THE SOCIALLY RESPONSE-ABLE MATHEMATICS EDUCATION PROJECT

Feed Me Project
Year 8

Materials developed by Paul McQuade

Rationale

Far too often we get caught up in teaching our students the content that is required to pass the tests that we write so that the students can move onto the stage of the learning escalator. At times we forget about the context and the world around us. In this project I wanted to make an impact on the thoughts of Year 8 students that engaged them more deeply into the world and how they fit in. Perception is a form of reality and for some students they have very little perception of the world and of how others live. For these students, their world is tiny and they are very big in it. I want to shake that up and make students see themselves as part of a bigger more dynamic world. My challenge is to do it through Mathematical interactions and contexts.

A friend sent me an email with a photo study of people's possessions from around the world. I actually took the time to look at it carefully and I realised that it was a jaw dropping experience for me. Using the photo study ("Hungry Planet" by Peter Menzel and Faith D'Aluisio) I thought that I could get that same set of reactions with my students, but also tie some good Mathematical learning to it.

My Year 8 students had been subjected to a great deal of textual Mathematics rather than contextual Mathematics and I needed to establish the methodology of how to conduct research based Mathematics. I had hoped my first lessons would help in this, but alas it was too abstract and attached to the project. As the project started I soon realised that I should have done many more investigations prior to this one. I cut the task from the project and set about making a collection of 8 directed activities rather than one big project.

Overview of Activities

Activity 1

Feed Me's first activity is to collect a diary of all the food that you eat in a week. The focus is on the student as a Year 8 student is pretty good at focusing on themselves and food is a reasonably high priority in their life. A little letter was sent out to parents to assist and to also ask them to keep the till dockets.

Students then took the data and created a list of all foods involved in making those meals. This list then became a shopping list that needed to be costed out. This activity amounts to the actual cost of providing that food to each student. It was surprisingly expensive. Of course others shared the meals and the lists were then extended to include food requirements for the rest of the family. A great deal of estimation was used here and of course the final total was not just multiply your cost by the number of people in the family.

Activity 2

With a class full of different totals we needed to reach an agreement on the average food costs for a week for the class. Students were exposed to the different types of average and chose the mean as the best type for food costs. While working out the average family size all three methods were chosen by various students and supporting arguments for which method was best were made. (Great Math)

Activity 3

The key start point here is that we have this data that says the average family of a Year 8 in Kalbarri consumes so much money worth of food each week, …so what? Now was the time to introduce photos copied from "Hungry Planet" by Peter Menzel and Faith D'Aluisio, and discuss them. These images are so good that they hold vast amounts of detail that it is easy to overlook much of them. I chose the 6 hats strategy as a way to look at the images because I needed to get the students to see more than just what is obvious. I gave simple demonstrations of viewing objects from different perspectives and got students to explain what they saw. Of course the view from a different perspective gives you a different take on what you see. (Try this, hold up a skeletal model of a 3D cube and ask if they can see a (2D) hexagon. It is only by looking through the great diagonal that it appears). The idea of perception and reality is something to work on at another time. The 6 hats was a new concept to the students and describing what they saw from different viewpoints took some time. It also raises in my mind the validity of fact versus opinion, however inferences made by look at details surrounding photos is valid.

Activity 4

Data collection from the white hat part of the photo study was poor so the Venn diagram activity honed in on the ability to create lists using differing categories, then looking for items that are shared between lists. Students needed to work with three different types of country and this selection was based on wealth or richness. Venn diagrams were shown as a method of displaying this type of data. Later as students understood what they were doing I demonstrated how two way dabbles can be made from the Venn diagrams. I included this aspect as a question in an end of year exam. (Great Math)

Activity 5

As students worked with the photos in producing lists for the Venn diagrams, they noticed that comparing the money spent on food and the richness of the people didn't equate. This was the perfect observation for the task of representing variation through sketching graphs that deal with qualitative rather than quantitative data. Students looked at the photos for the whole class and had to compare richness and poorness of aspects of the photos. This enabled students to compare data collected through the red hat and judge an emotional aspect of the photo.

Activity 6

At this stage the photos have been heavily relied upon and the statement that they represent an average family from the country needed verification. Students were directed to research any aspect of the country to verify that the family is in some way is average.

Activity 7

Nutrition is an extension of this task and I ran with it. As part of the 6 hat study students should have made observations about the choices that the family need to make. Drawing attention to the choices of food preparation or menu was an obvious link. Students needed to use the food pyramid as a basis of creating a menu for one day for the family that fitted with the healthy principals of good nutrition. For some students this should have caused a conflict in ability to complete the task because in no way could the family eat a nutritious meal.

Activity 8

The summation of the task was vital as the questions lead students to make comments that question their previous understandings of the world, how they fit in it and how others see them in it. This worked a treat and really honed in the contextual nature of the task.

Activity Details

Each set of activities has it own assessable aspects and I have highlighted just some of the outcomes that **can be** demonstrated by students completing these tasks. It is up to individual teachers to choose the method of assessment that suits their purposes and or educational perspectives.

Activity 1 & 2 Food for a Week and Averages

Teaching points	Student Activities
The food I eat in a week. Discussion Point	Letter home informing of the topic and the need to pry into food consumption.
Show dockets from the grocer link these to food ads set up a chart of food consumed in a week.	Homework task weekly food consumption and collect grocery dockets and general menu information for the week.
Use the internet or store catalogues for a cut and paste activity or get the students to itemise the food for a week and cost it out.	Presentation of this data can be on a poster and ads used to fill a trolley. Students will prefer to create a personal grocery list and cost out each item, then total the cost. Be aware of a calculator's memory capacity. Encourage use of Excel.
Break foods up in the daily meals into component parts, so what is cooked in a stew needs to be costed. (Show how to use Excel.) You may choose to create an agreed average food consumption chart for a week, or just deal with the data to find average costs and family size. (3 types of average)	This needs to be extended to account for the food for the whole family estimate the difference to the lists and total. Useful pricing from IGA http://www.iga.net.au/index.cfm?page_id=2381 Coles (from the paper) Woollies (from the paper)
This data can be derived from the information brought back and what some students are willing to add. This data would be good to pass on to the Home Ec or Health teachers	Use data collected by the other students to calculate the average food cost for the class and then the average family size. Which average do you use and why? Submit all work.

Possible Student Outcomes taken from The Outcomes and Standards Framework WA

N 6A.4 b	Students use models to represent decimals as numbers, such as on a 10 ⬜⬜10 grid, and explain how they can be used to introduce key percentages and represent money or measures, referring to place value. • They can rewrite the decimal part of a number as a fraction: for example, 0.35 is 35/100.
N 7.4 b	Students plan the sequence of calculations needed for familiar situations: for example, they can facilitate a calculation using the memory function of a calculator.
N 7.4 c	Students select the appropriate operation to deal with a wide range of practical situations involving very large numbers and small decimal numbers, in which more than

	one operation is needed
N 8.4 c	**Students use calculators to carry out computational tasks, including writing fractions as decimals**. • They plan sequences of calculations using a calculator memory facility and/or brackets when they enter complex expressions such as (2.75 x 35) + (0.54 x ⬚27).
CD 13B.5 e	**Students use the measures of central tendency, mean, mode and median to summarise data**. They can perform the calculations in written form or by using a calculator or computer. They understand the advantages and disadvantages of these 'averages' and can determine which is most appropriate to a given set of data.

Activity 3 Photo Study

Teaching Points	Student Activity
Topic Task: Compare the food consumption of families from around the world to your own family's consumption. *This will be presented as a report drawn together over many sessions.* View the photo's "Hungry Planet" by Peter Menzel and Faith D'Aluisio. This discussion is key to the topic don't rush it. Draw out the need to look deeper at the photo and set the Photo Study (De Bono's Hats) Demonstrate perception as a point of view and who that can change what you see and what you believe you see. (Hollow 3D cube) Discussion points should include beyond the food: Wealth, Poverty, Family, Possession, Fresh/Packaged, Bulk, Variety, Household, Happiness, Body Shape, etc. Highlight these key issue points as raised by students.	Students (small group) look through the photos and discuss what they see. Students are to make written comment based on the key points from the given photo. The activity sheet 6 Hats is a guide, students are welcome to use their own headings to collect and organise data, but following the format given is useful later. After taking notes on the guide students write a full description of the photo highlighting different perspectives.

Possible Student Outcomes taken from The Outcomes and Standards Framework WA

Level 3 Reading UT3.1a	*Students interpret and discuss some relationships among ideas, information and events, and draw inferences from these in texts with familiar content that include some unfamiliar words, language structures and features, such as figurative language.*
Level 3 Reading CU3.2a	*Students interpret simple symbolic meanings and identify stereotypes in texts and discuss their purpose and meaning: for example, a star may symbolise religion, Christmas, magic, being dazed, dreaming or merit.*
Level 3 Reading CU3.2b	*They use stated information together with their background knowledge to make inferences: for example, they infer motives of story characters from their actions using knowledge of stereotypes and real experience.*

Activity 4 Graphing Data

Teaching Points	Student Activities
Classify the data in the photo. Present Graphical Interpretations of the data. Students can operate at differing levels by the type of representation they use. Simply graph is Level 3.	Students need to itemise the goods in each photo. It is essential to share data to complete this task. Suggested that students work in small groups to collect data from sets of photos. Use the rule that one countries set of data analysis can be traded for two other countries.(Without an original you can't trade and you need 3 sets of original work and you need to have representation from 3 different economies.)

Venn Diagrams and Pie Charts are useful for this type of data (No Bun Intended) Use a students Venn Diagram and show how two way tables are constructed.	Choose one nation's data and graphically present it. Encourage the use of Excel . Students are to be encouraged to use a Venn Diagrams to show the links in data e.g. Items of Fruit/Veg, Meat compared to Fresh/Packaged

Possible Student Outcomes taken from The Outcomes and Standards Framework WA

CD 13B.3f	**Students report numerically on the results of making conventional tallies.** They use Venn diagrams involving two overlapping categories and can place information into the correct location in simple two-way tables. Thus they place name cards in appropriate sections of their diagram or table. They also summarise data in diagrams and tables that show frequencies for different categories: for example, the category may be type of food and frequency the number of children who chose that type. The names of children recorded in a Venn diagram may be replaced by the count of how many were in that category.
CD 13B.3g	**They use simple scales and labels on the axes of graphs**: for example, they can produce (vertical and horizontal) bar graphs from frequency data, where one axis shows the whole numbers (0, 1, 2, 3, …).
CD 13B.4 f	**Students display data in bar graphs where the axis is labelled with discrete categories including separate numbers, such as 25, 30, 35, …, multiples such as 0, 5, 10, 15, … or they can group data into intervals, such as 21 − 25, 26 − 30, 31 − 35, …** They can also represent data, including grouped data, using Venn diagrams and two-way tables with confidence and can construct tree (arrow) diagrams.

Activity 5 Representing Variation

Teaching Point   Student Activity

Place in order from poor to rich each of the nations (families) shown. Focus Q How do you determine what is rich and what is poor? Does this only relate to money? Look at the family shown in each picture. What are the probable family relationships shown? What does the photo show about possessions? What information about central tendencies can be reached from this data? What are the commonalities between your family and those in any/all other families?	Data summary Mean Mode Median Use the photos from around the room and devise a graph that compares two different types of rich/poor relationships. Make a comment to support your graph.

Possible Student Outcomes taken from The Outcomes and Standards Framework WA

A 17.4 d	**Students recognise and describe informally some of the variables in their own lives that change with time,** such as height, daylight hours in a typical day, speed of a car; and recognise that other things that variation can also occur in quantities that are not easily measured or quantified, such as mood or hunger.
A 17B.5 d	**Students sketch graphs which 'give a feel for' relationships in situations familiar to them without recourse to careful data collection or point plotting**: for example, they may draw qualitative graphs of mood swings during a Grand Final football match from different points of view or they may sketch a graph from a verbal account of the noise level during a party.

Activity 6 Proof of Average

Teaching Point   Student Activity

Internet search activities. Using C&D data collection processes. Summarising Data and Interpreting Data It is highly unlikely that level 6 will be demonstrated but it shows where this task's learning can lead to.	Find data for Australia on Population, education, life expectancy, agriculture, etc. Use the data found to directly prove or refute the idea that the photo represents the average family from that country.

Possible Student Outcomes taken from The Outcomes and Standards Framework WA

CD 13B.5e	**Students use the measures of central tendency, mean, mode and median to summarise data**. They can perform the calculations in written form or by using a calculator or computer. They understand the advantages and disadvantages of these 'averages' and can determine which is most appropriate to a given set of data.
CD 14.5 c	**Students distinguish between different 'averages' in their interpretation of data**.
CD 13A.6a	**Students continue to collaborate in planning both primary data collection (such as surveying people, observing things, conducting experiments, generating data mathematically and undertaking simulations) and data collection from secondary sources (such as extracting information from published materials and databases), although they carry out some projects independently.** They are unlikely to undertake a technical analysis of sampling, but they consider the size of their sample and how the sample should be taken.

Activity 7 The Menu

Teaching Point	Student Activity
Extension of the task Nutrition is vital to Human Health. Categorise the food from yours and any nation for its nutritional value health aspects. Introduce Canteen manager to explain the nutrition focus in School canteens. Use the Home Ec, Phys Ed or Health teachers to provide food pyramid resources. Does the food purchased by the family mean they eat healthy nutritious food?	Create a menu of nutritional food that could be cooked by or presented to the family. Show how your meal for a day fits the healthy food pyramid. Make suggestions on how to improve the family diet and how to look at environmental / economic implications of their choices.

Possible Student Outcomes taken from The Outcomes and Standards Framework WA

H & PE KU 3 a	Students distinguish between the different components of health that people of all ages need to develop in order to be healthy, such as physical health (diet, exercise and rest), social health (relationships, friendships), and mental and emotional health (self-understanding, decision-making).
KU 3 b	They analyse the extent to which peers, food availability, advertising and the media can influence their food selections.
KU 3 c	They assess factors that may enhance or impair physical, social, mental and emotional development, such as adequate nutrition, smoking, social support and physical inactivity.

Activity 8 Summation

Teaching Points	Student Activity
Briefly go through each of the questions in the summary lead the students to understand the learning journey that they have been on and how it is possible that they may now see themselves in the world differently.	Write full answers to the summary as it wraps up you whole assignment, and gives you the opportunity to state the effect that this project has had on you. Answer the questions wisely.

Possible Student Outcomes taken from The Outcomes and Standards Framework WA

Appreciating Mathematics	**In the early adolescence years**, students focus on learning mathematics that will help them outside the mathematics lesson.
	They are confident in their own ability to solve problems in familiar mathematical contexts and apply problem solving strategies in non-mathematical situations.
	They use a variety of strategies to solve or follow up problems, and reflect on their solutions.
	They refine their solutions and are comfortable with applying their refinement to subsequent problems.
	They present solutions to problems confidently in oral and written reports, and share willingly their knowledge with others.
Contextualising mathematics	**In the early adolescence years**, Students understand that mathematical ideas can be used to represent their view of the world.
	They can describe a non-mathematical object or activity from a mathematical perspective.
	They appreciate the mathematics in some visual representations of physical aspects of our world.

Teachers notes from running the project

Activities 1 & 2
- This ended up a very big chunk of work.
- Setting up the homework phase and making sure students have the food consumed through the week is very important.
- Going through the teacher's food list is a good modelling activity and sets up the task for the students, it also reinforces the idea that they need to complete the food for a week task.
- Setting up the report format and getting students to see the plan that you are following is
  - Individual consumption listed and costed. (leads to)
  - Family list of food and that is costed (leads to)
  - Lesson on three types of average and choose best type for
  - Averaging the data for Average family size and average cost

The activity of creating a chart was dumped by the students as superfluous, preferring to go directly to students to gather data for averaging. Students chose the type of average and wrote simple concluding sentences in the reports.

Activity 3
I ended up having enough photos for one for each student. These were picked at random after the previous activity was complete. Discussion erupted and students scurried to complete the previous task to get a photo. Student collected atlases to see where the family lived and shared the cards around the room. An overwhelming impression of just how lucky we are. As we had a picture of an Australian Family I let the Aussie family comment slide. The students did benefit from the looking at objects from different perspectives but this is a big picture concept to continually chip away at.

Activity 4
On return from a 3 week break I reviewed the lesson sequence and involved students in the discussion and purpose of the project. Set a catch up or else threat for those who have not handed in the 6 Hats work. I started the lesson on classification and Venn Diagrams, the students started well with the task of identification and worked well on this task. Students have difficulty with the idea of creating many lists to make Venn Diagrams from, preferring to make 2 or 3 lists only. Some students are trying to use numbers in the Groups but don't get it yet.
I reinforced the idea that you can only trade twice to get the other economic data. This will create pressure points and hopefully move students to work faster. I have not promoted the Excel use as I need to speed up the project.
I was able to demonstrate using student drawn Venn Diagrams how to construct a two way table and compared both methods of displaying data. The students were very happy that they didn't have to do both types, but I put one into a test for them. A sad note.
The project has had a bit of a jolt with a parent of one the students suddenly dieing. This has affected the work output of students through many obvious, valid reasons.

Activity 5 & 6

At the start of Term 4 W2 I decided to write a task sheet to bring these 2 tasks together so I have some continuation of the project. Unfortunately I have a very wide range of part task completions and it is continually widening. There is enough class critical mass to continue and enough structure to get students working individually. The modified Task is among the documents and I explained in length the meaning and expectations of the work. I have certainly moved away from the one major written task to more readily digestible portions that can stand alone. Unfortunately it will mean when I reach the end many will not have reached the end as well. (Time will be limited)

This task has been strangely difficult to raise the understanding of what rich and poor mean. Today I will try a differing approach similar to the Year 9 project. Getting the understanding that rich and poor are extremes on a graduating scale and not the attribute is tricky. Getting students to determine the attribute is harder than expected.

In the end the Year 8 got the idea of rich and poor just being end points on a scale that measures something else. The graphs produced and the verbal reasoning for allocating positions on a graph due to a subjective idea was fine. The students ended up surprising me.

The activity of locating data about the country and find proof of average was poorly done and pushed some students too far. On of my better students gathered information on the city of Turkey in the USA thinking it was the country. Hmm.

Activity 7

For those students who really got into the project, found this to be a good activity as they set about looking up recipes and finding out more about some of the foods eaten in other counties. Seeing what looked like a dead penguin caused much discussion and then acceptance. Some students just tried to squeeze the food items from their menu into a pyramid hoping I wouldn't notice.

Activity 8

The summation of the project was vital to its success. This activity really gave the students the chance to reflect on their own thoughts and opinions and how they had grown through the project.

Australia: The Browns of River View

Food expenditure for one week: 481.14 Australian dollars or US$376.45
Family Recipe: Marge Brown's Quandong (an Australian peach) Pie, Yogurt

Guatemala: The Mendozas of Todos Santos

Food expenditure for one week: 573 Quetzales or $75.70
Family Recipe: Turkey Stew and Susana Perez Matias's Sheep Soup

Luxembourg: The Kuttan-Kasses of Erpeldange

Food expenditure for one week: 347.64 Euros or $465.84
Favorite Foods: Shrimp pizza, Chicken in wine sauce, Turkish kebabs

India: The Patkars of Ujjain

Food expenditure for one week: 1,636.25 rupees or $39.27

Family Recipe: Sangeeta Patkar's Poha (Rice Flakes)

United States: The Fernandezes of Texas

Food expenditure for one week: $242.48
Favorite Foods: Shrimp with Alfredo sauce, chicken mole, barbecue ribs, pizza

Mali: The Natomos of Kouakourou

Food expenditure for one week: 17,670 francs or $26.39
Family Recipe: Natomo Family Rice Dish

Canada: The Melansons of Iqaluit, Nunavut Territory

Food expenditure for one week: US$345
Favorite Foods: narwhal, polar bear, extra cheese stuffed crust pizza, watermelon

France: The Le Moines of Montreuil

Food expenditure for one week: 315.17 euros or $419.95
Favorite Foods: Delphine Le Moine's Apricot Tarts, pasta carbonara, Thai food

Greenland: The Madsens of Cap Hope

Food expenditure for one week: 1,928.80 Danish krone or $277.12
Favorite Foods: polar bear, narwhal skin, seal stew

Turkey: The Celiks of Istanbul

Food expenditure for one week: 198.48 New Turkish liras or $145.88
Favorite Foods: Melahat's Puffed Pastries

Japan: The Ukita family of Kodaira City

Food expenditure for one week: 37,699 Yen or $317.25
Favorite foods: sashimi, fruit, cake, potato chips

Italy: The Manzo family of Sicily

Food expenditure for one week: 214.36 Euros or $260.11
Favorite foods: fish, pasta with ragu, hot dogs, frozen fish sticks

Chad: The Aboubakar family of Breidjing Camp

Food expenditure for one week: 685 CFA Francs or $1.23
Favorite foods: soup with fresh sheep meat

Kuwait: The Al Haggan family of Kuwait City

Food expenditure for one week: 63.63 dinar or $221.45 **Family recipe**: Chicken biryani with basmati rice

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United States: The Revis family of North Carolina

Food expenditure for one week: $341.98
Favorite foods: spaghetti, potatoes, sesame chicken

Mexico: The Casales family of Cuernavaca

Food expenditure for one week: 1,862.78 Mexican Pesos or $189.09
Favorite foods: pizza, crab, pasta, chicken

China: The Dong family of Beijing

Food expenditure for one week: 1,233.76 Yuan or $155.06
Favorite foods: fried shredded pork with sweet and sour sauce

Poland: The Sobczynscy family of Konstancin-Jeziorna

Food expenditure for one week: 582.48 Zlotys or $151.27
Family recipe: Pig's knuckles with carrots, celery and parsnips

Egypt: The Ahmed family of Cairo

Food expenditure for one week: 387.85 Egyptian Pounds or $68.53
Family recipe: Okra and mutton

Ecuador: The Ayme family of Tingo

Food expenditure for one week: $31.55
Family recipe: Potato soup with cabbage

United States: The Caven family of California

Food expenditure for one week: $159.18
Favorite foods: beef stew, berry yogurt sundae, clam chowder, ice cream

Mongolia: The Batsuuri family of Ulaanbaatar

Food expenditure for one week: 41,985.85 togrogs or $40.02
Family recipe: Mutton dumplings

Great Britain: The Bainton family of Cllingbourne Ducis

Food expenditure for one week: 155.54 British Pounds or $253.15
Favorite foods: avocado, mayonnaise sandwich, prawn cocktail, chocolate fudge cake with cream

Bhutan: The Namgay family of Shingkhey Village

Food expenditure for one week: 224.93 ngultrum or $5.03
Family recipe: Mushroom, cheese and pork

Germany: The Melander family of Bargteheide

Food expenditure for one week: 375.39 Euros or $500.07

Photo Study – Dobono Hats

White Hat
Look at the photo you have been given, write about what you see.

Red Hat
The more you look at the photo you should notice that it makes you feel differing emotions and feelings. What do you feel and why?

Yellow Hat
What positive aspects of the photo do you see?

Black Hat
What judgements, or concerns or worries do you think arise from this photo?

Green Hat
Sometimes extra thoughts will pass through your mind that has to do with the photos that are worthwhile mentioning what other creative ideas can you add?

Blue Hat
What decisions would be needed next for the people in the photo?