

GRAINS, GLUTEN AND CARBOHYDRATES

EXPLORING THE FUNCTIONS OF GRAIN BASED FOODS



GRDC[™]

GRAINS RESEARCH
& DEVELOPMENT
CORPORATION

A TEACHING UNIT
FOR YEAR 10 HOME
ECONOMIC STUDENTS

About the GRDC

The GRDC

The Grains Research and Development Corporation is a statutory authority established to plan and invest in research, development and extension (RD&E) for the Australian grains industry.

Its primary objective is to drive the discovery, development and delivery of world-class innovation to enhance the productivity, profitability and sustainability of Australian grain growers and benefit the industry and the wider community.

Its primary business activity is the allocation and management of investment in grains RD&E.

GRDC Vision

A profitable and sustainable Australian grains industry, valued by the wider community.

GRDC Mission

Create value by driving the discovery, development and delivery of world-class innovation in the Australian grains industry.

GRDC Values

- We are committed and passionate about the Australian grains industry.
- We value creativity and innovation.
- We build strong relationships and partnerships based on mutual trust and respect.
- We act ethically and with integrity.
- We are transparent and accountable to our stakeholders.

Contact

TELEPHONE: 02 6166 4500

FACSIMILE: 02 6166 4599

EMAIL: grdc@grdc.com.au

INTERNET: www.grdc.com.au

Title: Grains, Gluten and Carbohydrates – Exploring the functions of grain based foods
Project Code: AGC00001
Authors: AgCommunicators
MAY 2016

©Grains Research and Development Corporation 2016
All Rights Reserved

This publication is copyright. Except as permitted under the Australian Copyright Act 1968 (Commonwealth) and subsequent amendments, no part of this publication may be reproduced, stored or transmitted in any form or by any means, electronic or otherwise, without the specific permission of the copyright owner.

Disclaimer

Any recommendations, suggestions or opinions contained in this publication do not necessarily represent the policy or views of the Grains Research and Development Corporation. No person should act on the basis of the contents of this publication without first obtaining specific, independent, professional advice. The Corporation and contributors to this publication may identify products by proprietary or trade names to help readers identify particular types of products. We do not endorse or recommend the products of any manufacturer referred to. Other products may perform as well as or better than those specifically referred to. The GRDC will not be liable for any loss, damage, cost or expense incurred or arising by reason of any person using or relying on the information in this publication.

Contents

GRDC Vision.....	2
GRDC Mission.....	2
GRDC Values.....	2
Contact.....	2
1.0 Teaching the science of grains.....	4
2.0 Learning outcomes and curriculum links.....	5
3.0 Teaching unit content and overview.....	6
4.0 Insight Good grains and your health.....	8
5.0 Activity The goodness of gluten.....	10
6.0 Activity Flour and gluten.....	13
7.0 Practical Extracting gluten.....	14
8.0 Practical Sensory analysis of gluten.....	16
9.0 Review Gluten free.....	18
10.0 Activity Grains tuckshop.....	20
11.0 Good reads.....	22
12.0 References.....	22



1.0 Teaching the science of grains



The Grains Research and Development Corporation has invested in the development of a suite of user-friendly grain education resources and initiatives for students, teachers and families.

These resources have been developed with teacher and researcher input and have been designed following a comprehensive survey of more than 340 teachers throughout Australia.

In each of our curriculum-linked resources we have worked to incorporate a range of lesson plans which explore the latest science, technology, engineering, mathematics, nutrition, research and innovation in the Australian agricultural industry. You can use these resources as a unit or select components to complement your teaching plan.

Using an investigation and inquiry based approach students will touch, try, taste and even smell the science of the Australian grains industry. It provides an ideal and relevant teaching context to engage students in food production.

Specifically, resources are available to address the food and fibre curriculum descriptors in geography, science, home economics and agriculture.

We hope you have fun teaching with these resources. Please contact us for more information.

Kind regards

The GRDC Education Team

2.0 Learning outcomes and curriculum links

Learning outcomes

The variety of foods available in the supermarket is growing, with new products produced to suit both consumer preference and consumer needs. Society is becoming more engaged with food and diet. Consumers want to know the source of their food, additives, the manufacturing process, packaging, food miles, superfoods, innovative foods, new flavours, how it's grown and much more. And with this comes an increase in consumer interest in ingredients and food terminology. Yet do we truly understand what the words in the ingredient list mean and what their roles are? We need to look at the scientific evidence behind food production and nutrition to increase our own consumer literacy and understanding.

Overview

Focusing on gluten, this resource encourages students to explore the function and purpose of ingredients and investigate the familiar terminologies (carbohydrates and gluten) associated with food products such as bread and pasta. Students will create and evaluate products using mathematical skills and science inquiry to understand how food can be affected by the quality of grain or their method to cooking. Using this information, students will be able to articulate how products evolve and why this understanding is important for developing safe and nutritious food – from the paddock to the plate. This resource includes the use of ICT, insights enhanced by short activities, practicals of application and extraction and the use of literacy skills through critical reviews.

Curriculum focus

- Examine the function of ingredients to better understand their relevance in health and consumer preference.
- Explore the structure of a protein in relation to its role in the production of food.
- Make observations and predictions about products to discover how they have evolved to current practices.
- Reflect and evaluate analysis of these products.

Australian curriculum content descriptions

Being healthy, safe and active

Propose, practise and evaluate responses in situations where external influences may impact on their ability to make healthy and safe choices(ACPPS092)

Communicating and interacting for health and wellbeing

Critically analyse and apply health information from a range of sources to health decisions and situations (ACPPS095)

Design and technologies processes and production skills

Investigate and make judgments on how the principles of food safety, preservation, preparation, presentation and sensory perceptions influence the creation of food solutions for healthy eating (ACTDEK045)

Work flexibly to effectively and safely test, select, justify and use appropriate technologies and processes to make designed solutions(ACTDEP050)

3.0 Teaching unit content and overview

This resource contains a range of curriculum-linked lesson plans which teachers can cut, paste, and utilise as they see fit. Our team work to develop resources which are interactive, fun and fit into your busy teaching schedule. The below table summarises the wide modes of engagement strategies including activity supported insights, exploring critical and lateral thinking and inquiry. You can use some of these lesson plans or all. Whatever you do, we hope you have fun teaching your students about the structure and function of grains.

PAGE 8	4.0 Introduction	<p>To lead students into the tasks around the role of gluten in grain based products, discuss with students what they know about grain based foods. Use Good Grains and Your Health insight to stimulate discussion about grain consumption, the importance of grains for health and the terms associated with grains.</p> <p><i>*Grain based food examples include different types of cereals and breads, pasta, noodles, wholegrains and pulses.</i></p> <p><i>*Brainstorming words: Begin with discussion about the term gluten. This might include function in bread products, associated sensitivities and allergies and the use of the word in the media. Ask students to list foods which they believe contain gluten.</i></p>
	Watch	<p>ABC Catalyst have produced a program which looks at what it means to be 'gluten-free'. This program is approximately 30 minutes long and includes a transcript.</p> <p>ABC Catalyst – 'Gluten: A gut feeling', Tuesday 24 November 2015 http://www.abc.net.au/catalyst/stories/4358631.htm</p> <p>Suggested reflection questions</p> <ul style="list-style-type: none">• What is gluten and why do some bakers add extra gluten to bread products?• For those diagnosed with coeliac disease, what are the main symptoms that occur when they consume products containing gluten?• For these individuals how does gluten affect the lining of the intestine?• What is the problem of testing for coeliac disease when a gluten-free diet is already being practised?• How have bread making processes changed and what does this mean for gluten?• How could the milling process impact the levels of gluten?• When looking at items in the supermarket, what was highlighted about the gluten-free products being claimed as health foods?• What do you think is the overall message(s) from this segment?

<p>PAGE 10</p>	<p>5.0 Activity The goodness of gluten</p>	<p>Use this activity as a worksheet or by working together as a class. Students are introduced to gluten at a molecular level including its structure and function. Included in this activity is an explanation of carbohydrates because people who avoid gluten products, may be at risk of low carbohydrate intake. Carbohydrates are an extremely important nutrient for a healthy diet as they are one of the most important sources of fuel for our brain, central nervous system and kidney. Wholegrain foods, including breads, are a great source of carbohydrates. Discuss with students the types of wholegrain foods they include in their daily diet and where they could add carbohydrate rich foods to ensure they are achieving the recommended daily intake as set by the Australian Dietary Guidelines. For background reading see page 44 of the 2013 Australian Dietary Guidelines: https://www.nhmrc.gov.au/_files_nhmrc/publications/attachments/n55_australian_dietary_guidelines_130530.pdf</p>
<p>PAGE 13</p>	<p>6.0 Activity Flour and gluten</p>	<p>Purchase several different varieties of wheat flour for students to assess the nutritional panels (i.e. bread flour, cake flour, plain flour). This flour can then also be used in the practical 'Extracting gluten'. Applying skills in interpreting food labels and using basic mathematical skills, students are to investigate the amount of gluten in different varieties of readily available wheat based flour. This is a basic activity which could allow for a homework task or flipped classroom scenario.</p> <p>Watch this animation which explains the role of gluten: CSIRO 'What is Gluten?', 2016 http://bit.ly/1WZgTKQ</p>
<p>PAGE 14</p>	<p>7.0 Practical Extracting gluten</p>	<p>Students will need different varieties of wheat flour (i.e. bread flour, cake flour, plain flour) and access to running water and a sink. This practical will let students discover the physical characteristics of gluten. Students will need to use observational and recording skills along with basic mathematical abilities. This is a basic practical which could allow for a homework task or flipped classroom scenario.</p>
<p>PAGE 16</p>	<p>8.0 Practical Sensory analysis of gluten</p>	<p>Begin by asking students their understanding of 'sensory analysis' and its role in food science e.g. how is sensory analysis valuable to the production of commercial food products? What senses/organoleptic factors should be utilised in this type of analysis? Why should words like 'yuk', 'yum', 'delicious' etc not be used when conducting sensory analysis.</p> <p>To complete these practicals, students will need access to the home economics kitchen, including oven and bread baking trays, along with the list of ingredients supplied. Provide students with two varieties of wheat flour which have different protein levels e.g. bread flour (wheat) and biscuit flour (wheat). Conventionally, bread flour has more protein (gluten) than other wheat flours, providing the structure and function desirable in a loaf of bread. Using flour with lower levels of protein will produce a loaf of bread with less desirable attributes. This practical will enable students to use their practical Home Economic skills and theoretical investigation skills.</p>
<p>PAGE 18</p>	<p>9.0 Review Gluten free</p>	<p>This review will open up discussion between students about the gluten-free market. The ABC Catalyst segment 'Gluten: A Gut Feeling' could also be included here as a third review option for students.</p>
<p>PAGE 20</p>	<p>10.0 Activity and practical Grains Tuckshop</p>	<p>This activity can be used as an assessment piece.</p> <p>Students are to engage with the school tuckshop and its manager to design new recess and lunch menu options which promote grain based foods. Secondly, students are to design a lunch product suitable for the tuckshop which can be enjoyed by all students, including those with Coeliac disease.</p>

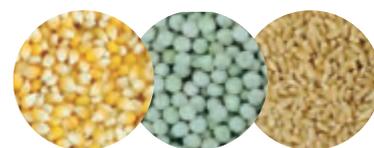
4.0 INSIGHT

Good grains and your health

Grain based foods play an important role in keeping us healthy. These foods give us energy in the form of carbohydrates, fibre to keep our gut healthy and provide protein, vitamins and minerals. The Australian Government's Department of Health reports that eating adequate amounts of cereals and wholegrain foods reduces the risk of a number of diseases including heart disease, diabetes, obesity and colon cancer. However, the Eat for Health campaign from the department also reports most Australians eat less than half of the amount of wholegrain quantities recommended (EatForHealth, 2015).



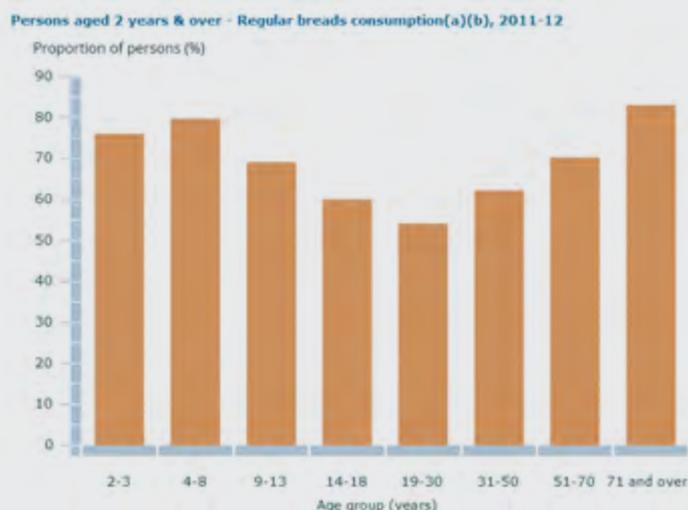
Brainstorm



Make a list of all the grain (cereal and pulse) based foods you can think of.

Which of these grain food are you not getting enough of?

This graph from the Australian Bureau of Statistics shows the proportion of Australians who regularly eat bread products (everyday). Discuss what you observe with your classmates.



Source: Australian Bureau of Statistics, Cereal and Cereal Products Survey, 2011

Consumption of grain in Australia

Most Australians consume some sort of grain based food everyday (ABS, 2011). However, they're not eating enough grains to promote good health. In fact, The Grain and Legumes Nutrition Council reported that in the three years leading up to 2015, Australians' consumption of core grains dropped by 30%!

At the same time, the number of people who were diagnosed with diseases which prevent them from eating grain based products, like coeliac disease and gluten-intolerance, remained constant at between one and two per cent of the population. The drop in consumption could be due to consumer misguidance, a lack of understanding of ingredients and fad diet trends. The health benefits of grains remain the same and a large proportion of the population are risking missing out on essential nutrients by not getting enough.

What is the recommended daily intake of grains for you?

Visit the Nutrition Australia website to find out.
<http://www.nutritionaustralia.org/>

Increasing consumer literacy

As more and more foods are introduced to the supermarket shelf, there is more interest in where these foods were grown, how they were manufactured and why they contain the ingredients they do. Consumers want to understand what they are eating and the best way to do that is to look at the structure and functions of these foods and their ingredients.

What are some of the words that you associate with cereal and bread products?

Do we truly understand what these words mean?

We need to look at the scientific evidence behind food production and nutrition to increase our own consumer literacy and understanding.



Brainstorm

WORD	MEANING

5.0 ACTIVITY

The goodness of gluten

In the media, we often hear the word ‘gluten’. This news usually relates to food intolerances that only a few people are affected by. But do we understand what gluten is?

Let’s work through some activities to better understand the important role that gluten plays in the production of food.

What is gluten?

Gluten is the protein molecule found in grains including wheat, barley, rye and oats. In each of these grains, gluten is formed by different proteins. It is naturally occurring and in people with no gluten allergies or sensitivities, gluten can be readily digested by our bodies. In food products, gluten is a very beneficial protein which provides elasticity, texture, flavour and helps to retain moisture.

The table below lists the proteins found in different grains which are given the general name gluten. List products which contain these grains.

GRAIN	GLUTEN PROTEIN NAME	WHAT PRODUCT(S) IS THIS GRAIN USED IN?
Wheat	Gliadin	
Barley	Hordein	
Rye	Secalin	
Oats	Avenin	

Wheat is a prime source of gluten. Bread is commonly made of wheat flour, meaning that gluten is a key component. **Gluten** plays an important role in the **structure** and **function** of these types of wheat products.

There are **two proteins** in wheat flour that form **gluten** – **gliadin and glutenin**. In order for these two proteins to join, you must knead the dough in the presence of water. Through this action of working the dough, gliadin and glutenin will attach to each other to form gluten.



Glutenin



Gliadin

=

Gluten network

Gluten creates a net like structure with pockets of air which trap gas created by yeast. This gives dough texture and elasticity.



Resting gluten



Stretched gluten

Baking gluten

When we bake bread in a hot oven, the gas trapped in this gluten network firstly expands. This causes the dough to rise. As the moisture evaporates from the dough, the the gluten structure becomes rigid. The ball of dough changes to now become a loaf of bread.

List two reasons why gluten is an important component of bread

6.0 ACTIVITY

Flour and gluten

There are many different types of flour available. Look at the labels of the following flour products and note the amount of protein in each. On the nutritional label of flour, the amount of protein is a guide to the gluten content.

Remember to calculate protein as a percentage

$$\frac{\text{AMOUNT PROTEIN}}{\text{AMOUNT PER}} \times 100 = \% \text{ PROTEIN}$$

$$\frac{12\text{G}}{100\text{G}} \times 100 = 12\% \text{ PROTEIN}$$

FLOUR	AMOUNT OF PROTEIN PER NUMBER OF GRAMS	PERCENTAGE OF PROTEIN
Pastry flour		
All-purpose flour		
Bread flour		
Cake flour		

What type of flour has the most gluten?

We now know that gluten is a protein which provides structure. The more protein a flour has, the more rigid its structure will be. Look at your results above and explain why the structure of bread is different to the structure of a cake even if they have all of the same ingredients except for the type of flour used.

7.0 PRACTICAL

Extracting gluten

Discovering the gluten in flour is an easy process. In this practical, we will extract the gluten from two different flour varieties to illustrate the amount of gluten and physical properties of each.

Materials

- 1 cup of each variety of flour
- Variety 1

- Variety 2

- 2 x ¼ cup water
- Running water and sink

Method

- 1 Slowly add all the water to flour variety 1.
- 2 Knead until you have a rubbery, soft ball of dough.
- 3 Weigh the ball of dough and record the weight.
- 4 Work the dough with your hands under running cool water. Squeeze gently.
- 5 You will notice that the water running off the dough is murky. This is the starch being washed away from the gluten.
- 6 When the water finally runs clear you should be left with a smaller ball. Turn off the tap.
- 7 Record the weight of the remaining dough.
- 8 What are your observations of the dough?
- 9 Repeat for your second variety of flour.

RECORD

FLOUR VARIETY NAME	INITIAL WEIGHT OF DOUGH (G)	REMAINING WEIGHT (G)	OBSERVATIONS ELASTICITY, FEEL, STRENGTH

Calculate the amount of gluten

$$\frac{\text{REMAINING WEIGHT (g)}}{\text{INITIAL WEIGHT}} \times 100 = \% \text{ PROTEIN}$$

VARIETY 1 _____	VARIETY 2 _____
CALCULATE THE AMOUNT OF GLUTEN	
COMMENT ON THE ACTUAL % OF PROTEIN COMPARED TO THAT STATED ON THE LABEL	

8.0 PRACTICAL

Sensory analysis of gluten

Sensory analysis is the scientific term we use for ‘taste testing’. This type of analysis involves all of the **organoleptic factors: texture, taste, appearance and smell/aroma**. Assessment is carried out by a trained individual e.g. food scientist or a chef or by a panel of people. They are asked to score a product on each of the organoleptic factors. Statistics calculated from these scores are used to compare the strengths and weaknesses of a product.

In this practical you will investigate the relationship between protein content and bread structure. You will bake three loaves using wheat flours with different **gluten (‘protein’)** content and test their sensory attributes. We suggest you use bread flour for one of these varieties, gluten free flour as a second variety and a third variety of your choice. You will provide evaluation and feedback using experimental design often used in sensory analysis of commercial food products.

Material

- Bread dough and one other variety of wheat flour e.g. pastry
- For each type of flour, you will need
- 3 cups flour
- 1 tablespoon yeast
- 2 tablespoons sugar
- ½ teaspoon salt
- 250ml warm water
- 2 tsp melted butter
- Baking tray or loaf tin
- Tea towel
- Scales
- Large mixing bowl
- Measuring jug and cup
- Cup
- Teaspoon

Method

- 1 In a cup, dissolve the sugar in the water and sprinkle in the yeast. Mix well. Leave in a warm spot.
- 2 In a separate bowl combine the flour, butter and salt and mix well.
- 3 When the water yeast mixture is frothy, add a little bit at a time to the flour mix until you form a soft ball of dough.
- 4 Knead the dough.
**Note that the bread dough will require more kneading as it is high in protein.*
- 5 Leave the dough to sit in the bowl, covered loosely by the tea towel for ½ hour.
- 6 Place the dough in a bread tin or tray. Put into a preheated oven of 220°C for 30 minutes.
- 7 Allow to cool on a rack.
- 8 Repeat for variety 2 or compare with a classmate who has used another variety of flour.

Sensory analysis of the bread

Once your bread has cooled, compare the three loaves made with different varieties of flour. Figure 2 is a Star Graph. Use this to compare the intensity of each loaf’s sensory attributes. Rate each attribute and then connect the dots. You can overlay your analysis of the second flour variety onto the same graph to compare attributes and form a conclusion.

Rise:	The overall rise of the loaf from being dough to being bread
Air bubble distribution:	Are the air bubbles/small holes in the bread distributed evenly?
Air bubble size:	Is the size of these small holes similar or varying?
Fluffiness:	Is the bread fluffy in appearance, touch and texture?
Elasticity:	After the first bite, does the bread retain its structure, or does it crumble/fall apart?
Doughiness:	Is the bread dry or does it leave a pasty feel in your mouth?
Chewiness:	Does the bread have a nice chewiness or is it tough?
Mouthfeel:	What is your overall opinion of the bread?

Once you have completed the Star Graph, you will have an overlapping representation of your analysis of the two bread samples.

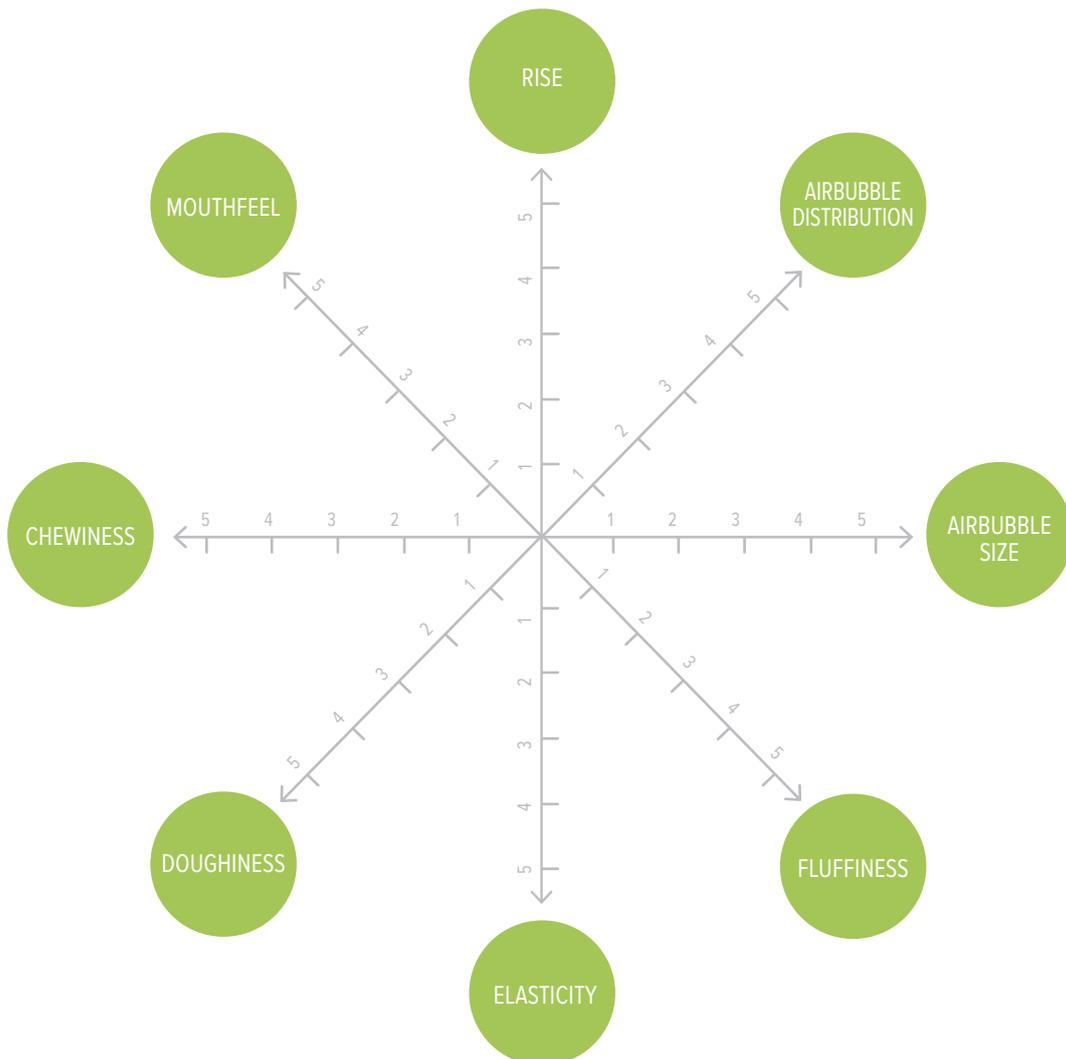
Comment on the similarities and differences between the two loaves.

Conclusion:

Figure 2. Star Graph: Sensory analysis of bread samples

Rate each of the sensory descriptions on the star graph below by placing a dot on the line, where 1 is the lowest and 5 is the highest rating.

Once you have rated each, join all the dots together. Repeat with a different coloured pen for the second sample.



9.0 REVIEW

Gluten free

There are a small number of people in Australia who are diagnosed with coeliac disease each year. Coeliac disease causes sufferers to experience stomach cramping, poor nutrient absorption and diarrhoea because the lining of their small intestine is damaged when it is exposed to the protein gluten. These people are recognised as having an intolerance to gluten.

In Australia, approximately 1% of people are diagnosed with coeliac disease. However, recent reports have found that 18% of the population are buying gluten free products.

Select one of the following case studies exploring the current Australian situation:

CASE STUDY A: VIDEO

Watch this segment from Landline about the gluten-free market in Australia. Listen carefully and answer the questions

'Gluten Free' 6/10/2013
Reporter: Kerry Staight

<http://www.abc.net.au/landline/content/2013/s3863244.htm>

CASE STUDY B: MAGAZINE ARTICLE

Read this extract from an article which discusses an Australian study into consumer attitudes to grains. Review and answer the questions.

'Grains and Legumes Consumption Symposium' 04/2014
Journalist: Chris Cahman

Full article: www.foodaust.com.au/wp-content/uploads/2014/04/Conference.pdf

CASE STUDY A: VIDEO

Viewing questions

Freedom Foods is a company which creates foods with a low allergy risk. Name four food allergies that would need to be considered when creating products for the allergen-free market.

The NSW Gluten Free expo began in 2004. Consumers with what type of allergy were the original target market?

Bob Reid, a farmer from Tasmania whose daughter suffers from coeliac disease, is now growing a grain crop which is gluten-free. What are three factors Bob had to consider when changing his grain crop to a new variety?

Stephen Jefferies, of Australian Grain Technologies, notes that Australia's primary client for wheat is the export market. What does the increase in Australian consumers demanding more gluten-free products mean for Australian grain growers?

Australian Grain Technologies tests 100,000 potential wheat varieties every year. How many varieties pass the quality testing measures? What do these tests look at?

What are the potential health disadvantages faced by people who choose not to eat products containing gluten?

CASE STUDY B: MAGAZINE ARTICLE

Read the extract from the article which discusses an Australian study into consumer attitude to grains.

Review and answer the questions.

'Grains and Legumes Consumption Symposium' 04/2014
Journalist: Chris Cahman

Full article: www.foodaust.com.au/wp-content/uploads/2014/04/Conference.pdf

List 3 ways that data was collected for this study

1. _____
2. _____
3. _____

Select one age group from the 'Average Intakes of Core Grain Foods Compares to Recommendations' and comment on the findings. Can you think of a reason this age group is not eating the recommended intake?

Hyland used these findings to explore the attitude of young women towards grain foods and legumes. What reasons do women give for avoiding total grains?

What outlets have led to an increase in awareness of foods and nutrients?

We know that gluten is a protein found in some grain foods which provides strength, structure and good texture. Only a small number of Australians have a diagnosed intolerance to gluten. What do you think is the best way to educate Australians about the importance of consuming grains food and legumes?

10.0 ACTIVITY

Grains tuckshop

A review of the dietary needs of the staff and students of your school has found that the tuckshop menu needs to be updated. The review found the following

- Most staff and students are not eating enough grains and pulses
- The tuckshop does not cater for those with Coeliac disease
- The majority of staff and students would like to see a better range of healthy foods in the tuckshop.

TASK

Create a report highlighting the need for grain based foods in the tuckshop. To create this report, complete and compile the questions and tasks under each heading 'Your tuckshop, your school community', 'Tuckshop menu', 'Designing a new lunch option'.

Your tuckshop, your school community

The tuckshop manager knows that there are many delicious grains based recess and lunch items that could be stocked, as well as grains based alternatives for those with coeliac disease. Your task is to select 2 new products for the recess menu and 2 new products for the lunch menu which are grains based.

Your selections must

- Meet the Australian Guide to Healthy Eating principles
- Be grains or pulse based
- List one grains based option for those with Coeliac disease for both recess and lunch

1 Answer the following questions

One paragraph summary

- What age groups and genders use your tuckshop?
- Do you think that the daily food needs of each of these groups is different?

Explain

2 Provide a background of your school tuckshop by answering the following questions

Two paragraphs

- Ask your tuckshop manager what are some of the most popular recess and lunch items at your school. Highlight any grains based favourites.
- Are there any recess or lunch items that you believe should not be on the menu? Why? Could they be replaced with a healthy grains based alternative?
- What is Coeliac disease? Does this disease mean you cannot eat any grain or pulse based foods?

Grain based foods include wheat, barley, oats, rice, rye, corn and quinoa, while pulse based foods include beans, lentils, chickpeas, tofu and peas. There are many types of foods that are supplied in the school tuckshop that include these ingredients.



Brainstorm

Create a list of tuckshop items that you know contain grains or pulses.

Tuckshop menu

3 New grain or pulse based menu options

Paragraph describing each item

- Select two new items for the recess menu, including one for those with coeliac disease
- Select two new items for the lunch menu, including one for those with coeliac disease
- What is the base ingredient of these products?
- How do these adhere to the Australian Guide to Healthy Eating?
- Write a sentence for each to describe why it is considered a healthy choice

Designing a new lunch option

- 4 Produce a suitable wholegrain based lunch product for the school menu which can be enjoyed by all students. It must be appetising, be appropriate for the tuckshop, be able to be packaged as a take-away product and cater for those staff and students with Coeliac disease.

Provide recipe, explanation of choice, poster

- Ensure that your product adheres to the Australian Guide to Healthy Eating principles.
- Explain why this product can be enjoyed by all staff and students.
- Create a poster promoting the new product which could be displayed in the tuckshop to encourage students and staff to try it. Include a picture and a catchy explanation of why it is a good choice for lunch.

11.0

Good reads

Grains & Legumes Nutrition Council, 'Gluten in Grains', 2015
<http://www.glnc.org.au/grains-2/allergies-intolerances-to-grains/gluten-in-grains/>

IFL Science – Why do people decide to go gluten or wheat free?
<http://www.iflscience.com/health-and-medicine/why-do-people-decide-go-gluten-or-wheat-free>

Golley, S et al, 'Motivations for avoiding wheat consumption in Australia: Results from a population survey, Journal of Public Health Nutrition', Feb 2015
<http://www.ncbi.nlm.nih.gov/pubmed/24739252>

12.0

References

Food Australia Magazine, 'Grains and Legumes Symposium', April 2015

Landline, ABC, 'Gluten Free', Straight, K, June 2013, <http://www.abc.net.au/landline/content/2013/s3863244.htm>

Australian Curriculum – Health and PE , 2015
<https://www.australiancurriculum.edu.au/health-and-physical-education/curriculum/f-10?layout=1#level9-10>

Australian Curriculum – Design and Technology, July 2015
<https://www.australiancurriculum.edu.au/technologies/introduction>

Australian Sports Commission, Australian Government, 'Gluten-free diets', written 2009
http://www.ausport.gov.au/ais/nutrition/factsheets/special_diets/gluten-free_diets

Science Buddies Staff.. 'Great Globbs of Gluten! Which Wheat Flour Has The Most?' November, 2014, http://www.sciencebuddies.org/science-fair-projects/project_ideas/FoodSci_p040.shtml

About Education, 'What is Gluten', October 2015,
<http://chemistry.about.com/od/foodcookingchemistry/a/What-Is-Gluten.htm>

Home Economics Institute of Australia, 'About Home Economics Education' (date of article not stated),
<http://www.heia.com.au/home-economics-education>

HowStuffWorks.com 'How Wheat Works' Lamb, R, 1 October 2008, <http://science.howstuffworks.com/life/botany/wheat.htm>

Australian Bureau of Statistics, 'Cereals and Cereal Products', 2011, <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4364.0.55.007~2011-12~Main%20Features~Cereals%20and%20cereal%20products~720>

Australian Department of Health, 'Eat for Health: Grain Foods', 2015, <https://www.eatforhealth.gov.au/food-essentials/five-food-groups/grain-cereal-foods-mostly-wholegrain-and-or-high-cereal-fibre>