UNIT 3

Food for Thought

Do primary school students eat nutritious breakfast cereals?

Materials

- Empty cereal boxes
- Computers with internet access

Curriculum Links

- HPE – Family, peers and the media influence on our food choices

Mathematical Focus

- Number – Compare and order, percentages as proportions
- Measurement – Grams, milligrams, kilojoules
- Statistics – Data collection, representation and interpretation

Resource Sheets

- Resource sheet 1: Sample Data Collection Sheet
- Resource sheet 2: Cereal Investigation Report

Support website

www.curriculumpress.edu.au/maths

All of the resource sheets are available on the support website to download as PDF files. Those that you might customise are also available as editable Word documents.

WHAT HAPPENS?

In this unit, students explore the nutritional value of a variety of cereals and investigate whether the most popular cereals are actually nutritious.

Students will:

- Discover why breakfast is important and why cereals are a good breakfast choice. (Discover)
- Create a plan to determine if primary school students eat nutritious breakfast cereals. (Devise)
- Collect and record the information on the nutritional value of cereals and the most popular cereals eaten by students in their class and in the wider school community. (Develop)
- Prepare suitable representations to display their findings. (Develop)
- Use their representations to answer the question. (Defend)
- Compare their findings with Australia-wide data. (Optional)(Defend)

TEACHER NOTES:

Choice, a consumer watchdog, has consistently found most cereals marketed to child or adolescent consumers contain too much sugar, salt or both to be a healthy everyday breakfast choice. This unit hones in on the nutritional values of popular cereals and will provide students with a better understanding, enabling them to make more informed judgements on the cereals they choose.

Begin collecting cereal boxes early to ensure that there are enough for all students and a variety to choose from.

Students love being able to refute the claims (or spot the omissions) made by cereal companies, using the data they gathered. Some students even went home and changed what they ate in the morning!

DISCOVER

Informally, survey the class on what they consume for breakfast. Construct a class table reflecting the proportion of students who eat similar breakfast foods. For example, 15 out of 28 (54%) students eat a bowl of cereal, 22 out of 28 (79%) students eat toast. Discuss the results.

TIP

Get students to estimate the percentage from the fraction before computing it: a good way to help them check for reasonableness.

Focus on the group of students who skip breakfast and elicit their reasons for skipping it. Discuss the importance of eating breakfast, preferably a healthy one. The discussion may include some of the following:

- Breakfast functions as a brain food, which refuels the brain as well as the body. Studies suggest that eating breakfast improves your learning ability.
- Breakfast makes a significant contribution to our overall nutrient intake. Children who eat breakfast tend to be healthier and more likely to consume their recommended daily intake of key nutrients such as iron, calcium, B vitamins and fibre.
- Children who skip breakfast are more likely to be obese.
- Eating breakfast tends to wake you up.

Focus on the proportion of students who eat cereal and the reasons they choose it as a breakfast option, such as:

- cereals are quick and nutritious
- cereals contain vitamins, minerals and carbohydrates
- cereals give us the energy we need to start the day.

As a class, debate the quote from Rebecca Boustead, Kellogg's spokesperson; 'The amount of sugar in Coco Pops and in Nutri-Grain is the same as two slices of toast and jam.'

DEVISE

Provide students with a cereal stimulus: an empty cereal box or a collage poster constructed from cereal boxes.

FORMULATE THE QUESTION

In pairs, have students devise questions that they could investigate involving breakfast cereals (see examples in the table on the next page).

TIP

If students have had limited experience posing inquiry questions, you may like to devote more time to developing their understanding of what an investigative question is and how to formulate one.

SHARE, RECORD AND REFINE IDEAS

Groups share their questions and record all of their ideas. Collaborate as a whole class to refine those questions that are non-investigative.

Mathematical Focus

Conversion of fractions to percentages

Assessment Idea

Focused observation:

Can students make reasonable percentage estimates from given fractions? Can they accurately convert fractions to percentages?

Students often focus on the one type of cereal that is given as a stimulus, often resulting in a closed question, such as 'How much sugar, salt and fat are in a serving of Kellogg's Coco Pops?' Use class collaboration and encouragement to foster their use of comparative language in their questions. This enables them to broaden their question, requiring a larger sample size and prompting greater depth in the inquiry.

A majority of the student questions will either relate to nutritional value or preference and students will probably suggest the groupings without much prompting or guided questioning.

SORT QUESTIONS

Have students suggest a way to sort the proposed questions into two groups (such as nutritional value and preference). For example, here are some possible questions:

POSE AN INQUIRY QUESTION

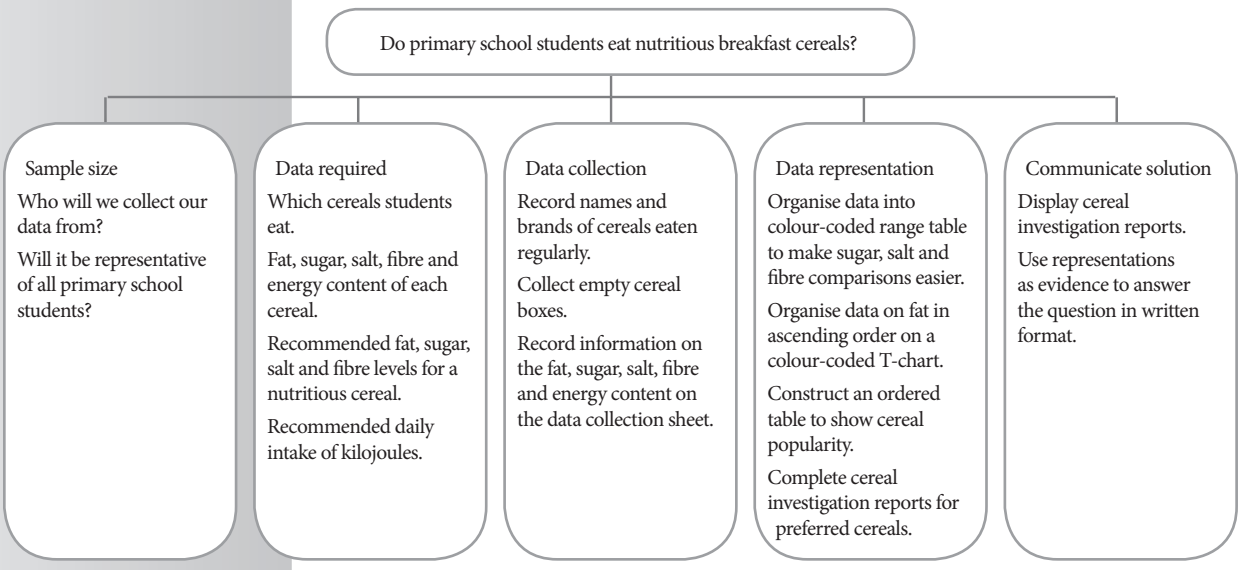
Nutritional value	Preference
Which cereal has the most natural ingredients? Which cereals contain the most fibre, salt, sugar, fat, energy, vitamins etc? Which cereals help you keep a balanced diet? Do all cereals have some common ingredients? Which company produces the healthiest cereal?	Are Sanitarium Skippy Cornflakes as tasty as Kellogg's Corn Flakes? Which cereal is most popular with Year Six students? What is your favourite cereal? Which cereal is the most popular family cereal

It is important to provide enough time for students to think through the steps in the plan before the whole class brainstorms a class plan. The planning phase of an inquiry is challenging for students and while the class brainstorm is an excellent scaffold for them, it is more beneficial to them if they have attempted the plan themselves first.

Challenge the class to come up with an inquiry question that requires them to look at both nutritional value and preference, something like: Do primary school students eat nutritious breakfast cereals?

PREPARE A CLASS PLAN

Have students individually complete an organisation chart (see example below) to help them think through what they will need to consider in order to answer the question.



TIP

If students have not had much experience planning inquiries it may be beneficial at this stage to provide them with the Assessment Checklist provided on p 14 to scaffold their thinking.

FORMULATE A CLASS PLAN

As a whole class, share, discuss and evaluate students' considerations. Working together and using a combination of students' planning ideas, formulate a sequential class plan to adopt. Record the plan for future reference.

DEVELOP

Discuss mathematical abbreviations students will encounter while collecting values and the correct abbreviation to use (g for grams, mg for milligrams, kJ for kilojoules).

TIP

Students may talk about calories, so it may be necessary to discuss the relationship between calories and kilojoules (1 calorie = 4.184 kilojoules). RDI (Recommended daily intake) may also be mentioned and might require clarification.

DISCUSS THE MATHEMATICS

To familiarise students with cereal packaging and nutrition panels, have them explain the mathematics used. Some examples may include:

- 97% wholegrain. What does that actually mean? (The remaining 3% is not wholegrain. An extremely high percentage of wholegrain should mean that the cereal is high in fibre.)
- Serving size = 40 grams. So, how many servings are there in this 735 g packet? How long would you expect it to last your family?
- % RDI (recommended daily intake). If a 40 g serving provides 619 kJ (energy) and represents 7% of RDI, what is the recommended daily energy intake?
- All specified values are averages. What does this mean?

Assessment Idea

Focused observation:

Are students able to envisage an inquiry pathway to answer the question?

Mathematical Focus

- Measurement conversions – milligrams to grams; calories to kilojoules
- Number – proportion, percentage

Assessment Ideas

Focused observation:

- Can students transfer their understanding of percentages to a practical application?
- Can students choose and use a suitable computation to generate a solution?
- Can students explain the use of averages in this context?

Serving sizes vary on different cereal packaging, so for comparison purposes and conversion to percentages, it is better to use 'per 100 g'. Older students may opt to use the serving size rather than 100 g and proportionally adjust to compare food values.

Mathematical Focus

- Statistics – data collection and representation
- Number – compare and order

Resource sheet 1 contains a sample data collection sheet and a nutrition guide to assist students to make informed judgments on the nutritional value of each cereal

RECORD THE DATA

Discuss Resource sheet 1. Using the information on cereal boxes, students record the nutritional values of each cereal.

Cereal	Brand	Energy (kJ) per 100g	Fibre (g) per 100g	Sugar (g) per 100g	Sodium (mg) per 100g	Fat (g) per 100g
Plus Protein	UNCLE TOBYS	1548	4.6	23.7	285	1.3

REPRESENT THE DATA

In pairs, have students represent their nutritional information in such as way that their results are easy to interpret. Encourage them to present their findings in a variety of representations. Some ideas include:

Tables comparing the fibre, sugar and fat content of each cereal. A sample chart is provided in Food For Thought In Action (p 44).

Ordered T-charts representing each nutrient individually. Use colour codes or smiley faces to rate (Good/Acceptable/Poor) each cereal using the nutrition guide on Resource sheet 1.

Cereal	Fat per 100g
Plus Sports Lift	3.8 g 😐
Crunchy Nut	3.3 g 😐
Plus	2.7 g ☺
Nutri-Grain	0.6 g ☺
Special K	0.4 g ☺
Kellogg's Corn Flakes	0.2 g ☺

Cereal investigation reports for each cereal, providing evidence for a judgement on the nutritional value of each particular cereal. Resource sheet 2 provides a template for the cereal investigation report and a possible student sample is discussed in Food For Thought In Action.

Computer representations such as TinkerPlots®, Microsoft Excel® or Microsoft Word® can be used for a variety of charts and diagrams.

SURVEY CEREAL CONSUMPTION

Have students list up to three cereals they eat on a regular basis. Collate information on a class chart.

TIP

Remind students they are to provide data for cereals they eat regularly, not their favourite cereal!

Mathematical Focus

- Number – order, proportion, percentage,
- Statistics – data collection and representation, frequency

CONSTRUCT A TABLE

Individually, students construct an ordered table recording the frequency, fraction, percentage of students who consume the cereal regularly and nutritional rating for each sample to establish the most popular cereals eaten by the class.

Class Chart

Brand	Frequency	% of students	Nutritional rating
Sanitarium Weet-Bix	16	(16/63) 25%	good
Kellogg's Corn Flakes	12	(12/63) 19%	poor
Kellogg's Sultana Bran	6	(6/63) 9.5%	acceptable
Kellogg's Rice Bubbles	6		
Kellogg's Mini -Wheats	6		
Kellogg's Crunchy Nut Corn Flakes	4		
Kellogg's Nutri-Grain	4		
Kellogg's Special K	3		
Nestle Cheerios	3		
Kellogg's Fruit Loops	3		

COLLECT DATA FROM OTHER CLASSES

In pairs, students collect data from other classes (asking, 'What cereals do you eat on a regular basis?') and record this information.

TIP

Collecting data from other classes can sometimes be problematic. Some tips to minimise disruption to other classes:

- Organise a mutually suitable time for data collection – don't just arrive expecting the other class to allow students to collect data.
- Ensure all data is collected by all groups in one visit.
- Ensure data collection sheets are prepared beforehand.
- Consider selecting a venue for the collection that doesn't disrupt others, such as the playground or school hall.
- Try to keep noise levels to a minimum.

ORGANISE DATA

Students compile the data for the whole class and display the totals. Repeat the ordered table, similar to the one above, to establish the most popular cereals eaten by the school population.

Key Vocabulary

- Frequency: number of times something occurs. Tally marks are often used to record frequency.

Students could represent the percentages as both common and/or decimal fractions.

IN ACTION! FOOD FOR THOUGHT

REPRESENTING DATA

Once students have generated and recorded data, they often think that they have finished answering the question. In order to clearly communicate their answer to the inquiry question, students need meaningful evidence to justify their conclusion. It is important that they choose the appropriate mathematics to represent and analyse their data and realise that their evidence needs to be organised in a way that makes it easy to see any patterns or information. Too often students opt for a table or bar graph as the only way to organise data, when other representations may be more useful.

In this unit, pairs of students chose to organise their data in the following ways. All representations allowed pairs to clearly communicate their findings and successfully display the evidence visually for the audience.

1. T-CHARTS

Students quickly established the need to complete T-charts for fibre, sodium, sugar and total fat content to provide enough evidence to answer the question clearly. They found it useful to colour code nutritional values (see Resource sheet 1).

Cereal	Fat per 100 g
Plus Sports Lift	3.8 g
Crunchy Nut	3.3 g
Plus	2.7 g
Nutri-Grain	0.6 g
Special K	0.4 g
Kellogg's Corn Flakes	0.2 g

2. CEREAL INVESTIGATION REPORTS

This representation (on the next page) provided more in-depth information about each individual cereal, but by itself did not provide students with enough information to substantiate an answer. Discussion identified the need to consider all of the cereal investigation reports together in order to have sufficient evidence to validate a conclusion.

Cereal: Plus Protein Lift

Description:

UNCLE TOBYS Plus Protein Lift can be purchased in most supermarkets, but is only available as a 735 g value pack in Woolworths supermarkets. Uncle Tobys guarantees this product is a wholegrain cereal which is naturally rich in nutrients. They claim it is high in protein and a source of fibre, and it contains pineapple and paw paw.

	Quantity per 100 g	% of 100 g
Energy	1548 kJ	
Protein	13.7 g (27% RDI)	13.7%
Fat (total)	1.3 g	1.3%
Saturated fat	0.4 g	0.4%
Sugar	23.7 g	23.7%
Dietary fibre	4.6 g	4.6%
Sodium	285 mg	0.3%
Top five ingredients	Wholegrain wheat (30%), corn, dried fruit pieces - pineapple (5.3%), paw paw (3.4%), sugar, food acid	
Vitamins and minerals	Vitamin B1, B2, B3, B6, E, folate, iron, calcium, zinc	

Findings:

UNCLE TOBYS Plus Protein Lift lives up to its marketing claims of being high in protein. A 40 g serving of this cereal (with milk) provides more than 20% or 1/5 of the daily recommended protein intake. The main ingredient is wholegrain wheat (30% or nearly 1/3) making it a good source of dietary fibre. This cereal has a high sugar content, partly due to added sugar and partly due to natural sugars in the fruit. The sodium content of this cereal is more than double the recommended level, but the fat content is well within the recommended range.

Conclusion:

Uncle TOBYS Plus Protein Lift is a reasonably healthy cereal but the high sugar and sodium content make it unsuitable for an everyday cereal. High sugar content can contribute to tooth decay and obesity and high sodium content can contribute to heart disease.

3. COLOUR-CODED TABLES

Students suggested they could use their original data collection sheet and highlight it using the colour coding provided on Resource sheet 1. This proved effective, enabling students to make judgements on the nutritional value of each cereal. Students said they liked this representation better than the T-charts (even though the results weren't ordered), as they found it easier to compare cereals when they were all together in one table.

Cereal	Energy (kJ)	Fibre (g)	Sugar (g)	Sodium (salt) (mg)	Fat (g)
Mini-Wheats	68.1	11.6 ☺	1.3 ☺	10 ☺	1.3 ☺
Milo	74.5	4.2 ☺	30.7 ☹	137 😐	5.8 😐
Special K	70.8	2.5 😐	14.5 😐	536 😐	0.4 ☺
Oats Quick	56.7	10.0 ☺	1.0 ☺	10 ☺	8.8 😐
Rice Pops	81.9	not provided ☹	8.0 😐	900 ☹	1.3 ☺
Weet-Bix	68.8	11.0 ☺	3.3 ☺	290 😐	1.4 ☺
All-Bran	45.4	29.5 ☺	13.6 😐	380 😐	3.0 ☺
Vita Brits	67.6	11.9 ☺	1.1 ☺	400 😐	2.2 ☺
Coco Pops	87.7	1.2 ☹	36.5 ☹	564 😐	0.3 ☺
Sultana Bran	63.6	14.2 ☺	22.7 ☹	270 😐	1.7 ☺
Light 'n' Tasty	73.0	7.7 ☺	23.0 ☹	240 😐	1.8 ☺

4. COMPARISON TABLES

Students favoured this representation: they found it the easiest to interpret. (All cereals with a high sugar content contained either fruit or chocolate. The healthiest cereals are Mini-Wheats, Weet-Bix and Vita Brits because they all are low in sugar and fat and have high fibre content.)

Fibre (grams)			
Good ☺ ≥ 3 g	Mini-Wheats Weet-Bix Oats Quick Vita Brits	All-Bran	Milo Sultana Bran Light 'n' Tasty Plus - Protein Lift
Acceptable 😐 =1.5 g – 2.9 g		Special K	
Poor ☹ ≤1.4 g		Rice Pops	Coco Pops
	Good ☺ ≤ 5 g	Acceptable 😐 = 5.1g – 14.9 g	Poor ☹ ≥ 15 g

Sugar (grams)

Mathematical Focus

Statistics – data interpretation

Assessment Ideas

Task analysis:

- The quality and choice of students' representations and written interpretations.

Focused observation:

- Did students provide appropriate feedback? Was it insightful? Did the feedback provide a helpful suggestion to improve the work?

Students provide written interpretations for their representations including an answer to the question and a justification for their answer.

PEER ASSESSMENT

Display both students' representations and written interpretations around the room. The class examines the display, using sticky notes to attach positive comments ('It was a good idea to compare the cereals using the range provided in the nutrition guide'), suggestions for improvements ('You could make it easier to read if you highlight the cereal in your T-chart using the colours provided in the nutrition guide') and clarifying questions ('Why didn't you include a value for the fibre in Rice Pops in your table?').

TIP

Model appropriate comments, suggestions and questions (see above) to avoid inappropriate and shallow feedback, such as comments on attractiveness or neatness of the display.

TIP

Providing anonymity through the use of sticky notes helps students to focus on the content and not the source of the comments. If students are hesitant to publicly critique others' work, it provides the opportunity for them to give meaningful feedback.

Students often produce effective representations but fail to interpret them in depth or neglect to refer to them as evidence in their presentations. Having students display their representations and written interpretation for others to decipher is a good way to help students realise where their 'holes' are.

Allow pairs time to respond to the feedback, making changes as required.

INTRODUCE THE CHOICE WEBSITE

Have students locate the Choice website (www.choice.com.au) and navigate Choice to find the review on the ten top-selling cereals. Using a table, have students compare their findings with those on the Choice website. A sample table is provided below.

Class 6A Top Ten Cereals	Sunny Heights School	Australian Top Ten Cereals
Sanitarium Weet-Bix ☺	Sanitarium Weet-Bix ☺	Sanitarium Weet-Bix ☺
Kellogg's Corn Flakes ☹	Kellogg's Corn Flakes ☹	Kellogg's Nutri-Grain ☹
Kellogg's Sultana Bran 😐	Kellogg's Nutri-Grain ☹	UNCLE TOBYS Flakes Plus ☺
Kellogg's Rice Bubbles ☹	Kellogg's Coco Pops ☹	Kellogg's Corn Flakes ☹
Kellogg's Mini Wheats ☺	Kellogg's Rice Bubbles ☹	Kellogg's Coco Pops ☹
Kellogg's Crunchy Nut ☹	Kellogg's Crunchy Nut ☹	Kellogg's Just Right 😐
Kellogg's Nutri-Grain ☹	Kellogg's Fruit Loops ☹	UNCLE TOBYS Vita Brits ☺
Kellogg's Special K 😐	Nestle Cheerios ☹	Kellogg's Sultana Bran 😐
Nestle Cheerios ☹	Nestle Milo ☹	Kellogg's Special K 😐
Kellogg's Fruit Loops ☹	Kellogg's Sultana Bran 😐	Kellogg's Crunchy Nut ☹

TO EXTEND

- A cereal company has asked you to create a new cereal nutritious enough to be eaten daily. Design the packaging for this new cereal.
- State a goal to improve the nutritional value of the breakfast you currently eat.

TO SIMPLIFY

- Does our class eat nutritious breakfast cereals?

ALTERNATIVE INQUIRIES

- Which cereal is the best (considering cost, taste, availability, organic ingredients, Australian made etc)?
- Do primary school students choose a variety of nutritious snacks?
- What is the average amount of kilojoules consumed by a primary school student at breakfast?

Data Collection Sheet

Cereal	Brand	Energy (kJ) per 100 g	Fibre (g) per 100 g	Sugar (g) per 100 g	Sodium (mg) per 100 g	Fat(g) per 100 g

NUTRITION GUIDE			
	Good (green)	Acceptable (yellow)	Poor (red)
Total fat	≤ 3 g	3.1 g – 19.9 g	≥ 20 g
Sugar	≤ 5 g	5.1 g – 14.9 g	≥ 15 g
Sodium	≤ 120 mg	121 mg – 599 mg	≥ 600 mg
Fibre	≥ 3 g	1.5 g – 2.9 g	≤ 1.5 g

Cereal Investigation Report

Cereal: .....

Description:

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	Quantity per 100 g	% of 100 g
Energy		
Protein		
Fat (total)		
Saturated fat		
Sugar		
Dietary fibre		
Sodium		
Top five ingredients:		
Vitamins and minerals:		

Findings:

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Conclusion:

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