How will parcels be delivered in the future?

Age group	13 and above
Time	30 mins
Subject	Computing

National Curriculum links

This activity would suit KS4 students or the top end of KS3.

The national curriculum for computing for key stages 3 and 4 aims to ensure that all pupils *"can analyse problems in computational terms"* and *"are responsible, competent, confident and creative users of information and communication technology."*

England Key stage 3 subject content

Pupils should be taught to:

- understand a range of ways to use technology safely, respectfully, responsibly and securely, including protecting their online identity and privacy; recognise inappropriate content, contact and conduct and know how to report concerns
- design, use and evaluate computational abstractions that model the state and behaviour of real-world problems and physical systems

England Key stage 4 subject content

Pupils should be taught to:

- understand how changes in technology affect safety, including new ways to protect their online privacy and identity, and how to identify and report a range of concerns

Learning outcomes

Pupils should be able to:

- Describe how drones and autonomous vehicles can be used for deliveries.
- State the legal and ethical implications of using drones and autonomous vehicles.
- List the advantages and disadvantages of using drones and autonomous vehicles to make deliveries.
- Evaluate the use of drones and autonomous vehicles for deliveries.

Skills developed

- **Decomposition:** Breaking a bigger problem down into smaller more manageable sections.
- **Abstraction:** Removing unnecessary details to focus on the key parts.
- **Communication:** Sharing thoughts with others on how they arrived at their solution.
- **Collaboration:** Working with others to discuss the problem.

Prior Learning

Learners may benefit from an overview of what sensors are before completing this task and how they can be used in computer systems.

Requirements

Students will need access to computers and the internet to complete this task.

Overview of 'How will parcels be delivered in the future?'

This task can be used as a real-world example of the considerations required in terms of safety when using technology and its ethical and legal impact.

The logistics industry is always looking at how technology can change the future and improve efficiency. Drones and autonomous delivery vehicles (AVs) are being explored as part of the potential future of logistics. The aim is to move away from using delivery drivers towards a system that works automatically.

It is important to consider the impact of these new technologies to understand the advantages and disadvantages, including legal and ethical aspects, before any implementation. The use of sensors allows devices to work automatically but this comes with additional considerations, for example, have they been programmed correctly?

Resource Overview

This resource includes these items:

- Teacher notes.
- Student activity sheet setting out the task and giving the information required for the students to complete the task.
- Exemplar responses which teachers may use to support groups of students who need some scaffolding to get started.
- Presentation slides to help explain the tasks.

The context

UK law states that drones must always be able to be seen by their operators. However, logistics companies would like to use drones to make deliveries across a large area. To do this, drones would need to be controlled by a remote pilot who will not be able to see the drone for most of its flight. This is known as beyond visual line of sight, (BVLOS). The latest versions of drones have built-in detect and avoid technologies that potentially allow drones to be flown beyond the sight of an operator.

Autonomous vehicles are being tested in some parts of the world such as Phoenix in the US where they are being used to deliver food.

Both these technologies use sensors to help detect objects around the vehicle or drone. They also use other technologies to help them complete the tasks they have been set, such as delivering specific items to a location.

The students' task is to research drones and autonomous vehicles and state the advantages and disadvantages of using each type of technology. The impact of legislation when looking at introducing these new technologies also needs to be considered as part of the exercise. Students are then asked if they would recommend whether a logistics company should use drones and autonomous vehicles for making deliveries. Students need to justify their answer.

Supporting notes

A table has been created to help learners organise the advantages and disadvantages they find.

Students could be split into 2 groups, with one group researching autonomous vehicles and the other drones. Each group can then share their research with the other.

Useful websites

These webpages provide useful information on the use of these technologies in logistics, but research could find more examples:

Drones:

- BBC News - Amazon pledges parcels in an hour using drone deliveries
- BBC News - Site of hospital drone hub moved after objections
- Amazon drones can now fly further and deliver more to customers

Autonomous delivery vehicles:

- BBC News – Self-driving delivery van ditches 'human controls'
- BBC News – Self-driving delivery trial
- BBC News – Driverless cars
- Waymo self-driving cars are delivering uber eats orders for first time

Below are links to student friendly overviews of some relevant legislation:

- Computers and the law – BBC Bitesize
- Legislation – Isaac Computer Science
- Computer Misuse Act – BBC Bitesize
- Computer Misuse Act – Isaac Computer Science
- Data Protection Act – BBC Bitesize
- Data Protection – Isaac Computer Science

(Please note - to use the free Isaac Computer science website, users need to register: https://isaaccomputerscience.org)

Generation Logistics Education Hub

This resource is one of the many engaging resources available from Generation Logistics on their Education Hub. For more details go to: www.educationhub.generationlogistics.org/