Responsible Design & Innovation programmes of study: Key Stage 3

National curriculum in England

Purpose of study

Responsible Design and Innovation (RD&I) is a practical subject that purposefully develops the shared domain knowledge of responsible designing and making within pupils. This is achieved through the study of the contemporary needs of society and embeds into pupils the responsibilities that both designers and engineers have in shaping our economy. Pupils develop approaches to design through real problems that are experienced in local contexts, as a microcosm of larger global challenges. These require designing for the needs of people other than ourselves, and for non-human inhabitants of our environment. The ability to design requires the study of knowledge and methods that can be learnt and practiced, that allow pupils to identify and analyze information drawn from a range of disciplines, and use it to adopt a bias towards action to create solutions that are viable. In order to design risk out of the most ambitious solutions, pupils must carry out iteration and user testing of their ideas, whilst remaining resourceful with concern for environmental and social impact. Through the study of material science and prototyping methods, which includes the fundamental understanding of manufacturing approaches, pupils create digital and physical prototypes, that develop their confidence to solve problems that impact their daily life, in the context of much greater global challenges. RD&I provides the essential knowledge and experience pupils need to enact change to the products and systems around them, in ways that are economically viable, innovative, inclusive and ethical.

Aims

The national curriculum for RD&I aims to ensure that all pupils:

- develop the responsible and practical expertise needed to carry out designing and problem-solving with confidence; able to address real issues that can be engaged in a local context, but reflect in larger global frameworks
- build and apply a repertoire of knowledge, understanding and expertise to research, data capture and ideate with people in order to develop viable solutions that evolve through valid digital and physical prototyping.
- learn to draw from different disciplines in ways that achieve ideas that can be implemented, tested, or simulated.
- understand and apply the principles of the circular economy to be able to critique the world they live in.

Attainment targets

By the end of key stage 3, pupils are expected to know, apply and understand the matters, expertise and processes specified in the programme of study.

Schools are not required by law to teach the example content in [square brackets].

Subject content

Key stage 3

Through project-based designing and prototyping, pupils should be taught the knowledge, understanding and expertise to engage in a design or systems thinking process in order to develop socially, environmentally and economically responsible solutions. They should work in a range of domestic and local contexts related to larger global frameworks of responsibility [e.g. the thematic areas of the economy, society, climate action and biosphere], and sectors [for example, engineering, design, food, energy, travel, clothing, construction, or agriculture].

When designing and prototyping, pupils should be taught to:

Design process

- use research tools and methods to identify and define real problems [e.g. framing “how might we…” questions or using “the five whys” method]
- apply techniques that deepen their understanding of the problems of others, and use approaches that draw out appropriate solutions.
- develop creative ideas that can be prototyped and tested in order to progress towards a solution that is grounded in material science and manufacturing knowledge, and clearly demonstrates social responsibility
- develop and communicate to others design ideas, using digital software and physical materials appropriately.
- draw inspiration from contemporary and historical design and engineering.
- apply methods from circular economy approaches [biomimicry, systems thinking, user centered design].

Material Science

- learn about existing and new materials through their classification, properties, sourcing and extraction, longevity of global reserves, footprint, and embodied energy.

Digital and physical prototyping

- develop and communicate design ideas using digital tools [e.g. computer aided design, low and no-code tools, digital whiteboards]
- develop and communicate design ideas using physical tools [e.g. annotated sketches, detail plans, rough models, appearance models, functional

prototypes, roleplay, and hybrid methods including electronic prototyping platforms such as Microbit, Crumble or VEX]

Responsibility

- investigate local and regional contexts to understand linear and circular economy models, and identify strategies that could improve negative impacts through design
- learn product and lifecycle analysis through contemporary case studies, in order to map the flow of resources and materials, identify carbon footprints, in the context of specific sectors [e.g. food, fashion, transport, energy and industry].
- understand design and engineering initiatives that aim to support global frameworks and agreements [e.g. SDGs, UN Framework convention, Paris Agreement], and regional agreements [e.g. WEEE initiative, RoHS, ELV]
- analyze and interpret climate change data in areas of scientific research including; greenhouse gas concentrations; raising land and ocean temperatures; shrinking of ice, reduced snow cover and glacier changes; rising sea levels; extreme weather events; and acidification of the ocean, in order to inform more responsible design and engineering.