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| **Backpack for the future** |
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| Designing the dream backpack of the future |
| **Subject(s):** Design and Technology, Engineering**Approx time:** 70-110 minutes |  | **Key words / Topics:** * annotation
* backpack
* colour
* design brief
* design criteria
* evaluation
* new technologies
* sketching
* specification
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| **Stay safe** Whether you are a scientist researching a new medicine or an engineer solving climate change, safety always comes first. An adult must always be around and supervising when doing this activity. You are responsible for: • ensuring that any equipment used for this activity is in good working condition• behaving sensibly and following any safety instructions so as not to hurt or injure yourself or others  Please note that in the absence of any negligence or other breach of duty by us, this activity is carried out at your own risk. It is important to take extra care at the stages marked with this symbol: ⚠ |
| **Suggested Learning Outcomes**  |  |  |
| * To understand the purpose and different uses of backpacks
* To be able to write a design specification for the backpack of the future
* To be able to design the backpack of the future
* To be able to evaluate designs against design criteria
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| **Introduction** |  |  |
| This is a resource that is designed to allow learners to use the theme of new and future technologies to develop their knowledge and skills in Design & Technology and Engineering. This resource focusses on learners designing a future backpack. |
| **Purpose of this activity**In this activity learners will make use of the theme of new and future technologies to design a futuristic backpack. They will discuss the purpose of backpacks and why they are used. They will then produce a labelled sketch of their design idea to meet the given design brief and criteria.This activity could be used as a main lesson activity to teach about designing textile and graphics-based products in context, or the use of new technologies within designs. It could also be used as part of wider scheme of learning focussed on the design process. |
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| **Activity** |  | **Teacher notes** |
| **Introduction (5-10 minutes)**Teacher to use presentation slide 3 to introduce the purpose of backpacks and discuss examples of how they are used:* Books when going to and from school.
* Food and water when out walking.
* Clothes when going on holiday.

Ask learners if they can think of any others.**Design brief and criteria (5-10 minutes)**Teacher to use presentation slide 4 to introduce the design brief and explain the task to learners. Teacher to use slides 5 and 6 to discuss the design criteria for the future backpack and other issues to consider when producing the designs. For example, how will learners ensure their design is original and creative?**Writing a design specification (20-30 minutes)**Learners to build upon the design criteria to produce a six point design specification for a backpack of the future. Learners to write their response on the design specification page of the worksheet (presentation slide 7).**Design idea (30-40 minutes)**Learners to sketch and label their design idea for their backpack of the future. The examples shown on slides 10-14 of the presentation can be used to help if needed.The future backpack design worksheet (slide 8) can be used by learners to present their ideas, or these could be presented on blank A4 or A3 paper.**Evaluation of designs (10-20 minutes)**Learners to evaluate how well their design meets the design criteria:* Which points does it meet? How?
* Which points does it not meet? Why?
* How could the design be improved?
 |  | This activity could be done as individuals or in pairs.**Introduction**Teacher could also discuss how STEM could be used when designing backpacks. STEM = Science, Technology, Engineering and Mathematics.**Design brief and criteria**Discuss the design criteria with learners. This is a list of design points that the finished solution must meet.Examples of clever gadgets that could be used within the design could include:* A solar power system to help cycle extra fast on the way home from school
* A special hive to help protect bees
* A way of healing cuts if the wearer fell over
* A way to instantly turn plastic rubbish into cool toys to play with at breaktime

Explain these examples to learners and ask them if they can think of any others. In necessary, refresh the learners understanding of the terms originality, creativity and feasibility.**Design specification**A design specification gives specific and measurable criteria that must be met by the design. It should therefore expand on the design criteria.For example, what exact materials, colours and technologies will be used.Extra points could also be added e.g. how the design could be sustainable, make use of solar energy etc.**Design idea**Learners should use notes and labels to explain their idea, how it meets the design criteria and any interesting features.**Evaluation**Evaluation involves checking the design produced against the design criteria and identifying where improvements could be made.A check list could be provided to compare against, with spaces for comments, or the evaluation page of the worksheet (presentation slide 9) could be used. |
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| **Differentiation** |  |  |
| **Basic** |  | **Extension** |
| * Produce outlines of the backpack shapes for learners to add detail and features to.
* Provide sentence starters for labelling of sketches.
 |  | * Make a prototype or model of your backpack design.
* Design a backpack for doctors or paramedics to carry their medical equipment.
* Design a backpack for a favourite sports star or musician.
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| **Resources** |  | **Required files** icon-docicon-pdficon-ppt |
| * Pens, pencils and coloured pencils
* A3 or A4 paper
 |  | icon-ppt Backpack for the future presentationicon-pdf Backpack for the future worksheet |
| **Additional websites** |  |  |
| * **Wikipedia – Backpack:** Information about backpacks, their designs and use. <https://en.wikipedia.org/wiki/Backpack>
* **TIME magazine:** A brief history of the modern backpack**.** <https://time.com/4477959/a-brief-history-of-the-modern-backpack/>
* **Buffalo Jackson:** History of the backpack: <https://buffalojackson.com/blogs/insight/history-of-the-backpack>
* **IET Backpack to the Future competition winner:** In 2022, the IET worked with lifestyle brand HYPE. to launch a competition for young people to design a futuristic backpack – here you can find more information about the competition and the winner. <https://www.dailymail.co.uk/sciencetech/article-11691551/Girl-12-creates-backpack-filters-air-pollution-seeing-mother-suffer-asthma.html> , <https://kindredagency.com/our-work/backpack-to-the-future/> , <https://eabw.theiet.org/past-campaigns-and-activities/backpack-to-the-future/>
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| **Related activities (to build a full lesson)** |  |  |
| **Starters** (Options) * Discuss the purpose of and uses of backpacks.
* Analyse examples of existing designs using ACCESS FM. What have they done well and what could they have done better?
 | **Plenary*** Self/peer assessment or produced designs. Identify three positive features of each design and one thing that could be improved.
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| **The Engineering Context**  |
| * Engineers need to understand how materials and new technologies could be used to produce improved future product designs. For example, how sustainable materials, materials with improved properties or renewable energy could be used in backpack design in the future.
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| **Curriculum links** |
| **England: National Curriculum**Design & Technology * KS3 Design - develop specifications to inform the design of innovative, functional, appealing products that respond to needs in a variety of situations.
* KS3 Design - develop and communicate design ideas using annotated sketches.
* KS3 Evaluate - investigate new and emerging technologies.
* KS3 Evaluate - test, evaluate and refine their ideas and products against a specification, taking into account the views of intended users and other interested groups.
* KS3 Evaluate - understand developments in design and technology, its impact on individuals, society and the environment, and the responsibilities of designers, engineers and technologists.
 | **Northern Ireland Curriculum**Technology & Design* KS3 Design – identifying problems; investigating, generating, developing, modelling and evaluating design proposals; giving consideration to form, function and safety.
* KS3 Communication – use of free-hand sketching.
* KS3 Explore issues related to Cultural Understanding - Critically evaluate the influence of cultural trends in products designed for young people, for example, the styling, colour schemes and materials used in sports and leisure equipment.
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| **Scotland: Curriculum for Excellence**Technologies* TCH 3-04c
* TCH 3-05a
* TCH 3-09a, TCH 3-11a
 | **Wales: National Curriculum** Design and Technology* KS3 Skills: Designing 1, 3, 4, 5, 6, 9
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| **Assessment opportunities** |
| * Formal teacher assessment of the completed specifications, design idea sketches and evaluations.
* Self/peer assessment of the completed specifications and design idea sketches.
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