Bolton Impact Trust Design and Technology Curriculum

Rationale

At Lever Park, we believe that a high quality Design and Technology education provides pupils with the opportunity to use their creativity and imagination to design and make products that solve real and relevant problems in the world today. Pupils will have the opportunity to work with a range of traditional and cutting edge equipment and technology which allows them to learn a variety of skills and processes. Pupils will gain an understanding and appreciation of the ways in which Design and Technology has shaped our world.

Knowledge

We ensure that throughout the Design and Technology curriculum pupils acquire the key knowledge required to:

- Design and make high-quality prototypes and products for a wide range of users
- Develop an understanding of the nature, processes and methods of Design and Technology through different types of Design and Technology enquiries that help them to answer questions about the world around them
- Critique, evaluate and test their ideas and products and the work of others
- Understand the uses and implications of Design and Technology, today and for the future

Character

We ensure that pupils develop their own character attributes by learning to take risks, becoming resourceful and learning to identify and solve problems. Pupils will understand that developments in technology affects individuals, society and the environment and that there is a responsibility on designers, engineers and technologists to consider the impact that they will have on the world.

Creativity

We ensure that pupils value and develop their own creativity by sharing with them the inventions, innovations and discoveries which have been made through individuals being creative in their thinking; and by doing so, have had a profound impact upon the world. We give pupils the skills and knowledge to develop confidence in their own creativity and to be able to participate successfully in an increasingly technological world.

Innovative Thinking

We encourage pupils to be innovative with their ideas, to understand how to reformulate problems given to them. We teach pupils a variety of approaches to use to generate creative ideas and to avoid stereotypical responses. We also ensure that they are knowledgeable about the latest developments and the new and emerging technologies available to them.

Transform

Pupils will transform the essential knowledge and skills that they are taught in the Design and Technology curriculum into long-lasting success in the world of further study and work. They will be equipped with a wide range of transferable skills such as problem solving, practical and numerical skills, enquiry, analytical skills and teamwork. Pupils will be exposed to, and will appreciate the myriad of opportunities for a career within Design and Technology.

The Design and Technology department at Lever Park are committed to delivering a curriculum accessible to all which provides the broadest possible range of opportunities for pupils. One which will allow pupils to become self-motivated and confident learners, who can work independently and as part of a team. We aim to ensure that learners develop technical and practical competencies as well as the wider skills valued by employers. A key priority is for pupils to be problem solvers who are not afraid of making mistakes

Design and Technology pupils at Lever Park are given the opportunity to design and make usable products that provides each pupil with a real sense of achievement. The pupils benefit from experiencing their own progress and taking responsibility for their own learning. They enjoy the practical application of forming ideas and their personal engagement with the tasks improves attention span, patience, persistence and commitment.

Pupils at Lever Park can gain a GCSE qualification in Design and Technology which provides them with a route into post 16 provision and enables them to access a wide range of careers in creativity, engineering, manufacturing, motor vehicle and construction industries. The skills learned in Design and Technology are essential and desirable in the workplace. Many Lever Park pupils excel at practical activities. Design and Technology offers these pupils the chance to experience achievement at a level that may seldom occur elsewhere in their school life. It allows them the opportunity to showcase their creative and innovative skills.

Design and Technology is a popular and valuable subject for SEMH pupils. The activities are focused on the physical making of design and are supported on a small group or ‘one to one’ basis. It is also important that pupils are encouraged to work as independently as possible. For example using key words and visual instructions which explain a process in a step-by-step manner. Knowledge and understanding is drawn from across the curriculum and helps to develop and enable numeracy, literacy and communication skills that can be applied in practical ways. This consolidates skills from other lessons and reinforces learning with positive outcomes.

Design and Technology enables pupils to develop their learning through Key Stage years 7, 8 and 9, furthering their critical thinking and practical skills. At Key Stage 4 pupils continue to further develop their practical skills and subject knowledge in preparation for the GCSE 9-1 examination process. The skills acquired from this course will serve pupils well in the future whether they choose to undertake further education or go directly into the workplace.

The Design and Technology department strives to teach pupils about the wider world and their place within it. The pupils learn about the wider the culture, traditions, needs and wants of various populations around the world. They also learn about how technological advancements can benefit these communities through; agriculture, medicine, transportation and industry etc. Pupils have benefit from visiting museums, manufacturers, retailers and sorting depots. The pupils enter national competitions against some of the best schools in the country and historically perform very well, providing experiences they would not otherwise have access to.

The Key Stage 3 Design and Technology Curriculum Design

Design and Technology is delivered in key stage three as part of a carousel. Pupils follow a Doddle Learn sequential study programme. Through a variety of creative and practical activities, pupils should be taught the knowledge, understanding and skills needed to engage in an iterative process of designing and making.

When designing and making, pupils are taught to:

Design

- use research and exploration, such as the study of different cultures, to identify and understand user needs
- identify and solve their own design problems and understand how to reformulate problems given to them
- develop specifications to inform the design of innovative, functional, appealing products that respond to needs in a variety of situations
- use a variety of approaches to generate creative ideas and avoid stereotypical responses
- develop and communicate design ideas using annotated sketches, detailed plans, 3-D and mathematical modelling, oral and digital presentations and computer-based tools

Make

- select from and use specialist tools, techniques, processes, equipment and machinery precisely, including computer-aided manufacture
- select from and use a wider, more complex range of materials, components and ingredients, taking into account their properties

Evaluate

- analyse the work of past and present professionals and others to develop and broaden their understanding
- investigate new and emerging technologies
- test, evaluate and refine their ideas and products against a specification, taking into account the views of intended users and other interested groups
- understand developments in design and technology, its impact on individuals, society and the environment, and the responsibilities of designers, engineers and technologists

Technical knowledge

- understand and use the properties of materials and the performance of structural elements to achieve functioning solutions
- understand how more advanced mechanical systems used in their products enable changes in movement and force
- understand how more advanced electrical and electronic systems can be powered and used in their products
- apply computing and use electronics to embed intelligence in products that respond to inputs, and control outputs, using programmable components

The Design and Technology Curriculum Intent – KS3

	Autumn →	Spring →	Summer →
Year 7	• Health and Safety • Timbers • Plastics	• Metal and Mechanisms • STEM Project: Fly to the Line	• Structures and Smart Materials • STEM Project: Fly to the Line
Year 8	• Health and Safety • Plastics • Systems Controls • Electronics	• Design and manufacturing • STEM Project: Rocket Car Challenge	• Evaluation products • CAD CAM • Professional Designers • STEM Project: Rocket Car Challenge
Year 9	• Woods and Metals	• Plastics • Components • STEM Project: Hover to the Line	• Adhesives • Product Analysis • STEM Project: Hover to the Line

The Design and Technology Curriculum Intent – KS4

Key Stage 4

In Key stage 4 pupils are able to choose to study Design and Technology as an option subject. The key stage 4 curriculum builds upon knowledge and skills delivered in the key stage 3 curriculum, pupils will build upon and develop their critical thinking and practical skills. They will also have the opportunity to engage with creativity and innovation in more depth, as well as having the freedom to focus in more depth on areas of Design and Technology that most interests them.

Pupils will study the OCR's GCSE qualification in Design and Technology and throughout the course will:

- develop an awareness and understanding of real-life experiences in designing and in the developments and opportunities seen in creative, manufacturing and engineering industries
- demonstrate their understanding that all design and technological activity takes place within contexts that influence the outcomes of design practice
- develop an experienced understanding of an iterative design process and the relevance of these to industry practice
- develop realistic design proposals as a result of the exploration of design opportunities and users' (and stakeholders) needs, wants and values
- use imagination, experimentation and combine ideas when designing

- develop the skills to critique and refine their own ideas whilst designing and making
- communicate their design ideas and decisions using different media and techniques, as appropriate for different audiences at key points in their designing
- develop decision making skills, including the planning and organisation of time and resources when managing their own project work
- develop a broad knowledge of materials, components and technologies and practical skills to develop high quality, imaginative and functional prototypes
- become independent and critical thinkers who can adapt their technical knowledge and understanding to different design situations
- be ambitious and open to explore and take design risks in order to stretch the development of design proposals, avoiding clichéd or stereotypical responses
- consider the costs, commercial viability and marketing of products
- demonstrate safe working practices in Design and Technology
- use key Design and Technology terminology including those related to: designing, innovation and communication; materials and technologies; making, manufacture and production; critiquing, values and ethics
- engage with routes that are open to them when progressing to an apprenticeship or in a future career in the field.

Key Stage 4 Curriculum Intent

Key Stage 4	**Autumn** →		**Spring** →		**Summer** →	
Year 10	**Half Term 1**	**Half Term 2**	**Half Term 1**	**Half Term 2**	**Half Term 1**	**Half Term 2**
	• Considering Usability when designing	• New and Emerging Technologies	• Energy Generation and Storage • Nuclear Powder	• Developments in New Materials	• Electronic Systems • Mechanical devices	• Material categories and properties • Design engineering
Year 11	• Investigating	• Designing	• Making, measuring and using reference points	• Evaluating • Improving designs	GCSE Revision	

Assessment and Progress in Design and Technology

Key Stage 3

Pupils are assessed continually for both their practical and design outcomes and theory work from the start to the end of the project. All KS3 pupils take a tailored quiz at the end of each unit. This is designed to mimic and prepare pupils for the type of assessment which will occur at the end of KS4 in the written examination. Pupils are tested on their understanding of some of the core principles and key theory concepts that they have learnt during each unit.

Key Stage 4

Assessments take place regularly. Pupils are tested using quizzes and written exam papers at the end of each unit/topic. Assessments are used to gather data and monitor progress. This is used to inform planning and teaching, helping to monitor whether key concepts have been grasped or require additional reinforcement. Peer marking or self-marking are also used. This type of assessment is useful as they engage pupils and allow them to reflect more thoroughly on correct information. Practical and theory marks are awarded by at the end of each topic. A progress chart is used to inform pupils of their exact position regarding the completion of NEA folder assessment material.

Strand 1 – Explore (AO1)

	Mark Band 1 (1–5)	Mark Band 2 (6–10)	Mark Band 3 (11–15)	Mark Band 4 (16–20)
Investigations of the context	Superficial investigations identify little or no problems and/or opportunities for further consideration.	Investigations are of sufficient quality to identify some problems and/or opportunities for further consideration.	Investigations offer a good level of detail and identify a breadth of problems and opportunities for further consideration.	Comprehensive investigations identify a breadth of challenging problems and opportunities for further consideration.
Design brief	Limited relevance to the context and little or no identification of a primary user or other stakeholders.	Some relevance to the context and identification of a primary user and/or other stakeholders.	Mostly has relevance to the context offering scope for challenge and identification of a primary user and other stakeholders.	Clear and full relevance to the context offering scope for challenge and a focused identification of a primary user and other stakeholders.
Investigations of user and stakeholder needs and wants and the outlining of stakeholder requirements (nontechnical specification)	Superficial consideration of primary user(s) needs and wants with little or no consideration of other stake-holders. Little or no requirements have been identified and are outlined with limited scope to support the future design process.	Some relevant consideration of primary user(s) needs and wants and some consideration of other stakeholders. Some requirements are identified that offer some scope to support the design process.	Informed consideration of primary user and other stakeholders needs and wants. A range of requirements with a good level of detail are identified that offer scope to support the design process.	Full and objective consideration of primary user and other stakeholders needs and wants. A range of comprehensive requirements are identified that offer scope to support the design process.
Investigations of existing products and design practices	Little or no information or sources of inspiration are identified to offer support to design iterations and thinking.	Some information and/or sources of inspiration are identified that may not always be relevant but do offer some influence on design iterations and thinking.	Good amount of relevant information and sources of inspiration are identified to influence design iterations and thinking when required throughout the design process.	Comprehensive and relevant information and sources of inspiration are identified to influence on design iterations and thinking when required throughout the design process.

Exploration of materials and possible technical requirements	Superficial consideration of materials and/or possible technical requirements.	Some relevant consideration of materials and possible technical requirements.	Informed consideration of materials and possible technical requirements when required throughout the design process.	Full and objective consideration of materials and possible technical requirements when required throughout the design process.
Technical specification	Inaccurate, outlines basic details and/or is incomplete making it difficult for a third party to understand.	Generally accurate, outlines details that communicate some requirements to a third party.	Good levels of accuracy, outlines details that communicate most requirements to a third party.	High levels of accuracy, outlines details that clearly communicate all requirements to a third party.
	1 2 3 4 5	**6 7 8 9 10**	**11 12 13 14 15**	**16 17 18 19 20**

0 marks – No response or no response worthy of credit.

Strand 2 – Create: Design Thinking (AO2)

	Mark Band 1 (1–6)	Mark Band 2 (7–12)	Mark Band 3 (13–18)	Mark Band 4 (19–24)
Generation of initial ideas	Limited use of different design approaches that lead to ideas that do not always reflect the requirements and may appear stereotypical.	Some different design approaches that lead to some ideas that avoid design fixation and generally reflect the requirements.	Different and relevant design approaches that lead to ideas that mostly avoid design fixation, offer scope for challenge and reflect requirements.	Different and relevant design approaches that lead to ideas that fully avoid design fixation, offer scope for challenge and fully reflect requirements.
Design developments	Limited developments are superficial and/or are not iterative.	Iterative developments are generally progressive and respond to some identified next-steps of development.	Iterative developments are progressive, incorporating technical requirements and respond to most identified next-steps of development.	Iterative developments are comprehensive and progressive, incorporating all technical requirements and fully respond to identified next-steps of development.

Development of final design solution(s)	Little or no progression seen from earlier developments and little or none of the identified opportunities and requirements have been met.	Some progression seen from earlier developments and some of the identified opportunities and requirements have been met.	Clear progression from earlier developments and most of the identified opportunities and requirements have been met.	Clear and comprehensive progression from earlier developments and all of the identified opportunities and requirements have been met.
Critical thinking	Superficial responses when problems are identified. Little or no evidence of innovation* throughout the design process.	Effective responses to some identified problems. Some evidence of innovation* throughout the design process.	Effective responses to most identified problems. Clear evidence of innovation* throughout the design process.	Systematic and effective responses to all identified problems. Clear and systematic evidence of innovation* throughout the design process.
	1 2 3 4 5 6	**7 8 9 10 11 12**	**13 14 15 16 17 18**	**19 20 21 22 23 24**

0 marks – No response or no response worthy of credit.

* Innovation in this context refers to learners considering new methods or ideas to improve and refine their design solutions and meet the needs of their intended market and/or primary user.

Strand 3 – Create: Design Communication (AO2)

	Mark Band 1 (1–4)	Mark Band 2 (5–8)	Mark Band 3 (9–12)	Mark Band 4 (13–16)
Quality of chronological progression	Design iterations are not always clear and/or chronological, with little or no support from real-time evidence.	Design iterations are sometimes clear and predominantly chronological, some support from real-time evidence.	Design iterations are clear and chronological, mostly supported by real-time evidence.	Design iterations are systematic and chronological, fully supported by real-time evidence.
Quality of initial ideas	Informal graphical and modelling skills are limited and rarely clear enough to appropriately communicate initial thinking.	Informal graphical and modelling skills are sufficient, but are not consistent in appropriately communicating initial thinking.	Informal graphical and modelling skills are good and are consistent in appropriately communicating initial thinking.	Informal graphical and modelling skills are excellent and are effective and consistent in appropriately communicating initial thinking.

Quality of design developments	The range of communication techniques* used are limited and rarely clear enough to appropriately develop or communicate design concepts.	The range of communication techniques* used are sufficient, but are not consistent in appropriately developing or communicating design concepts.	The range of communication techniques* used are good and are consistent in appropriately developing or communicating design concepts.	The range of communication techniques* used are excellent and are effective and consistent in appropriately developing or communicating design concepts.
Quality of final design solution(s)	Formal presentation of the final design solution(s) is limited making it difficult for a third party to understand.	Formal presentation of the final design solution(s) is sufficient and provides some clarity to a third party.	Formal presentation of the final design solution(s) is good and provides appropriate clarity to a third party.	Formal presentation of the final design solution(s) is excellent and provides impact and appropriate clarity to a third party.
	1 2 3 4	**5 6 7 8**	**9 10 11 12**	**13 14 15 16**

0 marks – No response or no response worthy of credit.

* Refer to Strand 4 when assessing digital design and manufacture.

Strand 4 – Create: Final Prototype(s) (AO2)

	Mark Band 1 (1–5)	Mark Band 2 (6–10)	Mark Band 3 (11–15)	Mark Band 4 (16–20)
Quality of planning for making the final prototype(s)	Offers little or no support to the making process.	Generally supports the management of the making process with some relevant requirements identified from the technical specification.	Good level of detail and relevance, covering most requirements identified from the technical specification to manage the making process.	Comprehensive and relevant, covering all requirements identified from the technical specification to effectively manage the making process.
Quality of final prototype(s)	Inaccurate and/or basic standards demonstrated. Finishing may not be appropriate and/or the outcome would not present well to a stakeholder.	Sufficient standard demonstrated through a generally accurate outcome. Finishing is appropriate but the outcome could be better presented to stakeholders.	Good standard and levels of accuracy demonstrated. Finishing is appropriate and the outcome will present well to a stakeholder.	Excellent standard, demonstrating high levels of accuracy. Finishing is appropriate and the outcome will present well and provide impact to a stakeholder.

Use of specialist techniques and processes	Limited and rarely appropriate to materials/components being used.	Sufficient, but are not consistently appropriate to materials/ components being used.	Good and are consistently appropriate to materials/ components being used.	Excellent and are effective and consistently appropriate to materials/components being used.
Use of specialist tools and equipment	Use and selection of hand tools and/or machinery are limited and rarely appropriate. Digital design and/or manufacture* is limited and demonstrate little or no skills or knowledge.	Use and selection of hand tools and machinery are sufficient, but not always consistently appropriate. Digital design and manufacture* is not always used appropriately, but demonstrate sufficient skills and knowledge.	Use and selection of hand tools and machinery are good and consistently appropriate. Digital design and manufacture* are used appropriately to demonstrate good skills and knowledge.	Use and selection of hand tools and machinery are effective and consistently appropriate. Digital design and manufacture* are used effectively and appropriately to demonstrate excellent skills and knowledge.
Viability of the final prototype(s)	Little or no links to the technical specification and demonstrating limited potential to become a marketable product.	Meets some of the technical specification and demonstrating some potential to become a marketable product.	Meets most of the technical specification and demonstrating good potential to become a marketable product.	Meets all of the technical specification and demonstrating excellent potential to become a marketable product.
	1 2 3 4 5	**6 7 8 9 10**	**11 12 13 14 15**	**16 17 18 19 20**

0 marks – No response or no response worthy of credit.

***It may not have been appropriate to use digital design and manufacture in the final prototype. Where this is the case, the statement should be assessed on the skill levels demonstrated when using digital design and manufacture through earlier modelling. This can equally be applied to the use of hand tools and machinery, all of which require appropriate evidence.

Strand 5 – Evaluate (AO3)

	Mark Band 1 (1–5)	Mark Band 2 (6–10)	Mark Band 3 (11–15)	Mark Band 4 (16–20)

Analysis and evaluation of primary and/or secondary sources	Limited analysis and evaluation of investigated sources of information from stakeholders, existing products and/or wider issues, offering little or no support to inform the design process.	Sufficient analysis and evaluation of investigated sources of information from stakeholders, existing products and wider issues, offering some support to inform the design process.	Good level of analysis and evaluation of investigated sources of information from stakeholders, existing products and wider issues, offering clear support to inform the design process.	Comprehensive and systematic analysis and evaluation of investigated sources of information from stakeholders, existing products and wider issues, offering clear and focused support to inform the design process.
Ongoing evaluation to manage design progression	Superficial evaluations with little or no reflection on requirements or feedback. Little or no reviews to identify any problems and/or next-steps for future iterations resulting in limited support to design progression.	Some critical evaluations with sufficient reflection on requirements and feedback. Infrequent reviews to identify some problems and/or next-steps for future iterations that are not always consistent in supporting design progression.	Mostly critical evaluations with good reflection on requirements and feedback. Ongoing and clear reviews to identify problems and next-steps for future iterations to consistently support design progression.	Full and critical evaluations with focused reflection on requirements and feedback. Ongoing, clear and comprehensive reviews to identify problems and next-steps for future iterations to effectively and consistently support design progression.
Feasibility of the design solution	Limited with little or no methods used to appropriately analyse and test whether the design solution is fit for purpose.	Sufficient with some appropriate methods used to analyse and test whether the design solution is fit for purpose.	Good level of detail with mostly appropriate methods used to analyse and test whether the design solution is fit for purpose.	Comprehensive with fully appropriate methods used to analyse and test whether the design solution is fit for purpose.
Evaluation of the final prototype(s)	Superficial evaluation of strengths and/or weaknesses with little or no suggestions for modification and/or consideration of possible design optimisation presented.	Sufficient critical evaluation of strengths and/or weaknesses with some suggestions for modification and/or consideration of possible design optimisation presented.	Good critical evaluation of strengths and weaknesses with detailed suggestions for modification and consideration of possible design optimisation presented.	Full and critical evaluation of strengths and weaknesses with comprehensive suggestions for modification and consideration of possible design optimisation presented.
	1 2 3 4 5	**6 7 8 9 10**	**11 12 13 14 15**	**16 17 18 19 20**