Lesson plan

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| Topic 5 Using and manipulating data |
| Learning Objectives:* Describe the uses, processes and implications for individuals and organisations of accessing and using data and information in digital form
* Explain reasons for ensuring data accuracy
* Describe:
* Methods of ensuring accuracy: verification and validation
* Describe methods of extracting and sorting data
* Describe numerical and data modelling
* Describe the presentation of data and results
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| Content |
| StarterPowerPoint Guide: Topic 5 Digital devicesThe starter considers a common situation for small businesses that start with paper records of transactions. Online cloud finance services such as Xero and FreeAgent have now made it common for even very small businesses to do their accounting in a digital form. Discuss with students the advantages of keeping finances digitally and go through the answers slide.MainDigital data and information and the impacts on organisations and individualsIt is important to make the distinction with students between data and information. Data is the raw, unorganised facts. When data is processed or organised to give something useful it become information. Ask students how data impacts both organisations and individuals. Suggestions to answer this question are given on the following two slides.Give out **Worksheet 5** and ask students to do **Task 1.**Topic 5 Worksheet 5Topic 5 Worksheet 5 AnswersData accuracyIt would be a good opportunity at this stage to discuss some of the effects of inaccurate data. For instance, what happens if student data is inaccurate and a student was recorded as female when they were male. This would have knock on effects in reports that are written and be embarrassing for their school or college. Other inaccurate results, such as in a medical environment, could be catastrophic. NHS prescribing errors, for instance, result in up to 22,000 deaths per year. <https://www.independent.co.uk/news/health/nhs-medication-errors-deaths-prescription-drugs-jeremy-hunt-york-university-health-a8224226.html> ValidationValidation is comparing data with one or more rules to see if it is reasonable or appropriate. This was briefly discussed in the previous topic, but this time students are asked to come up with different ways of validating data. If they do not already know this, it would be useful to put some incorrect data on the board, for instance, an age of 700, a person’s height of 1811cm and a phone number of 1243887304. Ask them how these could be validated (range check for age and height, format check for the phone number). Take students through the answer slide that contains all the different validation checks that can be carried out on data. It is important to note that validation does not check the correctness of the data, but whether it looks appropriate.VerificationVerification is checking the data to try and verify that it is accurate. A number of ways in which this can be carried out are given on the slide. Students are likely to have experienced double entry verification with passwords and email links that verify their email address, so discuss these examples with them.Case study: GP patientsMore information about the case study can be found here: <https://www.bbc.co.uk/news/health-48600923>. It may be that some GPs are fraudulently claiming, however, there are some legitimate reasons why the numbers don’t match. When people have died, the GP may not be informed, so these people will remain registered at the GP. Equally, if people move to a different country they could still be registered.Ask students to do **Task 2** and **Task 3** on the worksheet.Analysis of data and sorting dataStudents are likely to have a good experience of analysing data both within spreadsheets and in other subjects such as Maths, Science or Geography. Ask them about these different contexts. Data in spreadsheets can be analysed using a variety of formulae such as SUM or COUNTIF. Both spreadsheets and databases can sort data as part of an analysis. Database data can be analysed by using queries. The criteria in the queries will often be used to select specific records from the database. Databases can also perform analysis such as average sales for a month across a number of years, or total sales for a year.QueriesSQL (structured query language) is a database language that allows relatively simple commands to be entered to select information. When queries are created in Access it is possible to view and edit the SQL code which is used behind the graphical interface. Ask students for three queries that can be made of a database. You should look for students to give a purpose and the criteria that they would use. Show them the answers slide which also shows the full SQL statements that would be used to interrogate the database.Database queriesThe screenshot shown is the result of running a query. Whenever a query is run, it will always return a table, even if that table contains just one row and column. The \* in the query, means select all the fields. It could be written as SELECT Lastname FROM… in which case only the last name would be shown in the resulting table. The criteria for this query is Totalspend > 1500. Show students that all the Totalspends are greater than 1500 in the query result.Ask students to do **Task 4** on the worksheet.Numeric and data modellingNumeric models are used in particular to create financial models. At a simple level, these can be used for looking at personal finances. Businesses may use far more complicated models to predict how the business will perform for different scenarios. Data models, by contrast will make use of databases to build a model that allows the data to be stored inside.Case study: Weather forecastsIn weather forecasting, a data model will be created that shows what data from weather instruments needs to be stored and how it is stored. This can then be processed to model the weather for the next few days. Whilst consumer weather forecasts often show just one option for the weather, the data model may reveal a number of different outcomes and a probability of each occurring. Show students the video “How the MET office creates a weather forecast” [2m17s] <https://www.youtube.com/watch?v=0eAB32HITWI> ReportsInformation in databases can be used to generate reports. Ask students to consider where else reports may be made. Some examples include: orders that need to be processed, reports of buildings owned by a property company or class lists for a teacher. Data can be presented in a number of ways. Charts and maps are shown on the following slides, but infographics are also increasingly popular ways to present information.ChartsThe trends on the chart show that summer sales have been falling for the last three years – dramatically in 2019. This is surprising given that the other months are stable or rising. A company looking at such data may find that they have a competitor product that is doing well in the summer, or that they have lost a big customer who trades mainly in the summer months. Such charts can give companies both the information of what is going wrong, but also possible ways to fix it. You may wish to show students the website: <https://informationisbeautiful.net/> which shows a variety of alternative ways in which data can be presented.MapsMaps are useful in presenting information where location needs to be taken into account. The data is far easier to understand than if it were displayed in a table of locations. Alternative ways that maps can be used would be to have different countries or regions colour coded to show intensity or to show different circle sizes, for instance, population size linked to city location.Ask students to do **Task 5** on the worksheet.PlenaryAsk students to complete the plenary task and then go through the answers. Hand out **Homework 5**. Topic 5 Homework 5Topic 5 Homework 5 Answers |