



# Assessing pupils' progress in ICT at Key Stage 3:

Standards File  
Pupil B



# **Pupil B Low Level 6 ICT Standards File**

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# Summary

Pupil B is part of a mixed ability group who start the year by considering the use of ICT in control systems used outside school. Later he takes part in a data handling project involving the processing of data from an international on-line survey about healthy lifestyles. This file shows evidence of progress in planning, sequencing instructions and handling data, integrating ICT tools and techniques. Pupil B is beginning to consider efficiency and the use of ICT outside school. The teacher's overall judgement places him at a low level 6.

## The evidence

1.      Environmental control
2.      Healthy lifestyles survey

# 1 Environmental control

## Assessment focuses

AF1, AF2, AF3

## Context

The teacher asked the class to design, implement and evaluate control systems for a new biome for the Eden Project, making sure to minimise its environmental impact, in line with the Eden Project's philosophy. Pupil B chose an 'underwater biome' as a new area for the project. Pupils produced 2D designs which they annotated to show the control systems. The class were asked to bring together all the work they had done in a presentation explaining the biome's design and control systems to tourists visiting the Eden Project.

## Pupil B's work

Pupil B's comments on his planning show his ability to describe in some detail the layout of the biome. These elements were later incorporated in his computer designs:

*'I'm going to have large tanks all through the biome dome. These will be full of the different plants and also some animals to create their habitat in them or feed on them. There will also be lots of pathways through the biome so the visitors can see everything. I'll need to think about having lots of notice boards. These need to be exciting to read with new, unusual facts. Also there will be some short little experimental parts where children can smell, touch and feel things. These are the general things which will be available throughout the WHOLE biome.'*

In his planning for the elements to the control system, pupil B took account of all requirements and how they link together:

*'The main control system will be on the left side of the underwater biome. It will connect to everything which needs to be run in the biome. The things that the control system will have power over are:*

- *Temperature of water in tanks*
- *Level of water in tanks*
- *Cleaning the tank*
- *A pump to pump new water into the tank*
- *Solar panels for lighting (for inside the tank and interior of the biome)*
- *Automatic doors for entrance and exit of biome*

*For the tanks there are going to be smaller control systems to control each one.'*

Pupil B planned some detail for all aspects of the control system, showing that he understood what the different parts of the control system would do.

*'We have to think about controlling the level of the water. There is going to be a pump which will be pumping new water in and we need to make sure that there is the right amount of water. So there will be a water level sensor in the tank. If there is too little water the pump will add more water.'*

His notes demonstrate familiarity with subroutines from previous projects, and recognition of the benefits of using them.

*"I have decided to use subroutines for the control system. Subroutines are useful if there is something that you want run at different times, and you don't want to keep writing the same thing again. I have a main control system that controls several things, and I am making subroutines so that the whole system works efficiently. For example there is a subroutine to increase the water level that can be run each night, and a subroutine for controlling the temperature of the tank."*

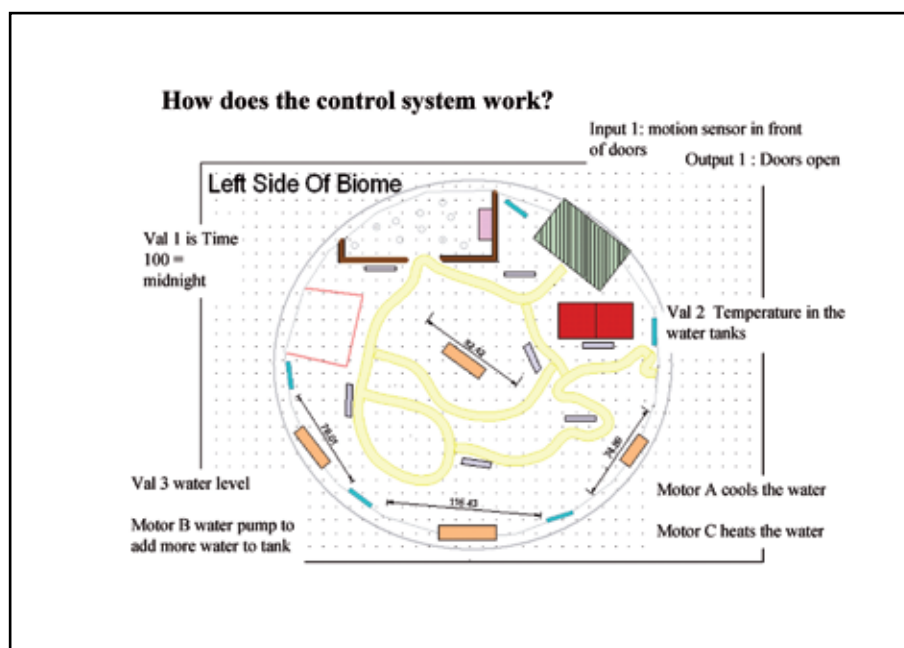
Pupil B considers how to communicate the control system to tourists.

*'In my presentation I need to show the tourists how the control systems work. It would be good to do an animation of the control system running so they see how it works.'*

Pupil B recognises the advantages of using ICT in control systems in the wider world.

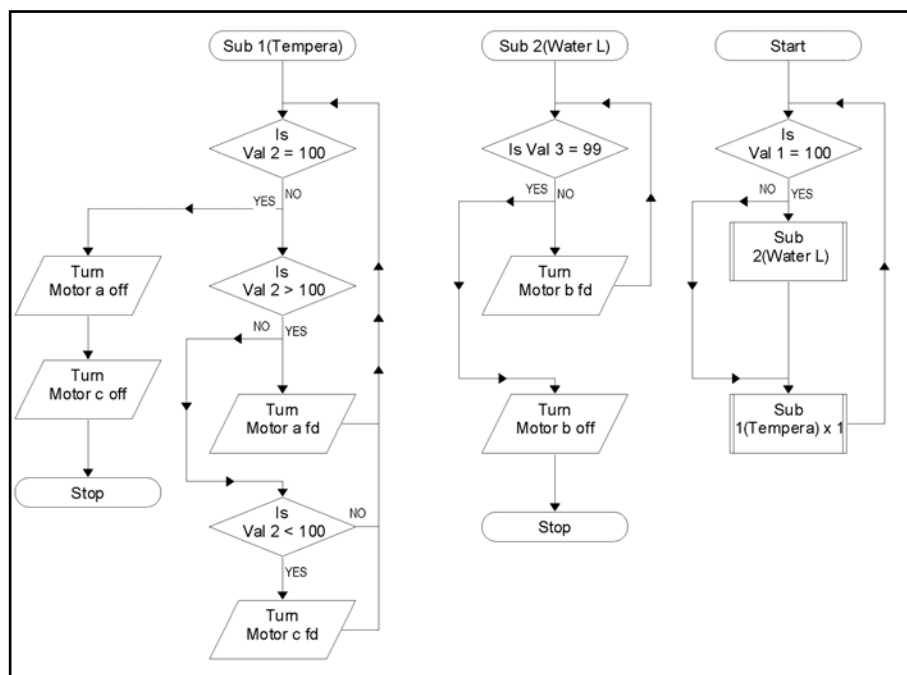
*'The smaller control system in the tank will control the temperature ... The reason why is to make sure that the biome is environmentally friendly. If the computer controls the temperature it will use less electricity because it will only use what it needs to keep the tanks at the right temperature. It will also keep the plants and animals alive by keeping them at the right temperature all day and night.'*

Pupil B created several annotated designs.



Pupil B worked on the control systems for the tanks, writing subroutines to control the water level in the tanks and the temperature of the water in the tanks so that he could create and test them separately.

He created a solution using the two subroutines and tested it using the control software. He realised the program did not run as originally planned and modified and refined the instructions.



Flowcharts created using FLOWOL™ by KEEP.IT.EASY (www.flowol.com), used with kind permission.

*'This is how I made it work. I looked back at the plan for my control systems and saw I had planned to include time of day but this was not in my flowcharts. This helped me. Val 1 is time, and Val 1 = 100 is midnight. Each night it pumps water in until it is at the right level. The rest of the time it checks the temperature, and adjusts the tank to keep it at the right temperature. The water level will not evaporate to dangerous levels in one day, but as I said in my plan for the control systems the temperature could affect the animals and plants, resulting in health problems and possibly even death.'*

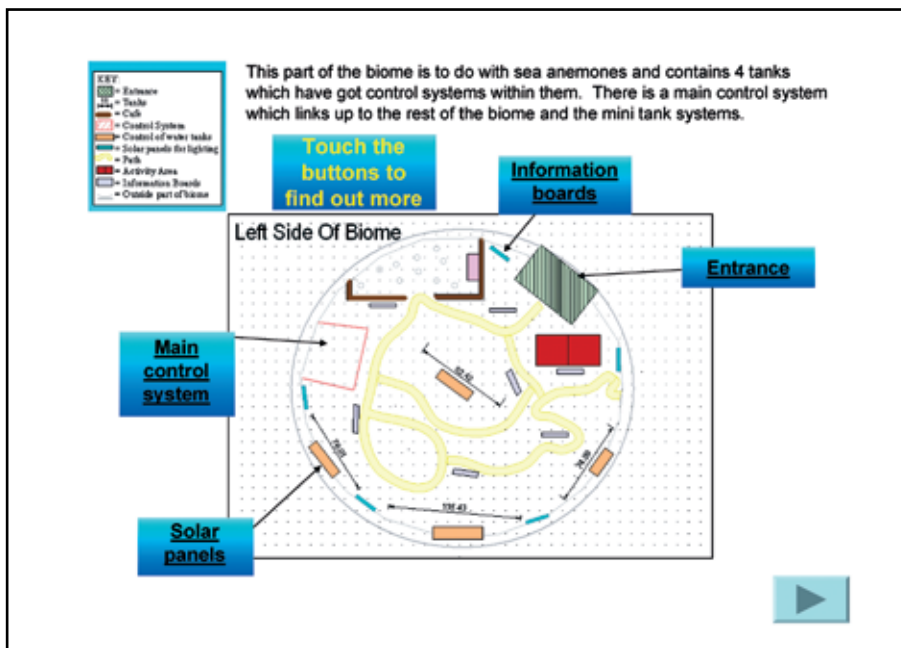
Pupil B evaluated his control system.

*'My control system is efficient to run because the level of water in the tanks is only checked once a day. This and the temperature checks keep the environmental impact down, as electricity for the pump and the water heaters and coolers are only used when they are needed. The sub-routines are efficient, because the instructions for adding water to the tank and checking temperature have only been written once, but can be repeated as needed all day and night. It also makes the program in the control system easier for other people to read and change if they want to in future.'*

Pupil B then designed a presentation to explain the design of the biome and demonstrate the control system to tourists visiting the biome.

*'I have used a key so the tourists can see all the things available to them in the biome, and when they touch a part of the screen the description comes up big, so they can see more about what they are interested in. This is because there are many different tourists every year and they will all be interested in different things, so they can choose what they want.'*





Pupil B realised that it was difficult for the visitors to understand the flowcharts, so used a screncorder to record the control system running, exported that as an animation and embedded it in the presentation.

Pupil B evaluated his presentation.

"I have chosen PowerPoint software because it's a good way to display information with buttons for use on a computer with a touch screen. I started using Publisher and I saved it as a website but it was more difficult for it to display properly on the screen as the tourists would have to scroll down and that did not look very good."

"The writing in the presentation is small, especially on the flowcharts, but it will be read on a screen in a computer room or on a touch screen at the Eden Project, so it does not need to be seen from a long way off and it needed to include all the information. I have put in navigation buttons so that the tourists can use the touch screens to see the information they want to see."

## Teacher's Notes

### AF1

Pupil B was able to independently plan a solution for a problem which was not familiar to him. He has integrated a range of ICT tools and techniques and his solution demonstrates some aspects of efficiency. He has evaluated and refined his presentation and used feedback from the control software to improve the effectiveness of his solution. Pupil B has identified a benefit of using ICT for a control system in a real-life setting.

### AF2

Pupil B has constructed a sequence of instructions in a modular way using subroutines.

### AF3

Pupil B has given sensible explanations of the choices made in communicating information about the control system to an unfamiliar and wider audience of tourists.

## Assessment Commentary

Pupil B structured a control solution showing some aspects of efficiency. Although Pupil B has understood why the use of subroutines can be efficient, he has only called the subroutine once in the program and has not repeated them in controlling the other water tanks. Throughout the project he has demonstrated a clear understanding of the requirements of the problem and has recognised some of the benefits of using ICT outside school. He has shown a sense of audience and has explained the choices he has made about his presentation. Pupil B has not carried out a lengthy evaluation, but has thought about which aspects of his solution are efficient, and which are effective. He has not articulated any success criteria by which to judge the success of the project, although he has recognised that his control system needs to work as planned.

## Next Steps

To make further progress pupil B will need opportunities to:

- develop efficient use of subroutines
- develop more complex success criteria to evaluate the solution to a problem.

## 2 Healthy lifestyles survey

### Assessment Focuses

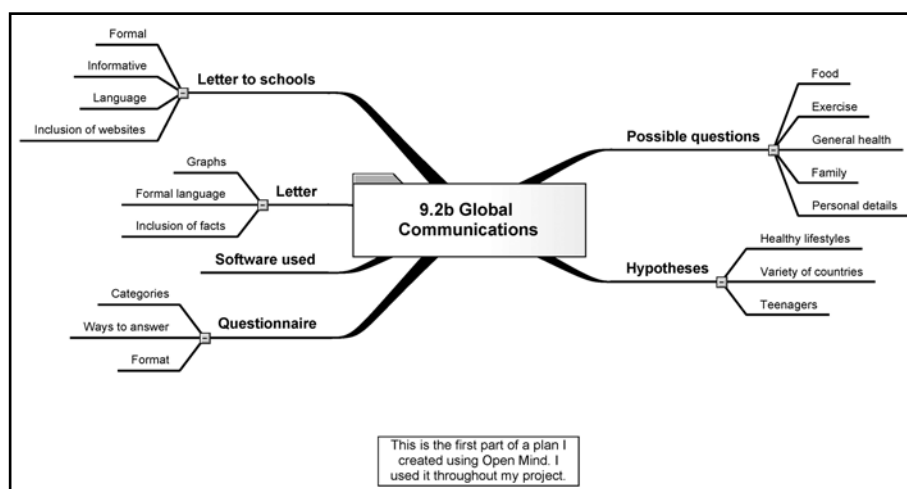
AF1, AF2, AF3.

### Context

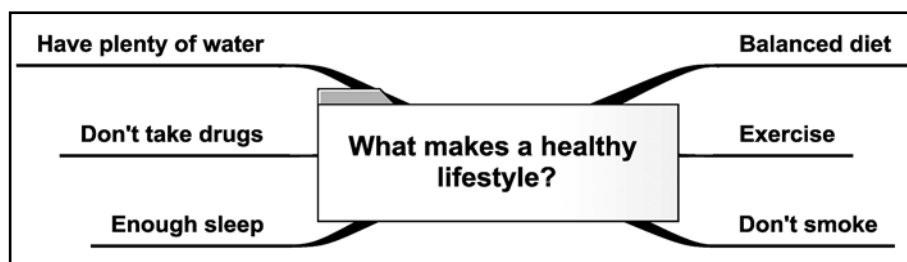
As part of a 'Healthy Eating' campaign, the head teacher asked the class to investigate how healthy the school's students are in comparison with teenagers from other countries. The initial planning for the project was done in groups but Pupil B worked independently to develop an online questionnaire. Although each pupil developed and tested their own questionnaire, the teacher advised the class that the response rate would be higher if pupils in other schools only had to answer one questionnaire. The teacher therefore combined the pupils' questions into one larger survey and posted this onto the website. In previous lessons pupils had undertaken data handling investigations and designed web forms, so they were able to select from an appropriate range of ICT tools and techniques. They were also familiar with the conventions of emailing and writing formal reports and letters, so they were able to write documents of sufficient quality to send to head teachers.

### Pupil B's work

Pupil B identified the elements of a solution to the problem using concept mapping software.



In discussion with other pupils Pupil B considered what makes a healthy lifestyle, and what lifestyles in other countries might be like.



Open Mind software screenshots used with permission from MatchWare A/S.

The pupils' initial hypotheses were that:

- German female teenagers are more likely to smoke than British female teenagers.
- Teenagers in England eat more snacks on average a day than teenagers in other countries.
- German teenage females do more exercise than British teenage females.
- Most pupils who lead healthy lifestyles have P.E as their favourite subject.
- British teenagers are more likely to take drugs than teenagers in other countries.

Pupil B explored the information needed to test the hypotheses and then devised the questions he needed to ask in order to find out this information. He then translated these into a format suitable for a questionnaire.

He chose to make this into an online form to allow easy collection of data from schools in other countries. He recognised that he needed to test the survey and noted that:

*'My form must:*

- *stop data entry errors*
- *be easy for pupils to use*
- *be available in several countries*
- *collect the right data*
- *work online*
- *save pupils' answers into a file*
- *produce output in graphs as well as answering the hypotheses'.*

Pupil B created his web form to collect the information, planning to minimise data entry error by using drop down menus, radio buttons and check boxes.

The screenshot shows a web form titled "Personal Information" with the following questions and input fields:

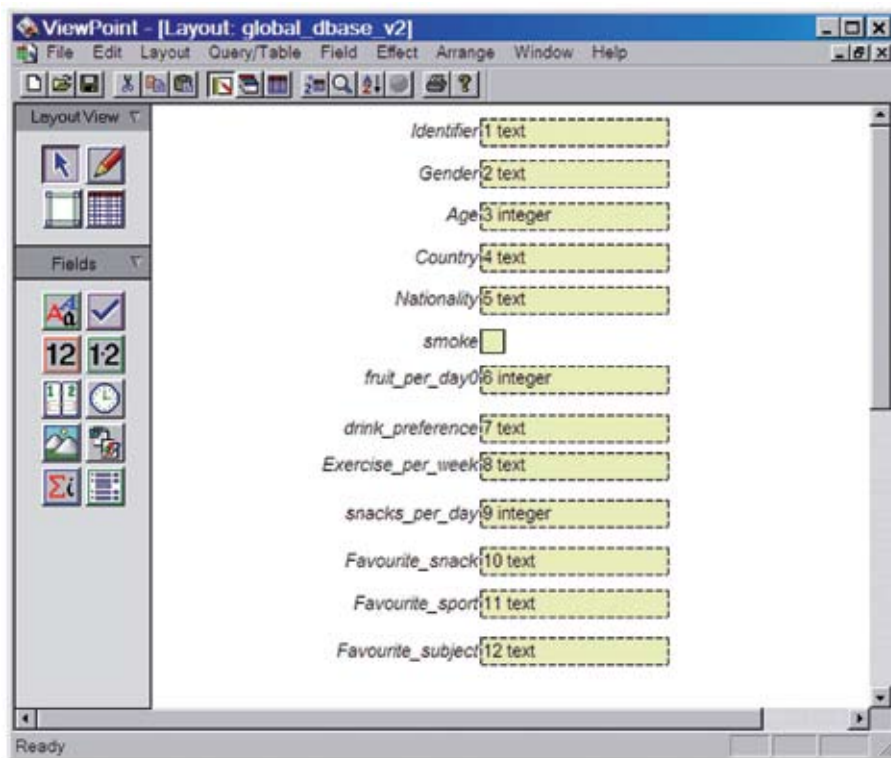
- What is your age? [12] (dropdown menu) If other, please state [ ] (text box)
- What is your gender? Male ☐ Female ☐
- What country are you from? [America] (dropdown menu) If other, please state [ ] (text box)
- How many litres do you drink of water a day? [0] (dropdown menu)
- What else do you drink throughout the day? (You may tick more than one)
  - Just Water ☐ Juice ☐ Fizzy ☐ Alcohol ☐ Hot drinks ☐
- How many fruit and vegetables do you eat a day? [0] (dropdown menu)
- Do you take drugs? Yes ☐ No ☐
- Do you smoke? Yes ☐ No ☐
- If yes, how many cigarettes do you have a day? [1-5] (dropdown menu)
- Do you drink alcohol? Yes ☐ No ☐
- If yes, how often? [Daily] (dropdown menu)
- How many hours do you exercise a day? [0] (dropdown menu)

Pupil B uploaded his survey to test that it worked and also amended it in response to feedback from peers. For example, Pupil B added an 'Other' field where responses did not correspond to those in a list and amended the items in the list of drinks when several pupils said they wanted to answer 'fizzy drinks'.

Pupils prepared a letter to send to schools in other countries, creating a database of contact details and using these to mail merge the letter using a word processor.

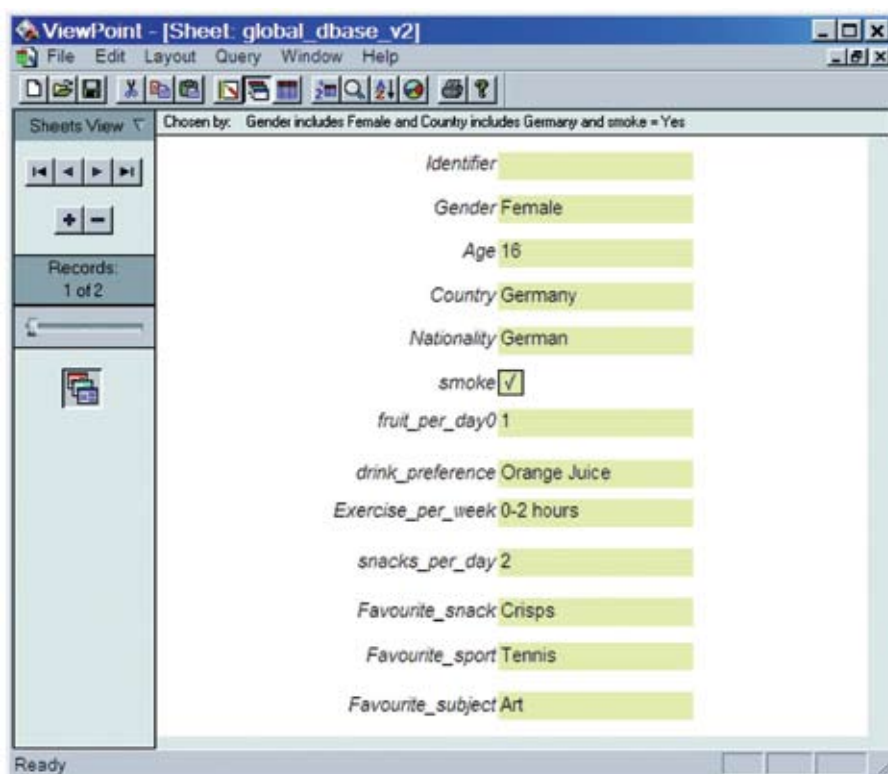
The 626 responses from the composite online survey were recorded as a csv file on the web server.

Pupil B decided which fields he needed to answer the hypotheses and created a data structure to contain the relevant records. He then imported the selected fields from all the records.



Pupil B then ran queries to answer the hypotheses.

"Hypothesis: German female teenagers are more likely to smoke than English female teenagers."



Viewpoint software screenshot used with permission from Iota Software Limited and Logotron Limited.

Pupil B told the teacher

*'the hypothesis looks true, as the percent of female smokers in England was 6%, and the percent of female smokers in Germany was 7%.'*

He mentioned a possible cause:

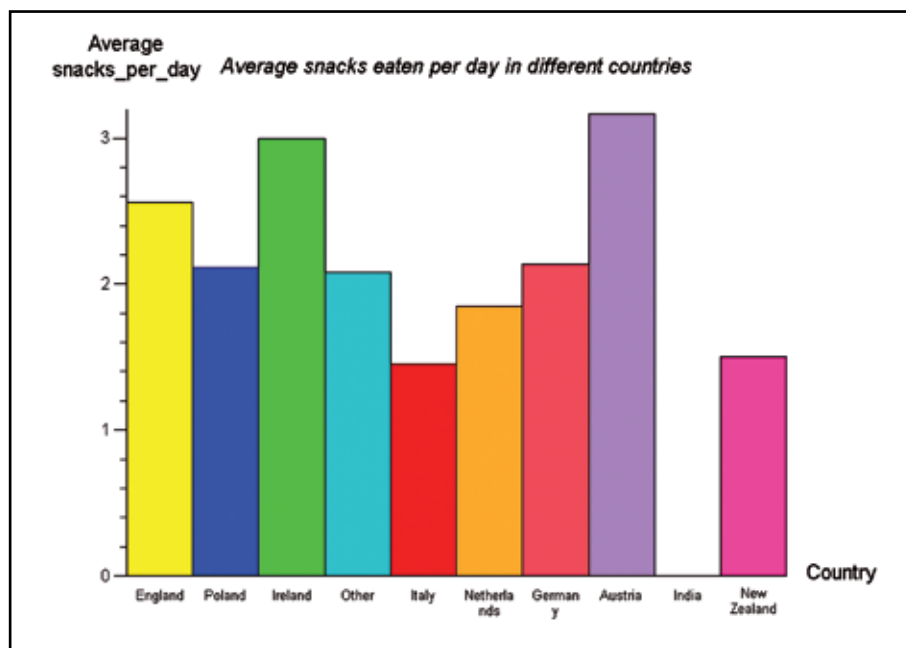
*'In England we have had some adverts to make us stop smoking and it's very expensive so maybe that's why.'*

In discussion the teacher prompted Pupil B to look at the number of respondents and the effect of sample size on his results.

*'Lots more English females did the survey (111) than Germans (30) and also the numbers are small – only two smokers in Germany, so they don't represent the whole population of Germany.'*

Hypothesis: Teenagers in England eat more snacks on average a day than teenagers in other countries.

Pupil B ran a query using the graph function to show average snacks eaten for each country.

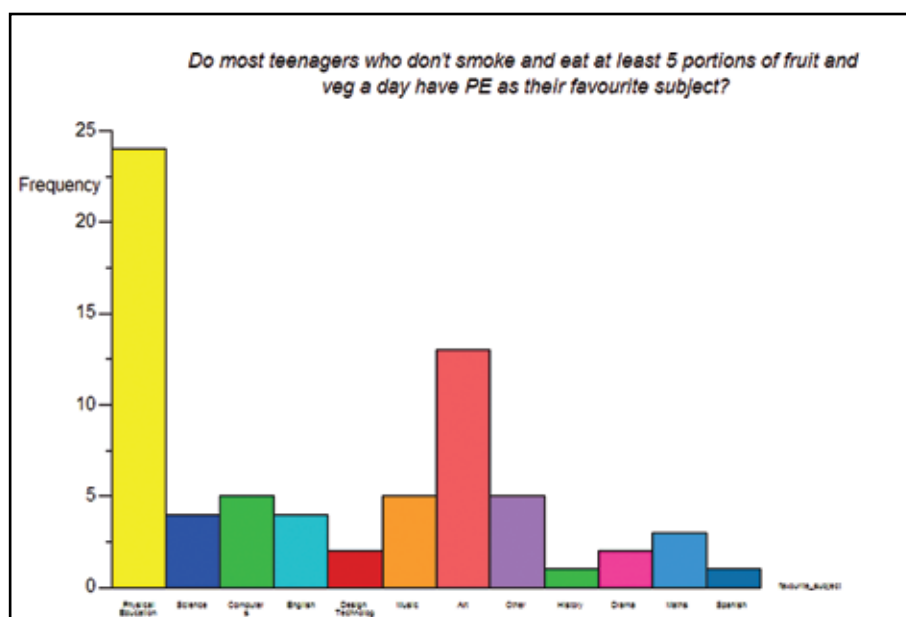


© Copyright Iota Software Limited and Logotron Limited. Used with kind permission.

*'This shows that yes, teenagers in England do eat more snacks a day on average than teenagers in the other countries except for Ireland and Austria. Apart from India, New Zealand teenagers eat the least snacks. Indian teenagers said they ate no snacks, so they are the healthiest on this measure.'*

Hypothesis: Most pupils who lead healthy lifestyles have PE as their favourite subject.

Pupil B decided that living a healthy lifestyle was best shown by not smoking and eating five or more portions of fruit and vegetables a day. He created search criteria, performed the search and then graphed the results from this to show favourite subject, noting that the hypothesis was true.



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Pupil B wrote the outcomes of the survey as a report for the Head teacher and also sent copies by email and as printed reports to the schools that had responded, using a mailmerge.

Report to: Headteacher  
Cc: <Title> <surname>, <job title> <participating school>  
From: Pupil D  
Date: XX/XX/XX

Title: Results of the \_\_\_\_\_ School survey into different lifestyles of teenagers all over the world

#### Summary of main findings

**German female teenagers are more likely to smoke than British female teenagers.**

**Teenagers in England eat more snacks a day on average than teenagers in other countries.**

**German teenage females do more exercise than British teenage females.**

**Most pupils that lead a healthy lifestyle have P.E as their favourite subject.**

In his report, Pupil B discusses the validity of his findings, identifying a flaw with the data and suggesting an improvement.

*'I have written my hypotheses for whole countries, and there are only results for one or maybe two schools in the whole country, so it is probably not true to draw a conclusion for a whole country. However I have selected schools at random, and in these schools there are about 5% of the school who have replied, which is an OK sample for a school. Does that school represent the whole country? To be sure I would need more replies from other schools in the same country.'*

Pupil B has made an attempt to check his findings against other sources and identifies a reason for possible bias in the results.

*'To check the UK results I used a search engine to find 'UK statistics teenage smokers 2008'. I found some numbers on smoking in the UK. Here it says 9% for 11- 15 [http://www.bma.org.uk/ap.nsf/AttachmentsByTitle/PDFforevercool/\\$FILE/forevercool.pdf](http://www.bma.org.uk/ap.nsf/AttachmentsByTitle/PDFforevercool/$FILE/forevercool.pdf)<sup>1</sup>*

*The same site says 20% for 16 – 19 year olds in the UK. Another site, <http://www.idea.gov.uk/idk/core/page.do?pagelId=6462399> says about a tenth or 10% of 12 – 15 year olds are regular smokers.<sup>2</sup>*

*Our survey said 6% which is a bit low. Maybe because people are doing the survey at school they don't want to say they smoke because they don't want their teachers to know. But this would be the same in the other countries too.'*

1. © British Medical Association (2008) *Forever cool: the influence of smoking imagery on young people*. Statistics from the Information Centre for Health and Social Care, National Centre for Social Research, National Foundation for Educational Research (2007) *Smoking, Drinking and drug use among young in England 2006*. London: Information Centre for Health and Social Care, National Centre for Social Research, National Foundation for Educational Research.

2. © Trigg, Nick. *Combating teenage smoking* (May 2007). Improvement and Development Agency. [www.idea.gov.uk](http://www.idea.gov.uk)



## Teacher's notes

### AF1

Pupil B planned and developed a solution to a problem which shows some efficiency and integration of ICT tools and techniques. For example, Pupil B has planned for efficient data collection through the use of an online form. He has created and tested an online survey, refining it in response to peer feedback. He has used a range of software to develop ideas, to collect data online, to hold data including school details, to graph data and also to present information to the head teacher. He has identified success criteria for the online form.

### AF2

Pupil B has created a data handling solution to test hypotheses, reducing input errors by using a range of ICT techniques. He has collated the results in an appropriate format, creating a database which he then used to test his hypotheses and provide a report for the head teacher.

### AF3

Pupil B has begun to consider how to exchange information with a remote audience. He has used complex lines of enquiry to test his hypotheses. Pupil B has recognised that different numbers of teenagers from each country have answered the survey and has thought about the consequences of this for the validity of his conclusions.

## Assessment Commentary

Pupil B has planned a structured ICT solution to a problem, integrating different forms of information and making appropriate choices regarding data structure and software to be used. He has manipulated a large data set and with prompting, demonstrated an awareness of sample size in data collection and the effect this can have on the reliability of conclusions. He has interpreted his results and communicated them in a form suitable to his audience.

## Next steps

- Discuss the impact of electronic databases on learning, everyday life and employment, and the potential for misuse of personal data.
- Establish complex success criteria to evaluate a solution to a problem.

## Assessment summary

### AF1 Planning, developing and evaluating

Pupil B is able to plan and develop solutions independently which integrate ICT tools and techniques and demonstrate aspects of efficiency. He tests and evaluates the success and effectiveness of his solutions and uses feedback from peers and from running the control program to improve them. However his use of success criteria is limited and needs to be developed further. Pupil B is aware of benefits of using ICT control systems in a real life situation, but the work provides limited opportunity for exploring the wider impacts of the use of ICT in work, leisure and home. The evidence suggests he is working at low level 6 in AF1.

### AF2 Handling data, sequencing instructions and modelling

Pupil B is beginning to think about efficiency when planning sequences of instructions and understands some of the benefits of using subroutines. He is able to devise a data handling solution to test hypotheses using a large data set and has begun to use techniques to reduce input errors.

The work does not provide opportunity for him to use ICT to test predictions using modelling.

The evidence places him at low level 6 in AF2.

### AF3 Finding, using and communicating

Pupil B is able to use complex lines of enquiry to interrogate a large data set and find information efficiently in order to answer hypotheses. The evidence places him at low level 6 in AF3.

## Overall Assessment Judgement

Pupil B is making progress into level 6 but much of his work shows that he is not yet working at a secure level 6. He is able to plan and develop solutions independently which integrate ICT tools and techniques but he is only beginning to demonstrate aspects of efficiency. He understands the benefits of using subroutines when creating sequences of instructions, but doesn't always use them in an efficient way. Pupil B is able to use a data handling solution for testing hypotheses and has begun to use techniques to reduce input errors. He is able to use success criteria in a limited way, but needs to develop this further. In addition, he needs further opportunities to demonstrate use of modelling to test predictions and opportunities to explore the impact of ICT in work, leisure and home.

## ICT assessment guidelines: Level 6

Pupil name.....Pupil B.....

	AF1 – Planning, developing and evaluating situations pupils:	AF2 – Handling data, sequencing instructions and modelling pupils:	AF3 – Finding, using and communicating information situations pupils:
L6	<ul style="list-style-type: none"> <li>Plan and develop solutions to problems which show efficiency and integration of ICT tools and techniques</li> <li>Use criteria and feedback to improve the effectiveness and efficiency of solutions</li> <li>Explore the impacts of the use of ICT in work, leisure and home.</li> </ul> <input checked="" type="checkbox"/>	<ul style="list-style-type: none"> <li>Devise a data handling solution to test hypotheses that uses techniques to reduce input errors.</li> <li>Create efficient sequences of instructions including the use of using subroutines</li> <li>Test predictions by varying rules in models and assess the validity of the conclusions.</li> </ul> <input checked="" type="checkbox"/>	<ul style="list-style-type: none"> <li>Use complex lines of enquiry efficiently to interrogate information</li> <li>Explain choices when presenting information for different purposes and wider or remote audiences</li> </ul> <input checked="" type="checkbox"/>
L5	<ul style="list-style-type: none"> <li>Plan and develop structured solutions to problems which use a combination of ICT tools and techniques</li> <li>Use criteria to evaluate the quality of solutions, identifying improvements and refining their work</li> <li>Identify benefits and limitations of using ICT both inside and outside school</li> </ul> <input type="checkbox"/>	<ul style="list-style-type: none"> <li>Use logical and appropriate structures to organise and process data</li> <li>Create precise and accurate sequences of instructions</li> <li>Change variables within models and explain the impact</li> </ul> <input type="checkbox"/>	<ul style="list-style-type: none"> <li>Take account of accuracy and potential bias when searching for and selecting information</li> <li>Present information in a range of forms for specific purposes and familiar audiences</li> <li>Use ICT safely and responsibly</li> </ul> <input type="checkbox"/>
BL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
IE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Key: BL-Below Level IE-Insufficient Evidence

**Overall assessment** (tick one box only)
 Low 5 ☐    Secure 5 ☐    High 5 ☐    Low 6 ☒    Secure 6 ☐    High 6 ☐

Audience: Secondary ICT subject leaders

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