AQA
Questions matter

Climate Change and Sustainability in GCSE Design and Technology



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Introduction

AQA have put together this resource with the support of the Royal Meteorological Society (RMetS), the professional and learned Society for weather and climate, to support teachers with teaching the sustainability and climate change elements of the AQA GCSE Design and Technology specification.

Sustainability and climate change feature explicitly in several areas of the specification and are relevant to the nature of the subject of Design and Technology in almost all areas. Several resources could be used across several specification areas.

Teachers are asking for ideas and resources to help teach this important content. Learners are asking to be taught about more than just the causes and effects of climate change. They want to learn about what solutions are being researched and how they can develop a sense of agency so that they can take action in their own lives and be prepared for green careers.

We've written this resource to:

1. Identify the sustainability and climate change content in the specification.
2. Suggest questions to help bring ideas together in lessons
3. Suggest teaching activities
4. Suggest online resources if available

The Impartiality Guidance issued by the DfE makes clear that climate change denial has no validity and teaching about climate change, the scientific facts and evidence behind it, would not constitute teaching about a political issue.

It is also worth noting that some of the materials will overlap with content from other subjects. Chemistry and Geography, in particular, share several key topics and it would be advisable to plan accordingly with colleagues from these subjects.



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How to use this resource

We've designed the information in this pack for you to use alongside your scheme of work with as much or little adaptation to the scheme as you choose. Use of this resource is entirely optional and supports the GCSE Design and Technology specification. There is no expectation that teachers will include the material in this resource in their delivery of the GCSE Design and Technology specification. The author has no awareness of any future GCSE Design and Technology exam questions



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Overview resources

Curriculum_Climate_Action_Project 2020.pdf (wwf.org.uk)

This document from WWF outlines the 2020 Climate Action Project, providing a comprehensive framework for integrating climate education into the curriculum, with the goal of empowering students to take meaningful action on climate change.

Climate Change Education in Schools | Campaign against Climate Change (campaigncc.org)

The Campaign against Climate Change provides resources and advocacy through this guide to promote the inclusion of climate change education in schools, encouraging students to understand and engage with the climate crisis.

Sustainable design and manufacture | STEM

This STEM resource introduces the principles of sustainable design and manufacturing, offering educational materials that support the teaching of environmentally responsible design in the classroom.

WWF Schools sustainability PDF spreads_0.pdf

WWF's Schools Sustainability guide provides educational resources and activities aimed at fostering a deeper understanding of sustainability and encouraging students to take positive environmental actions.



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Specific resources

Specification Point	Link to other areas of the specification	Linking/Big questions	Activity suggestions .	Resources
3.1.1 New and emerging technologies		How do hydrogen and electrically fuelled vehicles support sustainability?	Students research how hydrogen powered cars work.	Hydrogen Powered Cars -An Article in Catalyst: Secondary Science Review via STEM Learning
3.1.1 Enterprise		How can businesses consider their sustainability responsibilities? What is greenwashing? How does fair trade impact climate change? What is carbon inequality?	Students understand and identify examples in everyday life of 'greenwashing'. Students explain the meaning of the term 'carbon inequality' and discuss the issues surrounding it.	Video: What is Greenwashing? Newsround. Teaching Resources: Carbon inequality lesson, information and quiz. Fairtrade Foundation.
3.1.1 Sustainability		What is the impact of resource consumption on the planet? Finite, Non-finite and the disposal of waste. How can we eliminate waste by design?	Students break into groups to produce presentations on their research into eliminating waste and pollution.	Notes and Videos: Eliminate Waste and Pollution. Ellen Macarthur Foundation. Video: Waste. Ministry of Eco Education.
3.1.1 Sustainability		What are carbon emissions and what is their contribution to global warming?	Class discussion about the UK's responsibility in the global climate change crisis.	An overview of the UK's carbon emissions and contribution to climate change.

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3.1.1 Culture and Society		In fashion, how has climate awareness influenced choices?	Student debate: Should fashion be vegan?	Vegan Society: The Rise of Vegan Fashion. Presentation. Vogue: Is 'Vegan Fashion Really Better For The Planet?'
3.1.1 Environment		See all other areas.	Content can be taken from all other areas e.g. Positive and negative impacts new products have on the environment: continuous improvement, efficient working, pollution, global warming.	
3.1.1 Critical evaluation informs design decisions		What is planned obsolescence and how does it affect the environment? How can we design for maintenance?	Students identify products in their life they believe to have planned obsolescence and investigate them. Students to identify ways to design products to last longer.	Trailer for 'The lightbulb conspiracy' (A good introduction/hook to a lesson.)

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3.1.2 Energy generation and storage		What is renewable energy? What are the advantages and disadvantages to each different type of energy?	Explain the difference between renewable and non-renewable energy, can students group the different types? Students research and present on the main renewable energy sources: Wind, solar, tidal, hydroelectric and biomass.	Teacher Pack of resources from the Geological Society via STEM Learning. Energy Resources. (lower ability aimed at 11-14) Video: Solar Energy. Khan Academy Notes: What is Hydroelectric power? Khan Academy Notes and videos: Renewable Energy BBC Bitesize Notes: Energy Storage. BBC Bitesize Video: Imagining a world without fossil fuels. BBC Ideas
3.1.2 Fossil Fuels		How is power is generated from coal / gas /oil ?	Class debate: Arguments for and against the selection of fossil fuels.	Fossil Fuels and Alternative Energy Digital Flashcards. Brainscape Video: Electricity Generation: Non Renewables. Pumpkin Interactive via STEM learning.
3.1.2 Nuclear Power		How is nuclear power is generated?	Class debate: Arguments for and against the selection of nuclear power.	Nuclear Energy: Lesson Plan. Calacademy (US Resource)

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3.1.2 Renewable Energy	**3.1** Energy generation and storage	How is power generated from wind / solar / tidal / hydro-electrical / biomass.	Students create a news report (written, video, or podcast) about recent developments in renewable energy technology or policy. They should use reputable sources and focus on UK-specific news where possible.	Renews.biz: an example renewable energy news site.
3.1.2 Energy storage systems inc. batteries.		What are kinetic pumped storage systems? How do alkaline and re-chargeable batteries work?	Quiz	Seneca Quiz: Energy Storage Systems
3.1.3 Developments in new materials		What are biodegradable ('green') materials and how can we use them?	*There is an opportunity for a practical learning experience:* Making bioplastic. Students research different natural, biodegradable materials.	How to make bioplastic? Step by Step guide WikiHow Video: Plastic made from seaweed. Video: How Banana waste is turned into rugs, fabric and hair extensions
3.1.6.1 Papers and boards		What are the key sustainability concerns associated with paper and boards? What are the alternatives and are they better or worse?	Discussion about whether paper is more environmentally friendly than polymers and why/ why not.	How paper is making a comeback - BBC Which is more environmentally friendly: Paper or plastic?

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3.1.6.1 Natural and manufactured timbers	**3.2.3** Deforestation, mining, drilling and farming.	What is sustainable timber? What is deforestation? What do we mean by 'trees are carbon sinks?	Students design a campaign to protect forests and make the use of timber even more sustainable.	Video: The sustainable system of timber production. Pumpkin Interactive via STEM Learning. Forestry England: Climate Change resources for teachers
3.1.6.1 Metals and Alloys		How can we use metals sustainably?	Students to debate the advantages and disadvantages of recycling metals with industrial processes.	Video: Rexam's Full Circle Film. The lifecycle of an aluminium can. Cool facts about metal recycling. BMRA Video: Recycling Metals. FuseSchool
3.1.6.1 Polymers		What are the key sustainability concerns associated with polymers?	Students to identify different types of plastic from school waste/ recycling bins and categorise it into how easy it is to recycle. There is an opportunity for a practical learning experience. Collecting HDPE bottle tops and reforming them into other items using a panini press.	Notes and explainers: The seven types of plastic. London Recycles. Notes and infographics: Plastic Recycling. British Plastics Federation. Video: Lifecycle of a plastic bottle. TED-Ed Video: HDPE reforming with a panini press. CLEAPSS

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3.1.6.1 Textiles		What is the climate impact of fast-fashion?	Students create presentations for a campaign to make fellow students rethink their clothes shopping habits and choices based on their research.	Interactive activity: The story behind your t-shirt. Newsround BBC. Video: The true cost of fast fashion. The Economist. Scheme of work / Lesson plans. Sustainable Education through the topic of clothes. 'Behind the Seams' TRAID Education toolkit.
	3.2.4 Sources and origins	What is the climate impact of organic v. non-organic cotton	Debate: Is cotton good or bad for our environment?	Video: Unravelling the Thread: The Story of Cotton' Fairtrade Foundation Video: The life-cycle of a t-shirt. TED-Ed
3.2.3 Deforestation, mining, drilling and farming.	**3.1.6.1** Natural and manufactured timbers	How can we improve how we extract raw materials or rethink the processes?	Students debate the pros and cons of Deforestation, mining, drilling and farming. Role play: some students are campaigning to limit the process, some students are part of the planning team to increase it.	Why deforestation matters – and what we can do to stop it. National Geographic The environmental problems caused by mining. Earth.org Video: What is Fracking? in 45 seconds. Video: Can we create the perfect farm? TED-Ed.

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3.2.3 Mileage of product from raw material source, manufacture, distribution, final disposal.		How can we assess a product's impact on the environment at every stage of its life? What is the mileage of a product throughout its life, from raw material source, manufacture, distribution and final disposal.	Students look at the labels in their clothes and discover how many miles the clothes they are wearing have travelled. Students produce a presentation on the local community's local products /produce and explain why it is better to buy local.	Teaching resources: Glass, from cradle to grave. RE Sources. Food miles calculator: Foodmiles.com Lesson Ideas: Where does my stuff come from? Royal Geographical Society.
3.2.3. The 6Rs		What are the 6Rs of sustainability? How do they relate to product design?	Match up the definitions of each R with the name of it. Students should rank the Rs into priority order, of which society should do first when considering being sustainable.	Card sort, worksheets, wordsearch and presentation. 6Rs. Practical Action. Video: 6Rs of Sustainability.
3.2.3 Ecological and social footprint		What is our impact on the environment through the decisions we make when interacting with products?	Students to reflect on their product consumption and their personal ecological and social footprint.	Environmental Footprint Calculator – A 5 minute quiz.
		What is oceanic pollution? What is air pollution?	Students to discuss recent designs and inventions to help clean up our oceans. Students to reflect on the air quality in their area.	World Ocean Day resources for schools – Gov.uk Video: Australian 'Seabins' cleaning our oceans The ocean clean-up – 2 minute video footage Clean Air Calculator – 5 minute quiz

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3.2.4 Sources and origins	**3.1.6.1** Textiles	What are the basic principles in carrying out a life cycle assessment of a material or product?	Students carry out LCA investigations into simple products and feedback to the class.	Product Lifecycle Analysis worksheet, presentation and teacher notes. Practical Action Video: The life-cycle of a t-shirt. TED-Ed Video: Lifecycle of a plastic bottle. TED-Ed
3.2.7 Scales of production		Are we manufacturing the right amounts of the right things?	Discuss the environmental implications to mass, batch and one-off manufacture.	Video: Are we manufacturing sustainably? IET EngShorts
3.3 Designing and making principles		How can we design with sustainability in mind? Should designers always consider the environment when designing?	Challenge students to design solutions to briefs concerned with sustainability. Students to apply all previous knowledge here.	The paper cup company case study. pdf (stem.org.uk) How product design can change the world. TEDx talk. 13 minutes
3.3.3 The work of others	**Designers with Sustainability / Eco / Climate Change Approaches:** **Alexander McQueen:** Although the brand wasn't initially known for sustainability under McQueen himself, in recent years, the Alexander McQueen label has made efforts towards sustainability. The brand prioritises responsible sourcing of raw materials and has joined the "Make Fashion Circular" initiative, which aims to create a more sustainable fashion system. **David Adjaye:** Sir David Adjaye is an architect recognised for integrating sustainable practices in his projects. His designs frequently incorporate locally sourced materials, natural ventilation, and energy-efficient systems, as demonstrated in projects like the Smithsonian National Museum of African American History and Culture in Washington D.C.			Can a circular fashion system save us all? - Vogue

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3.3.3 The work of others	**Elsie Owusu:** Elsie Owusu is known for advocating sustainable and inclusive architecture. She supports the use of renewable materials and environmentally conscious design principles, promoting sustainability within the built environment. **Karim Rashid:** Rashid has been involved in several eco-friendly projects and advocates for sustainable design. He emphasises designing products with longevity, recycling, and reusability in mind, and has participated in projects that utilise sustainable materials. **Kusheda Mensah:** Kusheda Mensah creates modular furniture with sustainability as a core principle, using eco-friendly materials and practices. Her designs focus on reducing waste and promoting multifunctionality. **Norman Foster:** As one of the world's leading architects, Norman Foster has long been committed to sustainable design. His firm, Foster + Partners, is renowned for incorporating green technologies and sustainable materials into its projects, focusing on energy efficiency and environmental integration, such as in The Gherkin (30 St Mary Axe) in London. **Philippe Starck:** Starck is an advocate for sustainable design and has incorporated eco-friendly practices into many of his projects. He has designed products using recycled materials and promotes the importance of creating durable, sustainable designs rather than throwaway products. **Vivienne Westwood:** Westwood is one of the most vocal advocates for environmental causes in the fashion industry. She has used her platform to campaign against climate change, promote sustainable fashion, and advocate for reducing overconsumption. Her collections frequently highlight eco-friendly practices, and she regularly speaks on sustainability issues. **William Morris:** A pioneer of the Arts and Crafts Movement, Morris championed the use of natural materials, traditional craftsmanship, and sustainable practices. His philosophy advocated for sustainability long before it became a modern concern, emphasising quality and longevity over mass production. **Yinka Ilori:** Yinka Ilori is known for upcycling discarded furniture and materials, breathing new life into them through vibrant and imaginative design. His work emphasises sustainability by transforming waste into functional and beautiful pieces, encouraging eco-conscious design practices. **Zaha Hadid:** While not always explicitly eco-focused, some of Zaha Hadid's architectural projects have included sustainable elements, such as energy efficiency, renewable energy sources, and eco-friendly materials. Her designs often aim to minimise the environmental impact of construction.

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NEA Content

In the Non-exam assessment students will have several opportunities to apply their learning about sustainability and climate change. This applied understanding is credited explicitly in the following area of the mark scheme (note – these examples are taken from the top band of the criteria.)

Area of the mark scheme	Language from the marking criteria (note – these examples are taken from the top band of the criteria.)	Opportunities for students for further investigation of, or demonstrating understanding of, climate change and sustainability.
Section A: Identifying and investigating design possibilities (10 marks)	Design possibilities identified and thoroughly explored, directly linked to a contextual challenge demonstrating excellent understanding of the problems/ opportunities.	Students may have selected a problem that is explicitly connected to climate change and sustainability and will therefore reference their understanding of the issues and provide investigation into the problem. For those students who do not have an explicit link they should still be able to show that they have considered the philosophy of 'rethink' from the 6Rs when approaching their problem and discuss that they will consider this when it comes to designing.
	A user/client has been clearly identified and is entirely relevant in all aspects to the contextual challenge and student has undertaken a comprehensive investigation of their needs and wants, with a clear explanation and justification of all aspects of these.	Students may wish to investigate their client's opinions on material choices, recyclability and any climate anxiety they may have. Climate anxiety is often more prevalent in children and could be considered when approaching the design stage.

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Section A: Identifying and investigating design possibilities (10 marks)	Comprehensive investigation into the work of others that clearly informs ideas.	When investigating the work of others, students have the opportunity to understand choices that have been taken with or without the climate in mind and analyse them.
	Excellent design focus and full understanding of the impact on society including; economic and social effects.	Explicit demonstration of core understanding of the topics highlighted.
	Extensive evidence that investigation of design possibilities has taken place throughout the project with excellent justification and understanding of possibilities identified.	Students could signpost their consideration of sustainability and climate change at every stage of the project through colour coding or another visual method if this is a valid aspect of their portfolio.
4.4.4.2 **Section B:** Producing a design brief and specification (10 marks)	Comprehensive design brief which clearly justifies how they have considered their user/client's needs and wants and links directly to the context selected.	Has the student considered sustainability and climate change in their brief?
	Comprehensive design specification with very high level of justification linking to the needs and wants of the client/user. Fully informs subsequent design stages.	There might be a section of the specification that discusses how students are considering sustainability and climate change when they approach designing.
4.4.4.3 **Section C:** Generating design ideas (20 marks)	Ideas have been generated, that take full account of on-going investigation that is both fully relevant and focused.	Annotations can include how the student has considered the 6Rs of sustainability in their design.
4.4.4.4 **Section D:** Developing design ideas (20 marks)	Fully appropriate materials/components selected with extensive research into their working properties and availability.	Students can show their understanding of '3.2.3 Mileage of product from raw material source, manufacture, distribution, final disposal.' Discussing their material choices.
	Fully detailed manufacturing specification is produced with comprehensive justification to inform manufacture.	Students might consider waste and the reasons behind this consideration when planning their manufacture.

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4.4.4.5 **Section E:** Realising design ideas (20 marks)	The correct tools, materials and equipment (including CAM where appropriate) have been consistently used or operated safely with an exceptionally high level of skill.	In their making, students can demonstrate their understanding of waste saving apply their decisions from section D.
4.4.4.6 **Section F:** Analysing and evaluating (20 marks)	Extensive evidence that various iterations are as a direct result of considerations linked to testing, analysis and evaluation of the prototype, including well considered feedback from third parties. Comprehensive testing of all aspects of the final prototype against the design brief and specification. Fully detailed and justified reference is made to any modifications both proposed and undertaken. Excellent ongoing analysis and evaluation evident throughout the project that clearly influences the design brief and the design and manufacturing specifications.	Students should evaluate their work against their specification which will have considered sustainability and climate change. Students can also explicitly ask clients for feedback on this area and demonstrate their awareness of sustainability and climate change considerations throughout the project in their ongoing evaluations.



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