 Depth study task notification

Year 11 Investigating Science: Module 3

Constructing a scientific model

In this module you have learnt the importance of scientific models in both developing a scientific understanding of concepts and explaining concepts to an audience.

During this unit on 'Models', you will be undertaking a depth study. You will choose a scientific concept that interests you and build a working model about it. The model must be interactive for the audience (the audience must be able to manipulate it in some way) and should help them to understand the concept or idea you have chosen.

You cannot copy a model which is already commercially available and you must build it yourself at school. The model itself is not as important as the process you follow to make this model. A portfolio will be completed in class and your teacher will provide regular feedback as the Depth Study progresses.

The models will be demonstrated at a Science Fair and students and teachers will evaluate them. Any physical models must be able to sit on a small school desk and must be safe to operate.

Outcomes assessed

* develop and evaluate questions and hypotheses for scientific investigation (INS11-1)
* designs and evaluates investigations to obtain primary and secondary data and information (INS11-2)
* solve scientific problems using primary and secondary data, critical thinking skills and scientific processes (INS11-6)
* communicate scientific understanding using suitable language and terminology for a specific audience or purpose (INS11-7)
* develop, and engage with, modelling as an aid in predicting and simplifying scientific objects and processes (INS11-10)

This document references the [Investigating Science Stage 6 Syllabus](https://syllabus.nesa.nsw.edu.au/investigating-science-stage6/) © 2017 [NSW Education Standards Authority (NESA)](http://syllabus.nesa.nsw.edu.au/copyright/) for and on behalf of the Crown in right of the State of New South Wales.

Important details

Task weighting: 30%.

This includes 20% Working Scientifically skills and 10% Knowledge and Understanding.

Dates: [proposed date]

Time: 10 hours

Marks

1. Marking of model presentation at science fair by peers and teachers worth 20 marks (weighting 70% teacher mark, 30% peer mark)
2. Completing a short written task on the same day as the fair worth 10 marks. You will be allowed to refer to your portfolio during the written component of the task.

Peer evaluation

Science fair peer evaluation example.

Planning investigations

The model is designed to properly address the question posed.

| **1** | **2** | **3** | **4** | **5** |
| --- | --- | --- | --- | --- |
| Limited | Basic | Sound | High | Excellent |

Prediction

The model made a clear and relevant prediction.

| **1** | **2** | **3** | **4** | **5** |
| --- | --- | --- | --- | --- |
| Limited | Basic | Sound | High | Excellent |

Problem solving

The material and model constructed effectively demonstrated the answer to the question.

| **1** | **2** | **3** | **4** | **5** |
| --- | --- | --- | --- | --- |
| Limited | Basic | Sound | High | Excellent |

Communication

The speaker could explain the workings of the model well and the display helped to communicate meaning.

| **1** | **2** | **3** | **4** | **5** |
| --- | --- | --- | --- | --- |
| Limited | Basic | Sound | High | Excellent |

The above marking criteria will be used by teachers and other peers/guests. The final mark out of 20 will be weighted as 70% teacher mark to 30% peer mark.

Task

What have you always wondered about? Construct a working (and moving!) scientific model to explain the answer.

Einstein famously wondered about what would happen if you travelled in a train at the speed of light, and came up with a model to explain his answer.

As a child, did you wonder why is the sky blue? Or have you ever wondered exactly how paracetamol or antibiotics work? This is your chance to ask your own question and build a working model to explain your answer.

Submission, presentation and assessment

* A plan of your model and how you will create it must be submitted as a portfolio. You will be provided with feedback throughout the process and assist you in using your time effectively.
* Your working model will be assessed as part of a science fair where your peers will exhibit their models to an audience. You will create an A4 information sheet to introduce your working model. The audience will provide feedback and 'audience favourite' prizes will be awarded.
* You will be asked to provide written responses to the following questions on the day of the Science fair.

1. Explain how your model simplifies understanding of a scientific concept
2. Describe how you decided on the type of model to answer your question
3. Assess the accuracy of the predictions the model makes.
4. Discuss the limitations of your model.
5. How could you simplify and/or extend on your model?

Important Details

* Your question must start with 'why' or 'how' as it is posing a question for inquiry. They should not begin with 'what'.
* Your proposed question must be approved by your teacher.
* Your model must move and/or show the dynamics behind the answer to your question. It does not necessarily have to be physical model (that is; you could create a dynamic computer model or animation that demonstrates things well).
* Your model must also be predictive.
* Consider the expense of the materials you will like to use to build your model and how well it will function in a science fair environment
* You will be allocated 10 hours of class time (approximately 2 weeks) to complete the task.

Teacher notes

As a guide, it is suggested that the task be completed in 10 hours (teacher’s discretion) and up to 2 hours allocated for assessment of learning. This allows up to 12 hours of depth study time or just over a third of the overall time for Investigating Science.

If the teacher chooses to use this as a formal depth study assessment task, the teacher should continue to provide informal feedback to students and provide opportunities for formative assessment.

Possible variations and adjustment to task

Depending on the school context and students, the following adjustments may be appropriate:

* Not providing the 'questions' for the writing task to be completed on the day of the science fair (on pages 1 and 3).
* Not providing the 'questions' and allowing an 'open book' type of assessment. This could vary the challenge of the task.
* The level of 'audience' for the science fair could range from: primary school students, younger high school students, Year 10 students (as a taster of what the course is like), Year 12 students, teachers and/or parents. It is suggested that this is added specifically to the task to provide a context for students.
* The portfolio that students keep and submit may be written or completed electronically, such as using a OneNote Class Notebook.

Possible transformation to a Viva Voce task

Instead of demonstrating at a science fair, student could bring their constructed model to a live interview to demonstrate and explain their concept, or video themselves demonstrating their model and uploading. The use of software programs such as flipgrid can allow for teachers to issue questions and collect video at set times, or teachers could email questions and collect video submission via Teams assignment or Google classroom. Students could be asked similar questions to the science fair task with the marking rubric adjusted to cater for oral communication.

Possible use as a non-depth study task

Teachers could also use this assessment task to assess students’ skills rather than as a formal depth study for summative assessment. In this case, outcome INS11-1 need not be assessed, and teachers will be able to guide a cohort by providing students with a scientific concept/process about which to build a model:

* model of DNA
* model of an atom
* model of the universe
* model of current flow through a circuit
* model of how volcanoes are formed
* model of how cells reproduce