	Environmental Stewardship **(SUS3)**	Waste Management **(SUS4)**	Energy Conservation **(SUS5)**	Biodiversity and Ecosystems **(SUS6)**
Climate Change and Adaptation **(SUS7)**	Food and Agriculture **(SUS8)**	Water Conservation **(SUS9)**	Sustainable Transport and Urban Planning **(SUS10)**	Citizenship / Global Responsibility and Sustainable Development **(SUS11)**	Outdoor Learning and Connection to Nature **(SUS12)**

Understanding Sustainability
Computing/ Design and Technology
Computing: **Understanding Sustainable Computing Practices:** Learn about the environmental impact of computer hardware production and usage, including energy consumption, electronic waste, and resource depletion. Explore ways to reduce the environmental footprint of technology, such as energy-efficient computing practices, electronic recycling, and

sustainable manufacturing processes.

Coding for Sustainability:

Develop coding skills through programming activities that focus on sustainability-related projects, such as creating apps or games that promote environmental awareness, recycling, or renewable energy.

Explore algorithms and data representation techniques to analyse and visualise environmental data, such as climate change trends or biodiversity maps.

Digital Citizenship and Ethical Considerations:

Learn about internet safety practices to protect personal information and prevent cyber threats.

Explore digital citizenship concepts, including responsible technology use, online etiquette, and the importance of respecting intellectual property rights.

Discuss ethical considerations related to technology use, such as the ethical implications of data collection, privacy violations, and the impact of technology on social and environmental justice.

Design and Technology (D&T):

Sustainable Product Design:

Engage in designing products with sustainability in mind, considering factors such as material selection, energy efficiency, recyclability, and lifecycle analysis.

Explore sustainable design principles, such as biomimicry, cradle-to-cradle design, and upcycling, to create products that minimise environmental impact.

Design Process and Problem-Solving:

Learn about the design process, including research, ideation, prototyping, testing, and evaluation, to develop sustainable solutions to real-world problems.

Develop problem-solving skills by identifying environmental challenges and designing innovative solutions using sustainable materials and technologies.

Critical Thinking and Evaluation:

Evaluate the environmental and social impacts of products and design decisions, considering factors such as carbon footprint, resource use, and social equity.

Reflect on the effectiveness of sustainable design solutions and propose improvements based on feedback and evaluation data.

Environmental Awareness

Computing/ Design and Technology

Computing:

Understanding Environmental Impact of Computing:

Learn about the environmental impact of computer hardware production, usage, and disposal, including energy consumption, electronic waste, and resource depletion.

Explore how digital technologies can contribute to environmental sustainability through efficient energy use, virtualisation, and cloud computing.

Coding for Environmental Awareness:

Develop coding skills through programming activities that address environmental issues, such as creating simulations to model climate change scenarios or developing apps to promote environmental conservation.

Learn about data visualisation techniques to represent environmental data effectively, such as creating graphs or maps to visualise air or water quality data.

Digital Citizenship and Ethical Considerations:

Understand the importance of responsible technology use and digital citizenship in promoting environmental awareness and sustainability.

Explore ethical considerations related to technology use and environmental impact, such as the ethical implications of data collection, privacy violations, and the role of technology in addressing environmental challenges.

Design and Technology (D&T):

Sustainable Product Design:

Engage in designing products with environmental sustainability in mind, considering factors such as material selection, energy efficiency, recyclability, and lifecycle analysis.

Explore sustainable design principles and techniques, such as eco-friendly materials, renewable energy sources, and sustainable manufacturing processes.

Environmental Research and Prototyping:

Conduct research on environmental issues and identify opportunities for innovative product designs that address sustainability challenges.

Use the design process to prototype and test environmentally friendly products, incorporating feedback and iterative improvements to enhance sustainability.

Problem-Solving and Critical Thinking:

Develop problem-solving skills by identifying environmental problems and proposing creative solutions using technology and design.

Apply critical thinking skills to evaluate the environmental impact of products and design decisions, considering factors such as carbon footprint, resource use, and ecological footprint.

Environmental Stewardship

Computing/ Design and Technology

Computing:

Understanding Environmental Impact of Computing:

Learn about the environmental impact of computer hardware production, usage, and disposal, including energy consumption, electronic waste, and resource depletion.

Explore strategies for minimising environmental impact in computing, such as energy-efficient hardware design, responsible disposal practices, and sustainable sourcing of materials.

Coding for Environmental Stewardship:

Develop coding skills through programming activities that promote environmental stewardship, such as creating applications to monitor energy usage, manage waste, or promote sustainable lifestyles.

Learn about algorithms and data analysis techniques used in environmental monitoring and management, such as analysing climate data or optimising energy efficiency.

Digital Citizenship and Ethical Considerations:

Understand the ethical implications of technology use on environmental stewardship, including issues related to data privacy, security, and digital rights.

Explore how digital citizenship principles can support environmental stewardship, such as promoting responsible use of technology for environmental advocacy and activism.

Design and Technology (D&T):

Sustainable Product Design:

Engage in designing products with a focus on environmental stewardship, considering factors such as eco-friendly materials, energy efficiency, and end-of-life disposal.

Learn about sustainable design principles and techniques, such as cradle-to-cradle design, biomimicry, and circular economy concepts.

Environmental Impact Assessment:

Conduct environmental impact assessments for design projects, evaluating the lifecycle environmental impacts of products and design decisions.

Use tools and methods to quantify environmental impacts, such as life cycle assessment (LCA), carbon footprinting, and environmental risk assessment.

Problem-Solving and Critical Thinking:

Apply problem-solving skills to identify environmental challenges and propose innovative solutions through design and technology.

Use critical thinking skills to evaluate the environmental consequences of design choices and make informed decisions to minimise negative impacts and promote sustainability.

Waste Management

Computing/ Design and Technology

Computing:

Understanding E-Waste Management:

Learn about electronic waste (e-waste) generated from computer hardware and peripherals, including the environmental and health hazards associated with improper disposal.

Explore strategies for managing e-waste, such as recycling, refurbishment, and responsible disposal practices, and understand the role of regulations and policies in e-waste management.

Coding for Waste Reduction:

Develop coding skills through programming activities aimed at reducing waste generation and promoting recycling and reuse.

Create applications or games that raise awareness about waste management practices, encourage recycling behaviour, or facilitate the exchange of reusable items within communities.

Data Analysis for Waste Tracking:

Learn about algorithms and data representation techniques used in waste management, such as data visualisation, statistical analysis, and predictive modelling.

Use coding skills to develop applications for tracking and analysing waste generation patterns, identifying areas for improvement, and optimising waste management processes.

Design and Technology (D&T):

Sustainable Product Design for Waste Reduction:

Engage in designing products with a focus on waste reduction and circular economy principles, considering factors such as material selection, durability, and end-of-life recyclability.

Explore design strategies for minimising packaging waste, reducing product obsolescence, and promoting repairability and upgradability.

Waste Audit and Reduction Strategies:

Conduct waste audits to assess the types and quantities of waste generated in design and technology projects, including both material waste and digital waste.

Develop waste reduction strategies, such as material reuse, recycling, composting, and waste minimization techniques, and implement them in design projects.

Problem-Solving and Critical Thinking:

Apply problem-solving skills to identify waste management challenges and propose innovative solutions through design and technology.

Use critical thinking skills to evaluate the environmental and social impacts of waste management practices and make informed decisions to minimise waste generation and promote sustainability.

Energy Conservation

Computing/ Design and Technology

Computing:

Understanding Energy Consumption of Devices:

Learn about the energy consumption of different computer hardware components, including processors, graphics cards, and peripherals, and how they contribute to overall energy usage.

Explore methods for measuring and monitoring energy usage, such as software utilities and built-in system tools, and understand the importance of energy efficiency in reducing environmental impact.

Coding for Energy-Efficient Software:

Develop coding skills through programming activities aimed at optimising software for energy efficiency.

Implement algorithms and programming techniques that minimise computational resources, reduce power consumption, and promote energy conservation in software applications and systems.

Digital Citizenship and Ethical Considerations:

Learn about digital citizenship and ethical considerations related to energy use in computing, including the environmental impact of data centres, cloud computing, and internet infrastructure.

Explore ways to promote responsible energy use in digital technology, such as through energy-efficient programming practices, power management features, and sustainable data storage solutions.

Design and Technology (D&T):

Designing Energy-Efficient Products:

Engage in designing products with a focus on energy efficiency and sustainable design principles, considering factors such as power consumption, renewable energy sources, and lifecycle energy use.

Explore design strategies for optimising energy efficiency in electronic devices, such as low-power components, energy-saving features, and intelligent power management systems.

Prototyping and Testing for Energy Conservation:

Use prototyping tools and techniques to create models and prototypes of energy-efficient products, including circuit design, electronic components, and user interfaces.

Conduct tests and evaluations to measure the energy consumption and performance of prototypes, identify areas for improvement, and refine designs to maximise energy conservation.

Problem-Solving and Critical Thinking:

Apply problem-solving skills to identify energy conservation challenges in product design and development.

Use critical thinking skills to evaluate the environmental and economic impacts of energy-efficient design choices and make informed

decisions to optimise energy use and promote sustainability.

Biodiversity and Ecosystems

Computing/ Design and Technology

Computing:

Understanding Biodiversity Data Representation:

Learn about the role of computer algorithms and data representation in modelling biodiversity and ecosystems.

Explore how data structures such as arrays, lists, and trees can be used to store and analyse information about species diversity, population dynamics, and ecological interactions.

Coding for Environmental Monitoring:

Develop coding skills through programming activities aimed at creating software tools for environmental monitoring and conservation.Design algorithms and programs to collect, process, and analyze biodiversity data from sources such as wildlife cameras, environmental sensors, and citizen science projects.

Digital Citizenship in Conservation Efforts:

Learn about digital citizenship in the context of biodiversity conservation, including ethical considerations related to data privacy, open

access, and responsible use of technology in environmental research and management.

Explore how digital technologies such as geographic information systems (GIS), remote sensing, and machine learning can support conservation efforts and promote biodiversity awareness.

Design and Technology (D&T):

Designing Eco-Friendly Products:

Engage in designing products that promote biodiversity and ecosystem health, considering factors such as habitat preservation, wildlife protection, and sustainable resource use.

Explore materials and manufacturing processes that minimise environmental impact and contribute to ecosystem conservation, such as recycled materials, biodegradable components, and eco-friendly production methods.

Prototyping Nature-Inspired Solutions:

Use design and prototyping tools to develop nature-inspired solutions for biodiversity conservation and ecosystem restoration.

Create models and prototypes of products or systems that mimic natural processes, promote biodiversity, and address environmental challenges such as habitat loss, pollution, and climate change.

Problem-Solving for Environmental Sustainability:

Apply problem-solving skills to identify biodiversity and ecosystem conservation challenges and develop innovative solutions.

Use critical thinking and creativity to evaluate the effectiveness of design solutions in supporting biodiversity conservation goals and promoting sustainable development practices.

Climate Change and Adaptation

Computing/ Design and Technology

Computing:

Understanding Climate Data Representation:

Learn about the role of computer algorithms and data representation in modelling climate patterns, trends, and projections.

Explore how data structures such as matrices, grids, and time series can be used to store and analyze climate data from various sources, including weather stations, satellites, and climate models.

Coding for Climate Analysis:

Develop coding skills through programming activities aimed at analysing climate data and simulating climate scenarios.

Design algorithms and programs to process and visualise climate data, identify trends, and assess the impact of climate change on ecosystems, communities, and infrastructure.

Digital Citizenship in Climate Action:

Learn about digital citizenship in the context of climate change mitigation and adaptation, including ethical considerations related to data accuracy, transparency, and accessibility.

Explore how digital technologies such as data analytics, remote sensing, and geographic information systems (GIS) can support climate resilience efforts and empower communities to take action against climate change.

Design and Technology (D&T):

Designing Climate-Resilient Solutions:

Engage in designing products and systems that address the impacts of climate change and promote adaptation strategies.

Explore innovative design concepts for climate-resilient infrastructure, renewable energy systems, sustainable agriculture practices, and disaster preparedness measures.

Prototyping Climate Adaptation Technologies:

Use design and prototyping tools to develop climate adaptation technologies and solutions that enhance resilience to extreme weather events, sea-level rise, and other climate-related hazards.

Create models and prototypes of products or systems that incorporate climate data, simulation results, and stakeholder input to inform design decisions and improve effectiveness.

Problem-Solving for Climate Resilience:

Apply problem-solving skills to identify climate-related challenges faced by communities and develop adaptive solutions.

Use critical thinking and creativity to evaluate the feasibility, scalability, and sustainability of design solutions in addressing climate impacts and promoting resilience at local, regional, and global scales.

Food and Agriculture

Computing/ Design and Technology

Computing:

Data Analysis for Agricultural Trends:

Learn how computer algorithms and data representation are utilised in analysing agricultural data, including crop yields, soil health, weather patterns, and market trends.

Develop skills in using spreadsheets, databases, and statistical software to organise, analyse, and visualise agricultural data sets.

Coding for Agricultural Automation:

Explore coding concepts and programming languages used in developing agricultural automation systems, such as monitoring sensors, irrigation controllers, and robotic machinery.

Develop basic coding skills to write scripts or programs that automate routine tasks in farming operations, such as data logging, pest monitoring, and greenhouse climate control.

Digital Tools for Farm Management:

Learn about the use of digital tools and mobile applications in farm management, including crop planning, inventory tracking, and financial analysis.

Explore how cloud computing, Internet of Things (IoT) devices, and mobile technologies can improve efficiency and decision-making in agricultural production.

Design and Technology (D&T):

Designing Sustainable Farming Systems:

Engage in designing products and systems that promote sustainable agriculture practices, including organic farming, permaculture, and agroforestry.

Explore innovative design concepts for farm infrastructure, equipment, and tools that enhance soil health, water conservation, and biodiversity.

Prototyping Agricultural Technologies:

Use design and prototyping tools to develop agricultural technologies and solutions that address specific challenges in food production, such as crop pests, soil erosion, and water scarcity.

Create models and prototypes of farm equipment, irrigation systems, and renewable energy solutions to test functionality and effectiveness in real-world conditions.

Problem-Solving for Food Security:

Apply problem-solving skills to identify food security issues in local and global contexts and develop creative solutions that increase access to nutritious food and reduce food waste.

Use critical thinking and collaboration to evaluate the social, economic, and environmental impacts of different agricultural practices and technologies on food systems and communities.

Water Conservation

Computing/ Design and Technology

Computing:

Data Analysis for Water Usage:

Learn how computer hardware, software, and algorithms are used to collect, analyse, and visualise data related to water consumption, usage patterns, and resource management.

Develop skills in using spreadsheets, databases, and data visualisation tools to identify trends, monitor water usage, and assess the effectiveness of conservation efforts.

Coding for Water Monitoring Systems:

Explore coding concepts and programming languages used in developing water monitoring systems, such as IoT sensors, data loggers, and remote sensing technologies.

Develop basic coding skills to write scripts or programs that automate data collection, analysis, and reporting for water quality, quantity, and distribution.

Digital Tools for Water Conservation:

Learn about digital tools and applications that promote water conservation practices, including water usage calculators, leak detection systems, and smart irrigation controllers.

Explore how technology can be leveraged to optimise water use efficiency, reduce wastage, and promote sustainable water management practices at home, school, and community levels.

Design and Technology (D&T):

Designing Water-Saving Devices:

Engage in designing products and systems that promote water conservation and efficiency, such as low-flow faucets, water-saving appliances, and rainwater harvesting systems.

Explore innovative design concepts for water-efficient gardens, landscapes, and urban infrastructure that minimise runoff, erosion, and water pollution.

Prototyping Water Management Solutions:

Use design and prototyping tools to develop water management solutions that address specific challenges, such as water scarcity, drought resilience, and flood prevention.

Create models and prototypes of rain gardens, permeable pavements, and green roofs to test their effectiveness in capturing, storing, and filtering rainwater.

Problem-Solving for Water Sustainability:

Apply problem-solving skills to identify water conservation issues in local and global contexts and develop creative solutions that promote sustainable water use and protection of water resources.

Use critical thinking and collaboration to evaluate the social, economic, and environmental impacts of different water management strategies and technologies on ecosystems and communities.

Sustainable Transport and Urban Planning

Computing/ Design and Technology

Computing:

Transport Data Analysis:

Learn how computer hardware, software, and algorithms are utilised to collect, process, and analyse transportation data, including traffic patterns, vehicle emissions, and public transit usage.

Develop skills in using programming languages and data visualisation tools to interpret transportation data and identify trends, challenges, and opportunities for sustainable transport solutions.

Traffic Simulation Modeling:

Explore computational modelling techniques used in urban planning and traffic engineering to simulate and optimise transportation systems, such as traffic flow, congestion management, and road network design.

Develop coding skills to create basic traffic simulation models and scenarios, allowing experimentation with different transport policies and

infrastructure changes.

Digital Mapping for Urban Planning:

Learn about Geographic Information Systems (GIS) and mapping software used in urban planning and transportation management.

Develop proficiency in using digital mapping tools to analyse spatial data, plan transportation routes, identify bike lanes and pedestrian pathways, and assess accessibility and connectivity in urban areas.

Design and Technology (D&T):

Designing Sustainable Transport Solutions:

Engage in designing innovative transportation solutions that promote sustainability, such as electric vehicles, bike-sharing systems, and pedestrian-friendly streetscapes.

Use design thinking principles to consider user needs, environmental impact, and social equity when developing transportation prototypes and concepts.

Prototyping Urban Infrastructure:

Utilise design and prototyping tools to create physical models and digital simulations of urban infrastructure projects, including bus stops, bike racks, and green transportation hubs.

Experiment with materials and fabrication techniques to construct prototypes that demonstrate the functionality, durability, and aesthetic appeal of sustainable transport infrastructure.

Problem-Solving for Urban Mobility:

Apply problem-solving skills to analyse transportation challenges in urban areas, such as traffic congestion, air pollution, and carbon emissions.

Collaborate with peers to brainstorm and develop creative solutions that address these challenges, considering factors like multimodal transportation, transit-oriented development, and smart city technologies.

Citizenship / Global Responsibility and Sustainable Development

Computing/ Design and Technology

Computing:

Digital Citizenship and Online Safety:

Learn about the importance of responsible digital citizenship, including ethical online behaviour, cyberbullying awareness, and protecting personal information.

Develop knowledge of internet safety practices, such as creating secure passwords, recognizing phishing scams, and understanding the consequences of online actions.

Coding for Social Good:

Use coding skills to develop projects that address global challenges and promote social responsibility, such as creating educational games, apps, or websites focused on environmental conservation, human rights, or cultural diversity.

Explore the role of technology in advancing the United Nations' Sustainable Development Goals (SDGs) and develop coding projects aligned with specific SDGs, such as poverty alleviation, quality education, or climate action.

Data Ethics and Privacy Awareness:

Gain an understanding of data ethics principles and the importance of privacy protection in the digital age.

Explore ethical considerations related to data collection, usage, and sharing, and learn how algorithms and artificial intelligence can impact individuals, communities, and society as a whole.

Design and Technology (D&T):

Designing Solutions for Global Challenges:

Engage in designing products or solutions that contribute to global sustainability, social justice, or humanitarian efforts.

Apply design thinking methodologies to identify real-world problems, conduct research, and develop innovative solutions that address local or global issues, such as access to clean water, renewable energy, or healthcare services.

Cultural Sensitivity and Inclusivity:

Learn about cultural diversity, equity, and inclusion in design and technology.

Explore how products and technologies can be designed to be inclusive and accessible to people from diverse backgrounds, abilities, and cultures, and consider the ethical implications of design decisions on different communities.

Community Engagement and Collaboration:

Collaborate with peers to design and create products or projects that foster community engagement, civic participation, and social responsibility.

Use design and technology skills to develop interactive installations, public art, or digital platforms that promote dialogue, awareness, and action around local or global issues of importance.

Outdoor Learning and Connection to Nature

Computing/ Design and Technology

Computing:

Environmental Monitoring and Data Collection:

Use sensors and microcontrollers to collect environmental data such as temperature, humidity, and air quality during outdoor activities.

Develop coding skills to program data logging devices and create algorithms to analyse and visualise collected data, allowing for deeper understanding of local ecosystems and environmental changes.

Geospatial Technology and Mapping:

Explore the use of geographic information systems (GIS) and mapping software to create interactive maps of outdoor environments, including trails, habitats, and biodiversity hotspots.

Learn to integrate GPS data, satellite imagery, and environmental data layers to map features, track changes over time, and plan outdoor learning experiences.

Citizen Science and Environmental Projects:

Participate in citizen science initiatives by using computing tools and digital platforms to contribute data to environmental research projects.

Engage in collaborative projects that involve collecting, analysing, and sharing environmental observations with scientific communities, educators, and conservation organisations.

Design and Technology (D&T):

Outdoor Product Design and Prototyping:

Design and create outdoor learning tools and resources that promote exploration, observation, and interaction with nature.

Use a variety of materials and tools to prototype and construct outdoor educational materials, such as nature journals, field guides, birdhouses, or insect habitats.

Sustainable Design Practices:

Explore sustainable design principles and apply them to outdoor product design and fabrication.

Consider the environmental impact of materials, manufacturing processes, and product lifecycle, and develop innovative solutions that minimise waste, conserve resources, and support biodiversity.

Nature-inspired Design Challenges:

Participate in design challenges that draw inspiration from nature, such as biomimicry projects that emulate natural forms, structures, and functions.

Encourage creativity and critical thinking by asking students to design outdoor installations, shelters, or play spaces that blend harmoniously with the natural environment and promote environmental stewardship.