Project Based Learning at Brighton

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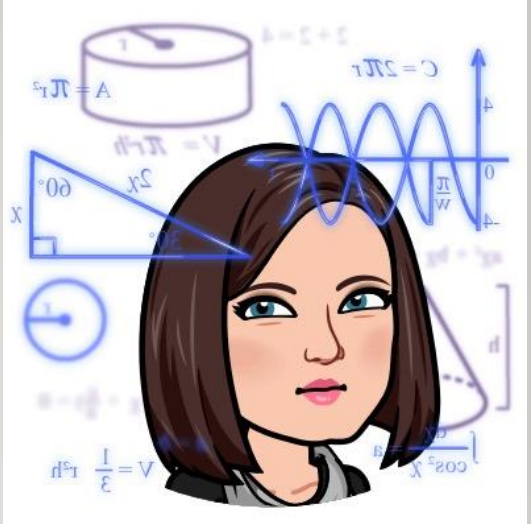
PROBLEM OF THE MONTH

SEPTEMBER

IN A CLASS OF P STUDENTS, THE AVERAGE TEST SCORE IS 70.
IN ANOTHER CLASS OF N STUDENTS, THE AVERAGE SCORE FOR THE SAME TEST IS 92.
WHEN THE SCORES OF THE TWO CLASSES ARE COMBINED, THE AVERAGE SCORE IS 86.

WHAT IS THE VALUE OF P DIVIDED BY N?



Perception is everything. What are students saying?

Video removed due to student faces

TAKE A MOMENT TO REFLECT ON YOUR CONTEXT

- What's the narrative around learning maths at your site?
- What do you think students/parents/teachers would say if you asked them to talk about their experiences with maths?

FREEDOM

- "Education has traditionally been about freedom. But there is no freedom any more. It's gone. Initiative and resourcefulness are banned."
- "Teachers are no longer encouraged to have a rationale for practice, account of themselves in terms of a relationship to the meaningfulness of what they do, but are required to produce measurable and 'improving' outputs and performances, what is important is *what works*."

- Ball, S.J. (2010) The teacher's soul and the terrors of performativity. In Journal of Education Policy, 18:2, 215-228, Routledge, UK.

WHAT IS PROJECT-BASED LEARNING AND HOW IS IT DIFFERENT FROM PROBLEM-BASED LEARNING?

- Learners as creators - outcome could be a product rather than a solution.
- Key learning usually occurs as you progress through the task.
- Authentic context.
- Usually collaborative.
- Differentiated with multiple entry and exit points.
- May be research-based and open-ended.
- Problem-based learning could occur within project-based learning tasks.

Year 10A Australian Curriculum Mathematics

Name of Assessment Task: Graphing Relations	**Assessment Type: Investigation**
Date Issued: Monday Week 6	**Due Date: Beginning of lesson Wednesday Week 7**

Achievement Standard
Make the connections between algebraic and graphical representations of relations.

Task Description
Working in groups of 4, you have been assigned one of the topics below and can communicate your findings in any form that can be presented to the class. You might choose to make a video, plan a lesson to teach, create a poster or anything else you can think of.

Topics

1. What methods can be used to find the x and y intercepts for equations of circles, exponentials, quadratics and hyperbolae? What happens when they don't exist or when there is more than one? What is the discriminant and how does it relate to x and/or y intercepts for a quadratic function?

2. What impact does adding a constant to a function have? What are asymptotes and how can you find them for exponentials of the form $y = a^x + b$ and hyperbolae of the form $y = \frac{a}{x-a} + b$?

3. Can an axis (or axes) of symmetry be found for circles, exponentials, quadratics and hyperbolae? Are there particular features of equations for functions and relations that indicate whether they are symmetrical? How do the axes of symmetry change for hyperbolae of the form $y = \frac{a}{x-a}$ as a changes?

However you choose to present your work, it should include examples and diagrams and any calculations not included should be submitted at the time of the presentation.

A	B	C	D	E
Comprehensive understanding of	Detailed understanding of	General understanding of	Some understanding of connections	Limited understanding of

Student Feedback

Shoghi (year 10)
I really liked this group project and thought it was a really good learning experience. I originally disliked the idea of chosen groups but after getting to know my group I started to grow on the idea. What I liked most about the project was the independent learning aspect of it. Even though I was frustrated sometimes because I had no idea what I was doing but after my own research I learnt a lot about symmetry.

Kate (year 10)
I liked this assignment as I really liked having control on how much I put into this assignment. This assignment taught me a lot within my own questions. I did not like chasing after my group trying to get everyone to do work when no one put much effort into it. I could not really help with how much my group did so I made sure to make my part very detailed.

Rheydyn (year 10)
I disliked having to present our learning, although saying that if our audio files hadn't currupted it would've been fine. Also it was hard communicating within our group, we probably could've managed that better. Although I liked working together and hearing others points of view to what they think is right, it helped me learn a lot more.

Two examples from year 9 2018 – choose and celebrate your champions

Video removed due to student faces and names

HOW WE USE FLIPPED LEARNING TO SUPPORT STUDENTS THROUGH PROJECT BASED LEARNING

- Scaffolded and flipped task sheets.
- Minimise class time devoted to whole class explicit teaching.
- Maximise teacher time to work individually with students who need it.
- Build independence in learners who don't need it.

HOW MUCH SHOULD WE CHARGE FOR THEM?

What is the lowest price you can sell each item to cover the costs of buying the ingredients? This is called the breakeven price.

Calculate a selling price with three different markups.

https://youtu.be/HklO1aOlIvU

Use online supermarket stores to investigate a sale price for a similar item.

Assuming the cost price is the same, calculate the markup the supermarket has used.

HOW CAN WE MAKE SURE WE SELL OUT?

Calculate how many full priced items you would need to sell to make a profit.

https://youtu.be/GKZKay2N1jY

How could you make sure you sell out? Explain three potential discount strategies and the advantages/ disadvantages of each.

You must calculate the markup and profit as a percentage of the sale price for each of your options.

HOW CAN WE MAKE SURE WE SELL OUT?

Discount strategies

1. After selling 21 items, we put a 30% discount on the slices
Markup: sale price ÷ cost price - 1 = markup
Our discounted slices will cost $0.70
0.7 ÷ 0.62 - 1 = 12.9% markup on the discounted slices
Advantage:
.as long as we sell the first 21 slices, there is no risk of not breaking even
Disadvantage:
.the discounted items has a very small markup, meaning we won't be making much money from them

2. At 10 minute intervals throughout lunch, we lower the sale price by 10%
Markup:
Markup at 12.45am: 0.9 ÷ 0.62 - 1 = 45.7% markup
Markup at 12.55am: 0.8 ÷ 0.62 - 1 = 29% markup
Markup at 1.05pm: 0.7 ÷ 0.62 - 1 = 12.9% markup
Markup at 1.15pm: 0.6 ÷ 0.62 - 1 = -3% markup
Advantage:
.prices will go down with the amount of customers
Disadvantage:
.For the last 5 minutes of lunch, we will be losing money

3. Have a deal in which a customer can buy 2 slices for $1.50
Markup:
1.5 ÷ 1.24 - 1 = 21% markup
Advantage:
.brings in more customers
Disadvantage:

There is no disadvantage we will still make a profit by selling 2 for $1.50, because to make 2 it costs $1.20. We will be making a profit, but it will be small

Break even point

Total cost price ÷ sale price per item = break even point

$19.92 ÷ $0.99 = 20.12

We need to sell at least 21 full price items to break even.

Profit as a percentage of the SP

We will be choosing the first discount option

How Can We Make Sure We Sell Out

We only need to sell 13 slices to make a very small profit. This is because the cost price is $18.35. Divide this by $1.50 (the selling price) and you get 12.2333(recurring). Therefore we need to sell 13 brownies to break even.

Strategy	Advantage	Disadvantage	Mark Up	Profit
Lower price to $1.00	Increased demand as price is lower. Reduced Wastage	Less profit made	(1.00 - 0.38) / 0.38 = 163%	(1.00 - 0.38) / 1.00 = 62%
Buy 2, get 1 free	Increased demand as perception of a deal	Risk of less demand as need to spend $3, less profit made	(3.00 - 1.14) / 1.14 = 163%	(3.00 - 1.14) / 3.00 = 62%
Buy 1, get 1 free	Increased demand as perception of a deal and only costs $1.50 Reduced wastage	Less profit Have to commit to $1.50	(1.50 - 0.76) / 0.76 = 97%	(1.50 - 0.76) / 1.50 = 49%

BAKE/FAKE SALE!

Our planned percentage profit if we sold all items at full price is 72.66%. We made $39.36 profit. Our percentage profit was 68%. We believe some reasons for these results are our price was competitive, our advertising was eye catching and our product was not hot/sticky/melty, it was tasty and popular, and we started off selling our brownies for $1.50 (although we later changed to $1.00)

Calculations-

1.50 - 0.38 = 1.12. 1.12/1.50 = 0.7266 = 72.66%

39.36 / 57.60 = 68%

WHAT ARE TEACHERS SAYING?

- Students need small successes early.
- Sometimes it goes for a long time without much outcome. Where is the rigour?
- They need to have learned the core skills before commencing and then use them throughout the project, taking the skills further.
- They should acquire the skills throughout the process of doing something authentic.
- Is it valued as learning time? Students can get lost.
- Having a product as a result of their maths learning is powerful.
- Requires collaboration between teachers.
- Improves student collaboration skills, use of IT, buy in and investment of time outside of class.
- Sometimes requires some perseverance from the teacher and scaffolding to ensure learning.

THINK PAIR SHARE

- How do you think your team would respond if you brought back units like these to be implemented?
- How would you build momentum?
- How would you encourage teachers to take a small step in the direction of authentic learning and play with the curriculum?

EXPERIMENTATION & INCUBATION STRUCTURES

- STEM and Think Bright specialist programs get two half days per term to develop integrated units.
- Teacher Learning Communities with specific foci that teachers are interested in (differentiation in middle school, flipped learning in maths, STEM integrated learning in maths).
- Integrated Innovation Team, Digital Innovation Team voluntary participation.
- Small, targeted teams within faculty, building time for teachers to collaborate into the school day.
- Enable team teaching through timetabling.

ANNUAL REDEVELOPMENT OF PROGRAMS, AUTHENTIC CONTEXTS AND INTEGRATION ACROSS TOPICS

- Creature Bunjee (year 8 linear relationships)
- Making sherbet (year 8 ratio)
- Mario Kart Championship (year 9 statistics)
- Fast Fashion (year 9 measurement, ratio and direct proportion)
- Design an astronaut's chair (year 8 statistics)
- Who wants to be a millionaire!? (year 9 simple interest)
- Where should I sit at the movies? (year 10 & 10A trigonometry)
- Mathematical Mandalas (year 8 congruence, properties of quadrilaterals, visual coding)

WHAT IF I'M NOT VERY CREATIVE?

- Scaffold the creative process for your teachers.
- Let's play ☺

Context Text Highlight Color • Develop a real-life story that will be relevant to students and will capture their interest	
Hands-on activity • Begin with a hands-on activity to get students to use a different part of their brain to traditional maths e.g. act it out, draw a picture, talk and discuss the story with a partner.	

Questions • Keeping within the context of the story, design questions that address the key learning intentions for the topic. • At this point you would be looking for concepts in the curriculum that could be included. • Questions should be scaffolded to build upon one another and facilitate deeper learning as a student progresses through the project.	
Hurdle tasks • Design tasks to facilitate learning required for the project which may require explicit teaching (could be flipped or interactive videos, classroom inquiries, classroom activities etc.)	
Check for inclusivity • Look back over the language used throughout the task and check that it is engaging, inviting, inclusive of gender and ethnicity and appropriate for the age of the students.	