Lesson plan

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| Topic 1 Connectivity |
| Learning Objectives:   * Explain wireless and wired methods of connecting devices and transmitting data within and between IT systems * Discuss how the features of connection types can meet the needs of individuals and organisations |
| Content |
| Starter  PowerPoint Guide: Topic 1 Connectivity  Students should already be aware of how PCs and smartphones can connect to the Internet. It is likely that within their school/college they have access to PCs connected by a wire. They are likely to also have a smartphone that uses Wi-Fi and a mobile connection. A smart watch will use Bluetooth to connect to a smartphone. Smart speakers (e.g. Amazon Echo or Apple HomePod) will typically connect with Wi-Fi or Bluetooth. Elicit other hardware from students. Students will find the hardware that is used on the following slides.  Main  Router  A router connects two networks together. It routes packets of information between the networks. In home and business networks the router is often connecting a local area network (LAN) to the Internet. The router shown will accept connection from Ethernet cable (with an RJ45 connector). A copper cable will be used with an RJ11 connector to connect to the Internet via a phone line. The device will also accept Wi-Fi connections.  Network Interface Card (NIC)  Network Interface Cards used to be separate cards in PCs. They are now normally integrated into the motherboard. If a PC doesn’t have Wi-Fi capabilities, then a separate Wi-Fi dongle can be added as a second NIC. The PC would now be able to connect to two different networks at once.  Network media  In the same way as storage media is the medium that stores information, network media is the medium through which information travels. Network media is another way of saying the connection type. Ask students whether each of the network media are wired or wireless. Answers are given on the next slide. Ask students how each of the different technologies are used within their school or college. It is likely that students connect their smartphones to a mobile network. PCs are probably connected using Ethernet. Wireless devices such as laptops can be connected using Wi-Fi. The school/college probably accesses the Internet with a fibre optic cable. Students may use Bluetooth to connect headphones or share files with one another.  Give out **Worksheet 1** and ask students to do **Task 1.**  Topic 1 Worksheet 1  Topic 1 Worksheet 1 Answers  Ethernet  Ethernet has many different standards within it. In the 90s it was common to set up bus networks with coaxial cable, but today almost all wired networks are set up in a star topology with an ethernet twisted pair cable. Show students some of the different types of cable that can be used. These cables all look the same, but are made to different specifications.  Wi-Fi  Now is a good opportunity to ask students about their experiences of using Wi-Fi at home or in public places. Wi-Fi is technically in the microwave region of the electromagnetic spectrum (microwave ovens operate at 2.4GHz). Ask students what hardware is required to make a Wi-Fi network and take them through the answers on the next slide. They may wish to mention other aspects such as a firewall or servers.  Mobile (cell) network  Students are likely to be very aware of mobile phones and the different networks. They may not realise that other virtual networks (such as Virgin Mobile or GiffGaff) make use of one of these four networks. The EE network was previously called Everything Everywhere and is a result of the merger of T-Mobile and Orange. It is owned by BT Group, whilst O2 is now owned by Telefónica.  Mobile generations  Take students through the different generations of mobile phone connections. The fastest generation is 5G which launched in the UK on 30th May 2019.  Case study: Rural broadband  Rural Internet has traditionally been poor. Expensive cables need to be laid for few houses, which is uneconomical for most companies. However, with mobile broadband the costs of connection are minimal as no cables need to be laid. 4G signals are comparable to most home broadband connections and therefore an alternative for many organisations and individuals. The advantages over wired broadband are given on the next slide.  Virtual providers  A list of some popular virtual providers is given. Both ASDA and Virgin mobile make use of the EE mobile network. If a customer switches between these networks, they will not have any difference in reception as both are using the same base stations.  Bluetooth  Students are likely to be aware of some of the possible uses of Bluetooth. Take them through the slide and questions. Whilst Bluetooth can be used up to 100 metres, typically devices are made with an intended range of just a few metres. Answers to the questions are given on the following slide.  Ask students to do **Task 2** and **Task 3** on the worksheet.  Connection speed  The word speed is a little confusing. It usually refers to bandwidth (the amount of data transferred per second), but it could mean latency (how long it takes for the data to get from a sender to receiver). On this slide the meaning is that of bandwidth. The download speed is the amount of bandwidth for downloading files/web pages/images. The upload speed is the bandwidth for uploading data. On home connections these two speeds normally provide a faster download speed to upload speed. This is known as an asymmetric connection. Faster speeds mean that users don’t need to wait as long to send/receive files. Slow speeds may also mean that some services, such as streaming TV, are not possible.  For the table shown, a typical MP3 file is 5MB, a JPG photo is 1MB and an MP4 film is 1000MB.  Speed test  Try visiting the website [www.speedtest.net](http://www.speedtest.net). The answers to the questions will depend on the speed that is tested in the lesson. The ping/latency is the amount of time data takes to get from the sender to receiver.  UK broadband  Most UK broadband is sold as ‘Fibre’ which is a little misleading. In most cases it is fibre to the cabinet (FTTC) with the final connection to the home being provided by copper cable. In 2018, full fibre was only available to 4.8% of UK premises. To add to the confusion, the UK government refers to any connection over 24Mbps as Superfast broadband, whilst the Welsh government, Scottish government and OFCOM expect the connection speed to be 30Mbps.  Typically, a home connection will use FTTC, whilst a school/college connection will be Fibre to The Premises (full fibre). These connections are capable of 1Gbps or faster.  Ask students to do **Task 4** and **Task 5** on the worksheet.  Plenary  Ask students to complete the plenary task where they create questions on the topics covered. Take a sample of the hardest or most interesting questions and then get students to ask these to the class. A further challenge can be given to write at least one question that involves the comparison of two of the given topics.  Hand out **Homework 1**.  Topic 1 Homework 1  Topic 1 Homework 1 Answers |