**Suggested Scheme of Work for Year 5 Science Fair**

*Please adapt as appropriate and complete risk assessment(s) as appropriate to your organisation. Health and safety comments on resources supplied are to support further appropriate planning and measures.*

**National Curriculum link**

(from Science programmes of study: key stages 1 and 2, National curriculum in England, 2013)

The nature, processes and methods of science ‘Working scientifically’ specifies the understanding of the nature, processes and methods of science for each year group. It should not be taught as a separate strand. The notes and guidance give examples of how ‘working scientifically’ might be embedded within the content of biology, chemistry and physics, focusing on the key features of scientific enquiry, so that pupils learn to use a variety of approaches to answer relevant scientific questions. These types of scientific enquiry should include: observing over time; pattern seeking; identifying, classifying and grouping; comparative and fair testing (controlled investigations); and researching using secondary sources. Pupils should seek answers to questions through collecting, analysing and presenting data. ‘Working scientifically’ will be developed further at key stages 3 and 4, once pupils have built up sufficient understanding of science to engage meaningfully in more sophisticated discussion of experimental design and control.

**Resources online**

This concept was adapted from work in a Chicago Middle School and there are many online resources from the US that may help, e.g. <https://www.sciencebuddies.org/teacher-resources/science-fair-tools> . Note that Science Fair will often mean this process of researching a question not the images from The Simpsons etc. of model volcanoes and robots!

**Possible Scheme of Work**

Basic resources are included. They deliberately do not contain many images so as to observe copyright etc. so can be improved to suit context. The nature of these projects means that some flexibility and adjustment is required to lesson content but we have found that some structure helps so that pupils are not in completely different points in the process each lesson, which is very challenging to manage and requires a lot of individual self-management by pupils too!

**Competition / Reflection**

Northfield School for Girls hold Science Fair in the last week of the school year. Please contact us if you would like to visit to see Year 8 work or join in the celebrations and competitions! We would love to have you join us!

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| **Lesson** | **Objective** | **Starter** | **Main(s)** | **Plenary** | **Support** | **Stretch** | **Homework** | **Notes** |
| 1 Choosing a project | To understand how to choose a question to investigate for Science Fair. | Look at pictures of suggested investigations and discuss whether they can be carried out safely and whether they are testable. | Come up with questions in a group and consider whether they are safe and testable. Share ideas as a class. | Feedback on suggested questions on the board using think pounce bounce.  1 MCQ | More questions could be given (e.g. from the slide) rather than generating their own questions. | Changing a question so that it is testable may be more challenging – pupils could be given some poorly worded questions to improve. | Develop a question to investigate for Science Fair.  A proposal form is included but see copyright in footer. | Projects may be individual but also could be completed in pairs or groups (or even as a class – plant investigations can work well for this). |
| 2 Variables and predictions | To understand types of variables and write down three types of variables for your question. | Consider how to plan to test “which brand of chocolate is the best?” including improving the question as a link to the previous lesson. | Comprehension task to understand the main variables (if required).  Further task to work as a class to identify variables for the chocolate question.  Check (and adjust) the question for Science Fair projects. | 3 MCQs | A support sheet is included to scaffold answers. | Explaining control variables in terms of how they can affect the dependent variable can be useful both for written explanation skills and better understanding of why some equipment is not a control variable. | Write a prediction for your question. | Submitting questions to the teacher in advance may be helpful as checking them during the lesson can be challenging, especially with individual projects. |
| 3 Writing a method | To write an equipment list and method for my science fair question. | An example question is provided to recap the three main variables and then to generate a prediction. | A comprehension task based on an example method sheet (resource provided).  Write a method for the Science Fair question to be tested. | 2 MCQs | A support sheet is included to scaffold answers. | The method should include the main control variables. It should also include the range and intervals of the independent variable (as appropriate). Repeats should be included.  Pupils should avoid writing “collect your equipment” in methods of listing easily available resources, like water. | Check for permission and be prepared to start the investigation. | Ensure health and safety is considered and checked before pupils begin investigating. It may be best to ensure parent signatures for any work at home. Batteries, back engineering, interfering with animal behaviour, dangerous plants and fungi etc. should never be allowed. |
| 4 Risk assessment | To write a risk assessment (including how to manage risks) for the science fair investigation. | Several possible investigation questions are listed. Pupils should try to think of hazards and how to manage the risks. | Write a risk assessment for the Science Fair question. | 1 MCQ | A support sheet is provided to scaffold learning. | A real-life scenario could be given for pupils to risk assess, such as an adventure activity. This may include flexibility and the understanding that sometimes decisions need to be made during activities but with effective pre-planning. | Discuss risk assessments at work with a member of the family. | This is a relatively short lesson and there is a good careers link here that many careers could be linked to. |
| 5 Recording results | To draw a table of results (with pencil and ruler) to record investigation results and understand why repeats should be included. | Look at examples of tables (sheet supplied with examples from online). Discuss similarities and differences. | Demonstrate the key points of a table with the presentation.  Pupils should draw their own table to use.  An activity to calculate averages but also consider rounding and anomalies is included as a second optional task. | 3 MCQs | A blank table with some prompts is available to scaffold. | Further work on averages could be included, especially spotting and accounting for anomalies and different numbers of repeats. | Have a table of results prepared.  Data collection can start if permission / H&S is complete. | Pupils particularly struggle with the layout of the headings when repeats are included.  Using a pencil and ruler is important for table lines.  Units should be included in the heading of columns but not in each recording. |
| 6 Investigations | To either record your results or be able to do this for homework by the next Science Fair lesson. | A checklist can be used to recap and ensure everything is prepared to start investigating the Science Fair question. | Collect data. | 1 MCQs | Some pupils may need support to collect data or may need to work in a group with the teacher or a TA to collect data, e.g. a plant investigation. | The amount of appropriate data collected can be a challenge at this stage and pupils may need to amend plans in light of findings. | Complete data collection and record data in the table ready for next lesson. | This lesson may need to be adapted for pupils carrying out data collection at home or omitted completely if all pupils are doing this. Consideration of how to do this if pupils have many things happening at once may be needed – sometimes pupils can observe each other as a class (e.g. coke fountain investigations). Further risk assessment may be needed. |
| 7 Graphs | To draw a graph or chart to display your results. | Look at a bar chart and scatter- and graph and discuss which is used when and how they are correctly constructed. | Draw a graph or chart for data collected.  This can be more creative once basic drawing with pencil and ruler is completed. | 2 MCQs | Pupils may need support to select their graph and possibly a prepared graph sheet. This will depend on the pupil as it may be help with axes, scales or the actual plotting. | Further work on types of variables (either names or categorising into continuous and categoric). Discontinuous can also be introduced as well as ordered data. Lines of best fit could be introduced (they may be curves in Science). Use of error bars would be very advanced but possible. | Complete the graph or chart for next lesson. | Using a correct scale can be an issue.  Lines of best fit can be curved in Science throughout KS3 and KS4. Xs are used for plots rather than dots. |
| 8 Conclusions | To write a clear and concise conclusion from the results of Science Fair. | Look at a table and graph to consider why graphs are useful.  Draw a conclusion and how to support this as a class using discussion. | Practise generating conclusions from the sheet of tables of results.  Move on to write a conclusion with supporting data for the Science Fair project. | 1 MCQ | Repetition of linking the dependent and independent variable may be needed.  Evaluation may be more limited to some key points depending on previous learning in Science. | Evaluation work can be extensive and increasingly adjusted towards GCSE level.  A literacy mat from KS4 is included with key evaluation and investigation terms used by AQA for GCSEs. | Prepare final resources to use for the write-up. | Evaluations can be split into data and method so that pupils can consider whether they have carried out a fair test separately to whether the data is sufficient to generate a conclusion. |
| 9 Write-up | To complete a write-up of Science Fair investigations. | Consider the pros and cons of ways to present work (this may be adjusted according to the planned presentation style).  Consider why scientists share work. | Complete the write-up. | Sharing work with the class – 2 stars and a wish or similar | Pupils could complete a template or workbook | The write-up could be a more in-depth report that includes background research and / or evaluation.  More advanced ICT skills could also be used, such as tables and graphs in Excel. | Complete the report write-up and / or display. | Displays on crisp boxes from shops are impressive but involve substantial “make” time in class with lots of art resources. Be aware of trying to dispose of lots of cardboard late in term time (unless pupils will take them home).  We have found a written project works well.  Universities often use posters to promote work and this can be a good way to introduce academic posters with key information included. |