

Roleplay Exercise

“Who is involved in the peer review process? What do they do?”

Objectives:

By the end of these exercises, students should be able to understand:

- ◆ the process of publishing papers in a journal
- ◆ the roles of the editor and other scientists (peer reviewers) in the peer review process
- ◆ the importance of peer review



CURRICULUM CONNECTION

REFERENCE	ACTIVITY		
	ROLEPLAY EXERCISE	SCIENCE IN THE NEWS	THE PROCESS AND ITS CHALLENGES
National Curriculum (KS4)	Pupils should be taught: 1.2d to evaluate methods of collection of data and consider their validity and reliability as evidence 1.3c to present information, develop an argument and draw a conclusion, using scientific language 1.4c how uncertainties in scientific knowledge and scientific ideas change over time and about the role of the scientific community in validating these changes		
GCSE Science A (AQA)	Candidates should be able to: a) demonstrate knowledge and understanding of the scientific facts, concepts, techniques and terminology in the specification b) show understanding of how scientific evidence is collected and its relationship with scientific explanations and theories c) show understanding of how scientific knowledge and ideas change over time and how these changes are validated.		
GCSE Science B (AQA)			
GCSE Science (Edexcel)			
GCSE Science (OCR – Gateway)	Element 2: Report on Science in the News A. Candidates are expected to be able to: The ability to plan an approach to the task, including the selection of suitable sources of data/information, which will address the issues. <ul style="list-style-type: none"> • Plan to answer a scientific question (PoS 3.6ia) • Collect data from secondary sources, including the use of ICT sources and tools (PoS 3.6iib) • Apply and question scientific information or ideas (PoS 3.6iia). B. The ability to analyse the data/information and interpret it to show trends or patterns. Candidates are expected to be able to: <ul style="list-style-type: none"> • Interpret data, using creative thought, to provide evidence for testing ideas (PoS 3.6ib) • Analyse scientific information or ideas (PoS 3.6iia). C. The ability to evaluate the data/information to reach judgments about its reliability and validity. Candidates are expected to be able to: <ul style="list-style-type: none"> • Consider the validity and reliability of data as evidence (PoS 3.6id) • Interpret and question scientific information or ideas (PoS 3.6iia). D. The ability to relate the data/information to social, economic and environmental issues and understand how science can contribute to decision making. Candidates are expected to be able to: <ul style="list-style-type: none"> • Know why decisions about science and technology are made, including those that raise ethical issues, and know about the social, economic and environmental effects of such decisions (PoS3.6ivb) • Know that uncertainty in scientific knowledge and ideas changes over time and know the role of the scientific community in validating these changes (PoS 3.6ivc). 		

REFERENCE	ACTIVITY		
	ROLEPLAY EXERCISE	SCIENCE IN THE NEWS	THE PROCESS AND ITS CHALLENGES
GCSE Science (OCR – Twenty First Century Science)	<p>laS4.2 Students can:</p> <ul style="list-style-type: none"> identify absence of replication as a reason for questioning a scientific claim; explain why scientists regard it as important that a scientific claim can be replicated by other scientists. 	<p>laS4.1 Students can:</p> <ul style="list-style-type: none"> describe in broad outline the ‘peer review’ process, in which new scientific claims are evaluated by other scientists; recognise that new scientific claims which have not yet been evaluated by the scientific community are less reliable than well-established ones. 	<p>laS4.3 Students can:</p> <ul style="list-style-type: none"> suggest plausible reasons why scientists involved in a scientific event or issue disagree(d). <p>laS4.4 Students can</p> <ul style="list-style-type: none"> suggest reasons for scientists’ reluctance to give up an accepted explanation when new data appear to conflict with it.
International Baccalaureate Diploma Programme	<p>The International Baccalaureate Diploma Programme requires students to research and prepare a 4000 word write-up or mini-thesis on a subject topic of their choice. This is called the Extended essay. It enables the students to get introduced to the concept of independent and fruitful research work, which should involve reproducible experimental results and plausible theoretical back-up.</p> <p>If the student chooses to write an extended essay in a science subject, such as Chemistry, he or she would need to be made aware of the importance of peer review in evaluating new scientific ideas, how science is reported in the news, and the risks associated with plagiarism and improper representation of facts.</p>		

Teacher's notes

Introduction

Science has a system for assessing the quality of research before it is published. This system is called **peer review**.

When a researcher finishes a stage of work, they usually write a paper presenting their methods, results, and conclusions. They then send this paper to a scientific journal to be considered for publication. The editor will pass the study on to external reviewers who evaluate the study for **validity, significance and originality**, before recommending that the study be either published, returned to the researcher for amendments, or rejected outright.

This exercise will allow students to re-enact that process. It is a mock study on the effect of chocolate on blood pressure, to undergo peer review by the students.

Suggested Activity Outline

HOMEWORK PREPARATION

- ◆ The class should be divided into groups, in each group there should be at least one editor, one scientist/researcher, and two peer reviewers.
- ◆ The handout containing the aim of the chocolate investigation and the method used should be distributed to the students one day prior to the actual activity day so that class time is not spent reading the worksheets. The worksheets with the title "scientist", "peer reviewer" etc should be given to the respective students so that they know what direction to think on.
- ◆ As homework, each group member whether a "scientist" or a "reviewer" or the "editor" should have their agenda ready for the class for discussions. E.g. the reviewer should anticipate what the scientist is going to say and be ready with their own questions and view points on the work.

CLASSROOM ACTIVITY

- ◆ In class, the scientist should present his/her findings and conclusion (15-20 minutes). This is the time when the reviewers can ask questions to the scientist or express their concerns.
- ◆ The class meets again in the next period and the editor and his/her team come up with their conclusion on whether the paper should be published or not. They present this information to the class. As editor is the final word in this activity, there could be brainstorming in class on the editor's opinion at the end of which the final verdict will be given (30-45 minutes)
- ◆ To conclude, the scientist will be given a list of recommendations if required to improve the study before it can be published.



Investigation into the effect of chocolate on blood pressure

By Dr Denver

Abstract

The effect of dark, milk and white chocolate on blood pressure was measured over a month. It was found that people who ate the chocolate with the higher cocoa levels had lower blood pressure as a result.

Introduction

Cocoa has been thought to have health benefits ever since studies showed Kuna Indians, from the island of San Blas off the coast of Panama reported less heart conditions than the rest of the world. Cocoa is an important part of the Kuna Indians' diet, so this study set out to measure how different types of chocolate with varying cocoa levels affected blood pressure. Grassi *et al* first showed that dark chocolate might cause a decrease in blood pressure when they looked at how eating it affected blood pressure compare to eating white chocolate. Previous studies have shown the presence of special types of chemicals called flavonoids in cocoa, which might be the reason for this effect.

Method

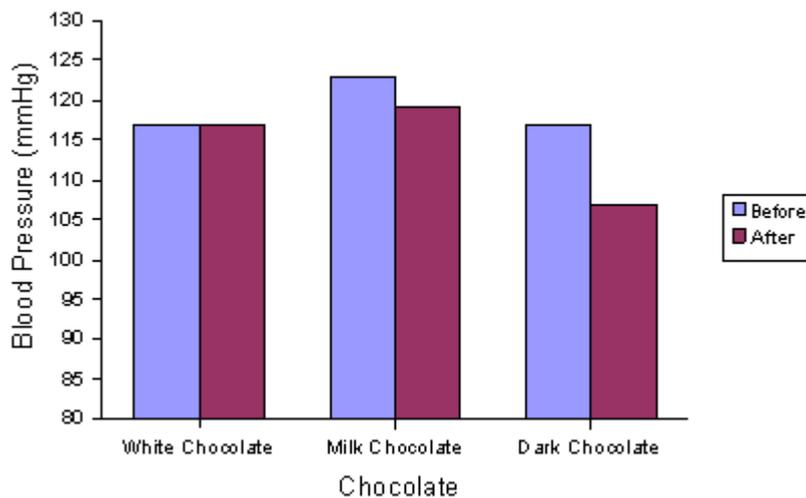
The sample group contained 36 people. The sample group taken for the study should all be of same sex, similar level of physical activity daily, similar age groups and people who are not suffering from any disease. This is to ensure uniformity in the people taken for the study.

Their blood pressure was measured for one week before the start of the study, and then every day, at the same time each day, for the duration of the study. The volunteers were split into three groups, each containing 12 volunteers. Each day the groups of volunteers ate either 50g dark chocolate, 50g milk chocolate or 50g white chocolate. The volunteers were told to follow a similar diet and exercise regime (i.e. one volunteer should not be an athlete and another one a completely sedentary worker). After 4 weeks, the volunteers stopped eating the chocolate. Their blood

pressure was monitored every day for a week after they stopped eating chocolate. During this time, they continued the similar diet and exercise regime

Results

Effect of Chocolate on Blood Pressure



Conclusion

White chocolate, which contains no cocoa, had no effect on blood pressure. The milk chocolate (30% cocoa) caused a moderate decrease in blood pressure. The dark chocolate (50% cocoa) caused a significant decrease in blood pressure.

The Scientist

You are a senior scientist who has had research published many times. You are really excited about your latest research as you think you have found something important which might help lots of people.

You have submitted your study to an important journal for publication. You are required to present your study to the editor of the journal and some other scientists who work in the same area (reviewers) to convince them to publish it.

Notes to the scientist: Think about these questions when making your presentation. Further information is included below to help you answer questions.

Analysis questions:

1. What was the aim of the study?
2. How did you perform the study?
3. What trends did you see in the results?
4. Can you make a link between blood pressure and amount of cocoa in chocolate?
5. What are the *potential consequences* of this link on healthcare?
6. How could you improve the study to confirm your conclusions?

Further information

- ◆ It is not recommended to eat too much chocolate a day due to its fat and sugar content.
- ◆ You are planning a further study looking at whether different amounts of chocolate make a difference.
- ◆ Each participant had their blood pressure measured for a week before being given chocolate. This allowed their natural changes in the blood pressure to be looked at.
- ◆ High blood pressure can cause strokes, heart attacks and heart failure.

The Peer Reviewer (1)

You are a **specialist on the causes of high blood pressure** and you have been asked to review Dr Denver's study on the effect of chocolate on blood pressure for the *Journal of Sweetology* (this is a fictional journal of course!).

The *Journal of Sweetology* is a very well known journal which publishes articles on the health effects of sweets. It only publishes original and new research. The studies also have to be relevant and useful to the general public's health, e.g. a study looking at the effect of 200 litres/day of lemonade on the brain would not be relevant as you could not drink that much in a day.

Read Dr Denver's study and then answer the questions on the review checklist.

Review Checklist

- Is the study showing work relevant to the journal?
- Does this study fit the criteria of the *Journal of Sweetology*?
- Is the study complete and a good design?
- Would you be able to repeat the experiment using the information given?
- Are the results stated clearly?
- Are there enough results to support the conclusion? (look at the sample size of the study and whether the results have been repeated)
- Does the conclusion make sense from the results shown?
- Does the study mention similar work carried out by other researchers?
- Is the work original or is it a confirmation of other work done?
- Are the findings important?
- Is there any other factor missed out that should/could have been included?

Peer Reviewer (1) cont.

Why are the findings of this study important?

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As a **specialist in blood pressure** a couple of things you might notice and want to question the scientist on are:

1. Did they take into account normal changes in blood pressure?
2. Why was a bigger sample size not used?
3. Can the results be applied to all different types of people, with different backgrounds, ages, diet and fitness levels?

Taking into account these things choose **one** of the following recommendations:

- This paper should be published in the *Journal of Sweetology* because:

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- This paper should only be published in the *Journal of Sweetology* once the following improvements have been made:

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- This paper should be rejected because:

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The Peer Reviewer (2)

You are a **specialist on chocolate** and know a lot about what it is made of and you have been asked to review the study on the effect of chocolate on blood pressure for the *Journal of Sweetology* (this is fictional of course!).

The *Journal of Sweetology* is a very well known journal which likes to publish articles on the effects of sweets on health. It concentrates on really original and new research but the studies have to be relevant. E.g. a study looking at the effect of 200 litres/day of lemonade on the brain would not be relevant as you could not drink that much in a day.

Read Dr Denver's study and then answer the questions on the review checklist.

Review Checklist

- Is the study showing work relevant to the journal?
- Does this study fit the criteria of the *Journal of Sweetology*?
- Is the study complete and a good design?
- Would you be able to repeat the experiment using the information given?
- Are the results stated clearly?
- Are there enough results to support the conclusion? (look at the sample size of the study and whether the results have been repeated)
- Does the conclusion make sense from the results shown?
- Does the study mention other important work in that area?
- Is the work original or is it a confirmation of other work done?
- Are the findings important?

Peer Reviewer (2) cont.

As a **specialist in chocolate** something you might notice and want to question the scientist on is:

1. Why were amounts of 50g used?
2. Were the basic ingredients in the three types of chocolate more or less the same? (The amount of cocoa will vary but the rest of the ingredients should be similar).
3. Can the results be applied to all different types of people, with different backgrounds, ages, diet and fitness levels?

Taking into account these things choose **one** of the following recommendations

- This paper should be published in the *Journal of Sweetology* because:

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- This paper should only be published in the *Journal of Sweetology* once the following improvements have been made:

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- This paper should be rejected because:

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Editor

You are the **editor** of the *Journal of Sweetology*. It is your job to make sure the work published in your journal is **valid, significant and original**.

The *Journal of Sweetology* is a very well known journal which likes to publish articles on the effects of sweets on health. It concentrates on really original and new research but the studies have to be relevant. E.g. a study looking at the effect of 200 litres/day of lemonade on the brain would not be relevant as you could not drink that much in a day.

It is your job to evaluate the reviewers' comments and to make the overall decision whether or not to publish the paper. Read Dr Denver's paper before moving on to the next section.

In addition to the two reviewers' reports from your group you have also received the following review report from a *third*, external reviewer:

- Does this study fit the criteria of the *Journal of Sweetology*?
Yes it does
- Is the study complete and a good design?
Yes
- Would you be able to repeat the experiment using the information given?
Definitely
- Are the results stated clearly?
Yes they are
- Are there enough results to support the conclusion? (look at the range/size of the study and whether the results have been repeated)
No - the results have not been repeated enough and the sample size is quite small
- Does the conclusion make sense from the results shown?
Yes
- Does the study mention other important work in that area?
Yes
- Is the work original or is it a confirmation of other work done?
The study is not original as it extends the work of Grassi et al
- Are the findings important?
Yes it confirms there is a link between cocoa and the changes in blood pressure.
I believe this paper should be published in the Journal of Sweetology - A.R.

Editor cont.

When you make your decision consider the following things:

- Have all the reviewers recommended the study be published?
- If not, why not? Have changes been recommended and how major are the changes? Is there good reason to reject it?
- Are the reviews detailed - has the reviewer taken the time to properly look at the study?
- Should the manuscript be sent out for further review?
- Do you think the study should be published?

Choose one of the following options about the study: "Investigation into the effect of chocolate on blood pressure."

- This paper will be published in the *Journal of Sweetology* because:

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- This paper will be sent for further review before a decision can be made because:

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- This paper will only be published in the *Journal of Sweetology* once the following improvements have been made:

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because:

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- This paper should be rejected because:

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