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Using mathematics to explore social entrepreneurship

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Mathematics is a powerful tool that can raise awareness of inequity and help young people to make sense of complex social issues. In this article, we present a task that explores the role of social entrepreneurship in helping people who are experiencing housing and food insecurity.

The economic fallout from the COVID-19 pandemic is exposing more and more Australians to financial loss, hardship and poverty. Even primary-aged students may be privy to conversations about unemployment, business closures, household budgeting, and difficulties making ends meet. It is through conversations about livelihood that young people become aware of their family's financial opportunities, circumstances, values and practices. To some extent, they might also become aware of the financial opportunities and circumstances of others within their community – including those who are vulnerable and disadvantaged. These conversations reveal the intersection between economics, finance and important social issues that can be better understood, if not challenged, by teaching mathematics with and for a social justice orientation.

The Sahm's Mugga Soup task discussed in this article reflects a 'thick' view of financial literacy, which recognises that financial decisions occur within a social system and affect the lives of other participants in that system (Lucey, Laney, & Agnello, 2015). The intention is to help students to see that businesses can operate for reasons other than profit and in ways that can in fact contribute positively to society. Financial literacy teaching that moves beyond the question of "What's in it for me?" prepares students to consider broader social, economic and environmental imperatives. Studies have shown that it can be productive to initiate this learning in the upper primary years (see Sawatzki, 2017; Sawatzki & Goos, 2018).

The task: Homelessness and social entrepreneurship

More than 116,000 Australians have no home (Australian Bureau of Statistics, 2016). Around 40% of Australia's homeless are less than 24 years of age. The most common reasons for young people experiencing homelessness are the housing crisis, domestic and family violence, and relationship/family breakdown (Australian Institute of Health and Welfare, 2015). Structural factors such as poverty, social inequality and youth unemployment also contribute to homelessness. The COVID-19 pandemic is exacerbating Australia's housing crisis and food insecurity.

A number of social enterprises exist to provide food and meals to those who are homeless for free or on a "pay as you feel" basis. Examples include Lentil as Anything in Sydney and Melbourne and Good Will Only in Wollongong (see links below). These organisations receive community funding, are staffed by volunteers, and provide hundreds of meals each week to those most in need.

The task presented in Figure 1 has been designed to encourage discussion about homelessness and the role of social entrepreneurship in feeding those who are homeless. This task might take several lessons.

Moreover, explicit and intentional teaching of terms like those presented in Table 1 is central to developing financial and enterprising capabilities through this task.

Sahm's Mugga Soup

Sahm runs a soup truck. During the day, he sells "Mugga Soup" for lunch. At the end of each day, Sahm donates leftover soup to people who are homeless.

Sahm would like to be able to feed more people who are homeless at the end of each day. He is considering a "buy one give one" scheme to encourage his daytime customers to pay for a "Gifted Soup" for somebody in need.

Sahm has created a table (below) to record information about his current business activity and the "buy one give one" idea. He has to *estimate* his costs and how many of his customers might be prepared to donate. He is thinking carefully about what the price of a "Gifted Soup" should be.

	Current Business Activity	Estimated Business Activity with introduction of "buy one, give one" scheme	
	Mugga Soups Sold	Regular Mugga Soups Sold	Gifted Soups Sold (Mugga Soup + Gifted Soup)
Cost per Soup	$2.00	$2.00	
Price per Soup	$5.00	$5.00	
Average no. soups sold per day	100		
Daily revenue	$500.00		
Daily cost	$200.00		
Daily profit	$300.00		
Total daily profit comparison	$300.00		

What questions might Sahm have? What information does he need? How would you advise Sahm? Use mathematics to explain your thinking.

Figure 1. Sahm's Mugga Soup task.

In the remainder of this article, we describe the key mathematical connections and associated pedagogies to support teachers enact this task in the classroom.

Important mathematical and cross-curricular connections

The Australian Curriculum describes opportunities for developing consumer and financial literacy in both the Mathematics (ACARA, 2020a) and Humanities and Social Science (ACARA, 2020b) learning areas. Illustrative examples of content from these learning areas in Years 5 and 6 are presented in Table 2. Note, building rich mathematical and cross-curricular connections is a key aspect of effective planning and teaching in mathematics (Davidson, 2019).

Beyond these sub-strands, there are ample opportunities to nurture students' knowledge, skills and capabilities for financial problem-solving and decision-making by connecting financial and consumer literacy with several general capabilities in the Australian Curriculum. These are:

Information and Communication Technology (ICT) Capability, Critical and Creative Thinking, Personal and Social Capability, and Ethical Understanding. Examples of these curriculum connections are offered under 'Possible student solutions.'

Supporting diverse learners

Below are suggested *enabling prompts* to support students who experience difficulty with the learning task. Students have a go at the enabling prompt and then proceed with the main task.

- Does it cost Sahm any more to make a serve of soup that is donated? How do you know?
- Do you notice relationships between the price, revenue, cost and profit figures in Sahm's table?
- Sam has chosen to 'bundle' a Mugga Soup + Gifted Soup Donation at a total price of $7.00. Do you agree with this price decision? Why / why not?
- Sahm assumes that his daily profit will stay the same if he continues to sell 100 soups per day. Is this true or not? Justify your thinking.

We also offer *extending prompts* for fast finishers who are ready to extend their thinking about the main task.

- If Sahm's idea is successful, he will have to make more soup. This will mean he will be able to buy

Table 1. Some key finance and enterprise terms.

Term	Definition
Social enterprise	Businesses who operate to achieve a social or environmental goal.
Costs or expenses	The dollar amount required to provide a product or service. While not specifically referred to, the cost per soup is otherwise known as the break-even price. Understanding the cost to provide a product or service is necessary to identify the price beyond which a sale is profitable.
Revenue	The income from sales before any costs are deducted.
Economy of scale	Saving in costs achieved by increasing production. Can be achieved through bulk buying inputs (in this case soup ingredients).
Price	The price set for a product or service. The price must be higher than the cost (or break-even price) if a profit is to be made.
Profit	The difference between the cost to provide a product or service and the price it is able to be sold for. Profit is calculated as revenue less costs or expenses.
Estimate	An educated guess about a future business situation. For example, number of sales, amount of profit.

Table 2. Connections with the Australian curriculum.

Year level	Learning area	Content description and code	Example of an elaboration
5	Mathematics: Money and financial mathematics	Create simple financial plans (ACMNA106)	Create a simple budget for a class fundraising event
5	Mathematics: Statistics and Probability	Construct displays, including column graphs, dot plots and tables, appropriate for data type, with and without the use of digital technologies (ACMSP119)	Identifying the best methods of presenting data to illustrate the results of investigations and justifying the choice of representations
5	Mathematics: Statistics and Probability	Describe and interpret different data sets in context (ACMSP120)	Using and comparing data representations for different data sets to help decision making
5	HaSS: Economics and Business	Influences on consumer choices and methods that can be used to help make informed personal consumer and financial choices (ACHASSK121)	Comparing the influence of a variety of selling and advertising strategies used by businesses on consumer choices
6	Mathematics: Money and financial mathematics	Investigate and calculate percentage discounts of 10%, 25% and 50% on sale items, with and without digital technologies (ACMNA132)	Use authentic information to calculate prices on sale goods
6	Mathematics: Statistics and Probability	Interpret and compare a range of data displays, including side-by-side column graphs for two categorical variables (ACMSP147)	Comparing different student-generated diagrams, tables and graphs, describing their similarities and differences and commenting on the usefulness of each representation for interpreting the data
6	HaSS: Economics and Business	The reasons businesses exist and the different ways they provide goods and services (ACHASSK151)	Explain the difference between not-for-profit and for-profit businesses

soup ingredients in bulk and the cost per Mugga Soup will decrease by 10%. This is called *economy of scale*. Use mathematics to explain the impact on Sahm's pricing and profits. It might help to draw another table.

- Sahm notices that he has at least 50% more daytime customers since he has introduced the 'Buy one give one' deal. Use mathematics to explain the impact on Sahm's pricing and profits. It might help to draw another table or represent your thinking in a graph.

Possible student responses

Students will need to make numerous mathematical and business-related decisions to model Sahm's social enterprise idea. A sample solution is provided in Figure 2 and the key decisions students need to make are highlighted in grey: cost and sales price for Gifted Soups and the estimated number of soups sold (regular Mugga Soup versus Gifted Soup). Based on the cost and pricing assumptions in Figure 2, the daily profit will remain $300 as long as the total number of soups sold remains the same (70 + 30 = 100).

There is no 'one right answer' to this task and there are meaningful ways that students can develop the general capabilities through practising problem-solving and decision-making in financial contexts. For example, by using a spreadsheet to investigate and analyse information, collaborate with classmates to estimate and make projections, and communicate their results, students will develop ICT capability (ACARA, 2020c).

By generating questions and possibilities, and then analysing the possible outcomes (ACARA, 2020d), students will develop critical and creative thinking skills. Provocations might include: "Would customers be more or less likely to purchase lunch from a social enterprise?" and "Is Sahm seeking to make money from the homeless?" These considerations will influence students' pricing decisions. For example, students may decide to price the Gifted Mugga Soups as the cost of the regular Mugga Soup ($5.00) plus the cost of the second soup for a homeless person ($2.00) rather than double a regular Mugga Soup (2 × $5.00).

Students will develop ethical understanding as they consider their personal and social outlook and think about how their values and behaviours affect others (ACARA, 2020e). For example, what would motivate a customer to pay for a Gifted Mugga Soup for a person who is homeless?

	Current Business Activity	Estimated Business Activity with introduction of "Buy one, Give one" scheme	
	Mugga Soups Sold	Regular Mugga Soups Sold	Gifted Mugga Soups Sold (Mugga Soup + Gifted Soup)
Cost per Soup	$2.00	$2.00	$4.00
Price per Soup	$5.00	$5.00	$7.00
Average no. soups sold per day	100	70	30
Daily revenue	$500.00	$350.00	$210.00
Daily cost	$200.00	$140.00	$120.00
Daily profit	$300.00	$210.00	$90.00
Total Daily profit comparison	$300.00	$300.00	

Figure 2. Example of Sahm's estimated sales assuming same number of total sales.

Suggestions for planning and facilitating the learning experience

Pedagogically, problem solving and reasoning is enhanced by adopting a student-centred approach to mathematics (Davidson, 2019). Suggestions for creating an environment where students can discover solutions for themselves include:

1. **Trial the task with colleagues during a planning meeting.** In our experience, trialing the task prior to teaching helps teachers grapple with the level of discomfort that can often be associated with the context and open-ended nature of such tasks. It should be noted that the richness of such tasks is optimised in classroom communities that are inclusive of and sensitive to diverse family opportunities and circumstances.
2. **Anticipate students' mathematical and social responses and let these drive discussions.** Trailing the task prior to teaching it also assists teachers contemplate ways that they might support and extend students' thinking during the lesson. You might consider how students attend to the mathematical aspects of the task by calculating the impact of different pricing decisions per 'Gifted Soup' on revenue and profit. Also consider how students might react to the social and ethical aspects of the task. For example, will they want Sahm to make a profit, break even or operate at a loss? Do students notice that the 'buy one give one' scheme is not a profit-driven initiative?
3. **Develop language and literacy through a productive launch phase.** A growing body of research is now showing that language and literacy skills and worded mathematical problem-solving skills are interrelated, not

only during primary school, but in early adolescence too (Kyttälä & Björn, 2014; Vilenius-Tuohima, Aunola, & Nurmi, 2008). Sawatzki and Goos (2018) found that students tended to confuse terminology that influences financial mathematisation—i.e., 'cost', 'price' and 'profit'. This task provides an opportunity to clarify these terms. When introducing the task, clarify concepts and language by relating the task to everyday observations and experiences. For example, "What is donating?" and "Why are donations important?"

4. **Encourage students to persist with the table.** Research has shown that primary students' exposure to tables in mathematics lessons is often limited to simple table-reading tasks. Yet tables can assist students to organise and think critically about information, including patterns and relationships (Watson & Callingham, 2014). Unsurprisingly, students are challenged when confronted with more complex tasks (Watson & Callingham, 2014) such as completing the table presented in Figure 1. Therefore, planning learning experiences that encourage students to construct, analyse and interpret data in more complex tables is important.
5. **Pose questions that tease out student reasoning.** Engage students in problem-solving and reasoning through the process of analysing problems, making and testing generalisations, and justifying solutions. The following prompts can be of assistance:
   a. "What is the same and different about...?" (Analysing)
   b. "What stays the same and what changes? (Analysing)
   c. "Is there another way?" (Generalising)
   d. "Is that (rule, pattern, solution) always going to work?" (Generalising)
   e. "How do you know?" (Justifying)
   f. "Convince me, a friend, a skeptic." (Justifying)
6. **Encourage multiplicative thinking and proportional reasoning in financial contexts.** Downton and Sullivan (2017) found that students can engage with more complex multiplicative tasks than are commonly posed to them, and posing such tasks elicits more sophisticated strategies from students. Sawatzki, Downton and Cheeseman (2019) found that a well-designed financial problem can prompt 10–12-year-old students to build their emergent concepts of rate and develop foundations to multiplicative and proportional reasoning before transitioning to secondary school. Through the *Sahm's Mugga Soup* task, students have the opportunity to apply multiplicative thinking and proportional reasoning for problem-posing as well as problem-solving.
7. **Encourage students to justify their pricing decisions.** Sawatzki and Goos (2018) studied students' pricing decisions when presented with a worded mathematical problem involving fundraising as an example of an enterprise activity. Some students gave loss-making and break-even responses, being price conscious and preoccupied with providing value for money to the market. Students who gave profit-making responses were familiar with fundraising initiatives and revealed awareness of and care for possible social and environmental objectives.
8. **Remember that you are learning too.** Hunter and Sawatzki (2019) found that lessons like this give teachers insights into their students' everyday financial realities, their observations and experiences with money, and how this prior knowledge shapes students' perceptions of and responses to money-related mathematical problems.

Concluding remarks

The Sahm's Mugga Soup task illustrates the potential of teaching mathematics for social justice by utilising a compassionate approach to financial literacy education. Students will have opportunities to apply mathematical knowledge and skills to consider a range of solutions from different perspectives. It is likely that this task will take more than one lesson to explore in depth. It is assumed this task will form part of a sequence of learning experiences that build mathematical and cross-curricular connections. We hope teachers find this task useful and would love to hear your thoughts and feedback should you wish to contact us.

Acknowledgment

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Useful links

Australian Alliance to End Homelessness: aaeh.org.au
Mission Australia: missionaustralia.com.au
Lentil as Anything: lentilasanything.com
Good Will Only: sbs.com.au/food/article/2019/05/29/good-will-only-new-pop-restaurant-dedicated-feeding-homeless

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