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ORIGINAL ARTICLE

Cost, price and profit: what influences students' decisions about fundraising?

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Abstract This article examines some of the complexities associated with developing financially literate, enterprising young Australians through school education. We aimed to explore what seems to influence students in pricing goods for sale within their school community. Data were collected from more than 300 years 5 and 6 students (10–12 years of age) in four government primary schools in urban Darwin. Students were asked to respond to problem contexts involving fundraising as an example of an enterprise activity. The findings reveal that familiarity with fundraising initiatives, personal values, and language and literacy skills shaped the responses students gave. Students who gave loss-making and break-even responses were price conscious, but also tended to confuse terminology influencing mathematisation—i.e., "cost", "price" and "profit". Students who gave profit-making responses applied reasoning that was mathematical, financial and entrepreneurial, giving explanations that distinguished between these terms. We argue that these insights contribute to our understanding how upper primary school students interpret and respond to financial problems, with useful implications for schools and teachers.

Keywords Realistic mathematics · Numeracy · Financial mathematics · Financial literacy · Problem-solving

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Policy and curriculum background

Over the past decade, policymakers have become increasingly interested in the potential for school education to prepare financially literate, enterprising graduates. This goal has been the focus of various initiatives and reports by the Organisation for Economic Cooperation and Development (OECD) and its member governments, including Australia.

The Australian government has invested significantly in initiatives intended to help children understand finance. This work is led by the Australian Securities and Investments Commission (ASIC: Australia's corporate, markets and financial services regulator) and involves key government bodies, the education sector, and industry and community stakeholders. Australia has a National Consumer and Financial Literacy Framework (Ministerial Council for Education, Early Childhood Development and Youth Affairs [MCEECDYA], 2011) and consecutive National Financial Literacy Strategies (ASIC 2011, 2014). Key to ASIC's work has been the establishment of MoneySmart Teaching (ASIC 2016), a collection of "one size fits all" teaching and learning resources intended to meet the financial literacy learning needs of an audience of teachers and students who are assumed to be more similar than they are different.

More recently, Australia's Office of the Chief Scientist released a report exploring the importance of entrepreneurship and principles and practices through which it might be effectively taught and learned. Stating that "Australia has been slow to embrace entrepreneurship as a driver of economic growth", the report argues a need for educational pathways to instil commercial and financial acumen (Spike Innovation for the Office of the Chief Scientist 2015, p.iv). In particular, the need to teach entrepreneurship so that Science, Technology, Engineering and Mathematics (STEM) research and innovation might become a source of national competitive advantage and economic growth is highlighted (Spike Innovation for the Office of the Chief Scientist 2015). The overarching theme is that more might be made of opportunities to commercialise Australian ideas and discoveries internationally. Focusing on the potential contribution of school education to this agenda, the Foundation for Young Australians (FYA) has called for a national enterprise skills and careers education strategy, stating that young people need to learn to be enterprising "so they can become job creators, not just job seekers, and navigate more complex careers" (Foundation for Young Australians 2016, p.1). The FYA classify problem-solving and financial literacy as examples of enterprise skills that are transferable and highly sought after (Foundation for Young Australians 2017).

Financial, enterprise and entrepreneurship education are not new. Renewed enthusiasm for their importance at the policy level would seem an ideal solution to steel school leavers for increasingly challenging labour and financial markets. Such narratives divest responsibility for economic complexity to the education system and the individuals within it. Meanwhile, there is critical debate about how enterprise and entrepreneurship education might be best defined and approached, and criticism whether it can realistically deliver on promises to improve employability, particularly among vulnerable populations (Pinto & Blue 2016).

The current policy and theoretical perspectives imply a necessary intersection between mathematics and humanities teaching and learning through financial, enterprise and entrepreneurship education. Whether operating for profit or not, the ability to

generate profit is of central concern to the feasibility and sustainability of any business or social enterprise. The Australian Curriculum (Australian Curriculum, Assessment and Reporting Authority [ACARA] 2017) provides framing for teaching and learning about pricing and profit, with relevant learning outcomes being notable in Mathematics and Humanities and Social Sciences (HaSS): Economics & Business. Illustrative examples of content from these learning areas in years 5 and 6 are presented in Table 1.

Reading and interpreting the opportunities for interdisciplinary teaching and learning that the Australian Curriculum affords and developing school-based programs and classroom tasks require imagination and innovation. For their part, many primary and secondary schools engage students in thinking about finance, enterprise and entrepreneurship by involving them in planning and operating market stalls where goods and services are priced for profit and fundraising (see MoneySmart Teaching 2017 for a typical case study). Items that assess students' ability to apply mathematics to fundraising contexts also feature in Australia's National Assessment Program. Consider this National Assessment Program—Literacy and Numeracy (NAPLAN) item on the Year 7 Numeracy Test in 2017:

> Mona is selling chocolates as a fundraiser for her athletics club. Each chocolate sold raises $2.50 for the club. She sells 40 chocolates. How much money does Mona raise for the athletics club?

This problem is closely aligned with the years 5 and 6 curriculum, assuming particular learning outcomes have been achieved in the upper primary years of school, prior to transitioning to secondary school. The problem necessitates a familiarity with fundraising as an example of an enterprise activity, but only assesses multiplication. This is described as *first-order use of context* to the extent that the context is "needed for solving the problem and judging the answer" (OECD 2009, p. 31) but serves more as a "wrapper" to the problem (Stillman 1998). The terms "fundraiser", "raises" and "raise" are used consistently to infer profit. Students are presented with the amount

Table 1 Excerpts from the Australian Curriculum related to fundraising, pricing and profit

Year level	Learning area	Content description and code	Example of an elaboration
5	Mathematics	Create simple financial plans (ACMNA106)	Create a simple budget for a class fundraising event
5	HaSS: Economics & 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	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	HaSS: Economics & 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

raised per chocolate ($2.50 per chocolate) and the number of chocolates sold (40). While the term is not used, students are required to calculate total profit. To mathematise the problem and calculate the total profit under these circumstances is just one aspect of contending with the concept of profit. Items such as this speak to mathematical literacy, but reveal little about students' developing financial and enterprising capabilities.

This article reports one aspect of a larger design-based research project, the Encouraging Persistence Maintaining Challenge (EPMC) project (see Sullivan et al. 2014; Sullivan et al. 2016). As part of the EPMC project, more than 50 teachers and more than 1000 of their students in Victoria and the Northern Territory participated in online surveys, interviews, focus group discussions and classroom investigations. The aim was to elucidate how children learn about money at home and at school and explore the potential for the classroom to be a site where students can contribute to and further each other's thinking about financial problems and decisions. The snapshot of research reported in this article examines how children make sense of problems involving fundraising as an example of an enterprise activity. The research question was: "What seems to influence 10-12 year old students' decisions when pricing goods for sale?" Data were collected from more than 300 years 5 and 6 students in four government primary schools in urban Darwin. The findings are based on an analysis of online survey and face-to-face discussion group data. Insights and implications for teachers in their curriculum and pedagogical work developing financially literate, enterprising school leavers are also discussed.

Learning to solve real world problems

Perhaps one of the most important aims of school mathematics is to prepare students to apply learned content to the real world (Verschaffel et al. 1994). The research reported in this article was critically informed by academic literature related to three particular factors that have been found to influence students' mathematisation of the real world problem-solving tasks: the choice of problem context, including the extent to which students are familiar with it; personal values; and language and literacy skills. Mathematising refers to the fundamental mathematical activities that are involved in moving in either direction between the real world and the mathematical world (Stacey 2015).

The choice of problem context and how students interpret and engage with it can influence performance on problem-solving tasks. Whether a problem context being familiar helps or hinders student learning and assessment performance is contentious. Neuroscience has shown there is a strong relationship between the processes underlying episodic memory and the ability to solve open-ended problems (Sheldon et al. 2011). So, when faced with a problem context that is familiar, a problem solver is more readily able to identify the problem space and retrieve information that is relevant and useful (Sheldon et al. 2011). This explains why problem contexts that are familiar to students can make for fun, engaging lessons—students typically contribute to their classroom learning with confidence when they have experiential knowledge to share. This is not to say that such contributions will always be productive. Problem contexts that are familiar have also been found to lead students to misinterpret, overlook or ignore the

intended relevance and meaning of a task (Van den Heuvel-Panhuizen 2005). Boaler (1994) found that girls were more likely to apply common sense as well as mathematical knowledge when faced with a fashion-related question that was considered more familiar and real to them. While the students became engaged and involved with the problem context, they underachieved on this question because their common sense interpretation interfered with the mathematical interpretation that was required for a successful solution. Cognitive psychology offers insights why. Problem contexts provide data that are intended to activate mathematical thinking, but these data can operate in ways that cue different facts, concepts, processes, prior experiences and semantic knowledge (Tulving 1985). Further, the salience of these cues can vary from problem solver to problem solver (Kaplan and Simon 1990).

Students bring to their learning knowledge and understanding filtered through their social and cultural lenses (Vale et al. 2016). Personal values—the convictions which one finds important (Seah 2016)—have also been found to influence students' responses to worded mathematical problems. In previous iterations of the research reported in this article, personal values learned within the home were found to shape students' responses to mathematical problems involving money, both in interview (Sawatzki 2013) and classroom settings (Sawatzki 2014). Similarly, Blue et al. (2017) recently reported that year 4 students demonstrated conservative, cautious and caring approaches to pricing goods for sale within the school community during an inquiry-based mathematics lesson. These findings make sense since values have been found to be influential in the formation and development of attitudinal and behavioural tendencies (Homer and Kahle 1988), including financial behaviour (Shim et al. 2009).

Zevenbergen (2000) noted that attempts to connect mathematics education to the real world by embedding knowledge and skills in relevant, meaningful contexts bring "significant barriers to success" (p.11), particularly in terms of the impact of language on numeracy. She argued that language is a political process through which some students have greater or lesser access to learning and assessment. In a study exploring the linguistic demands of the mathematics curriculum and ways that the learning of Aboriginal and English as an Additional Language (EAL) students might be supported, Parkin and Hayes (2006) found that while many students were able to competently work through mathematical processes, they had difficulties contending with written word problems where the mathematical processes were embedded in so-called real world problem contexts. They described that some students "had no way of interpreting the problem, identifying the mathematical processes and consequently completing the task" (Parkin and Hayes 2006, p.23). 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 years but in early adolescence too (Kyttälä and Björn 2014; Vilenius-Tuohimaa et al. 2008). Pimperton and Nation (2010) argued that mathematics assessments that place high demand on verbal ability and linguistic comprehension serve to underestimate the underlying mathematical abilities of students who tend to experience comprehension difficulties.

The above insights reveal how complex and involved the cognitive activities associated with mathematising real world problems can be. And while these issues speak to the challenges associated with understanding and measuring student learning, schools and teachers are increasingly held to scrutiny through standardised assessments, the results of which are relied upon to evaluate the extent to which students are

equipped to apply their knowledge and skills to the real world problem contexts. For example, the Organisation for Economic Cooperation and Development (OECD) Programme for International Student Assessment (PISA), which seeks to assess 15-year-olds' ability to apply knowledge and skills when problem-solving, is of particular interest to member governments, including Australia. In 2015, over half a million students completed a 2-h test that assessed science, mathematics, reading, collaborative problem-solving and financial literacy (OECD 2016).

The 2015 OECD PISA financial literacy assessment framework and results are particularly informative to the research reported in this article. The assessment framework consists of four content categories, four cognitive processes and four contexts. The four content categories are the following: money and transactions; planning and managing finances; risk and reward; and the financial landscape (Thomson and de Bortoli 2017). The four cognitive process categories are the following: identify financial information; analyse information in a financial context; evaluate financial issues; and apply financial knowledge and understanding (Thomson and de Bortoli 2017). The four contexts in which items are framed are the following: education and work; home and family; individual; and societal (Thomson and de Bortoli 2017).

The 2015 OECD PISA financial literacy results highlight that mathematical and reading literacy are central to financial literacy. Students struggled to complete relatively simple everyday financial tasks in which words and numbers were presented in different formats, including reading payslips and invoices. The results reveal a strong correlation between financial literacy and mathematical literacy (0.80) and between financial literacy and reading literacy (0.75) (Thomson and de Bortoli 2017). In Australia, 29% of the financial literacy score reflected skills that were directly associated with the financial literacy assessment, with the remaining 71% reflecting skills that can be measured in the mathematical and/or reading literacy assessments (Thomson and de Bortoli 2017). These findings seem to indicate that educational programs designed to build mathematical and reading literacies through practical and meaningful application to problems involving money could be the key to improving financial literacy achievement.

However, as a number of academics have argued, financial literacy education is typically values-laden, with middle class curriculum content that is disconnected from many students' everyday financial realities, and potentially marginalising for those from culturally diverse and low socioeconomic backgrounds (Appleyard and Rowlingson 2013; Blue and Pinto 2017; Sawatzki 2014). Enterprise and entrepreneurship education discourses can be similarly neoliberal. While enterprise education is typically conceptualised as being about identifying and creating new business opportunities, predominantly for self-employment and the accumulation of personal wealth and material value (Fayolle and Gailly 2008), theories about entrepreneurs as agents of change with the potential to create social value are emerging (Chell 2007). By definition, entrepreneurship education is framed as developing personal attitudes and attributes that cultivate creativity, initiative and risk-taking while critically and sensitively attending to possible social and environmental considerations (Fayolle and Gailly 2008). The culture and ethos of such "social entrepreneurship" are based on principles of cause, voluntarism and ethics (Chell 2007), ideologies at the heart of social justice in mathematics education. Clearly, there are tensions between neoliberal and social justice ideologies. With a view to contributing to a growing body of knowledge exposing these

tensions, this study aimed to examine student responses to problem contexts involving fundraising as an example of an enterprise activity, as well as the explanations given for these responses. The intention was to produce insights that might productively inform interested stakeholders how teaching and learning can be enhanced.

Methodology and methods

Methodology

This article reports one aspect of the Encouraging Persistence Maintaining Challenge (EPMC) project, a large design-based research project involving mathematics education researchers from Monash University and Australian Catholic University (see Sullivan et al. 2014; Sullivan et al. 2016). Design-based research evolved out of the need to examine the potential of educational innovation within the reality and messiness of authentic classroom settings. In such contexts, experimental and quasi-experimental methodologies, where the environment and associated variables require strict control, cannot accommodate the complex, interactive and reflexive nature of classroom interventions that focus on the "systematic generation and examination of data and refinement of theory" (Schoenfeld 2006, p. 193). Cobb et al. (2003) argue that design-based research is both theory-focused and pragmatic in nature, as it involves iterative interventions that take place in practical educational settings with an aim to generate theory about improved educational practice. Hence, it is a practical research methodology that seeks to increase the impact, transfer, and translation of educational research into improved teacher practice (Anderson and Shattuck 2012). It is important to note that some of the data collected through the EPMC project was intended to contribute to what is an emerging body of knowledge about children's financial problem-solving and decision-making, without being immediately related to the development or measurement of the educational intervention being studied. Rather, as is the case with the data discussed in this article, some insights were sought for the purpose of guiding future iterations of the research in keeping with principles of design-based research.

The research context and participants

Since initial stages of the research highlighted a need to better understand the everyday observations and experiences with money students from low socioeconomic backgrounds bring to their classroom learning (Sawatzki 2014), schools servicing working class communities were sought to participate. The research was undertaken in four government primary schools in urban Darwin. The Index of Community Socio-educational Advantage (ICSEA), created by the Australian Curriculum, Assessment and Reporting Authority (ACARA), was used to understand the socioeconomic profile of potential school communities. An ICSEA value below the Australian average of 1000 was a qualifying criterion to participate. Table 2 consists of data sourced from the My School website (https://www.myschool.edu.au/) including data to describe each school's size and student characteristics (socioeconomic background, identifying as being Indigenous, and being from a language background other than English).

Table 2 My School data describing each school community

	Total enrolments	ICSEA value	Indigenous students (%)	Language background other than English (%)
School A	433	912	26	14
School B	397	983	9	2
School C	407	995	10	14
School D	270	935	24	45

These figures serve in some way to describe the diverse, often challenging communities within which the teacher participants work. Across the four schools, 14 teachers of years 5 and 6 (10–12 years of age) and more than 300 of their students participated in this study. Table 3 presents the number of teacher and student participants in each school.

The educational intervention

Being design-based research, the larger study focused on the design and testing of an educational intervention. The intervention consisted of a series of ten challenging contextualised learning tasks referred to as "financial dilemmas". Sawatzki and Sullivan (2017) describe financial dilemmas as sharing the following task features:

- They are challenging, open-ended mathematical problems with multiple possible solutions
- They are based on real world financial contexts with which students might be familiar and/or interested in and/or able to imagine
- They feature both social and mathematical dimensions—the social tending to provide a reason to see, engage with, and explore the mathematical
- They are designed to assist in both understanding and developing students' financial literacy, with a particular emphasis on mathematical processes

The first author brainstormed and created the ten financial dilemmas in Melbourne. Each task involved representations of price information, including ordering take-away food (fish and chips and pizzas), catching the bus, playing laser tag and buying bread (see Sawatzki 2017 for reports of data and findings related to the educational intervention). The teacher participants from all four participating schools described

Table 3 The participants

	No. of teacher participants	No. of student participants
School A	4	78
School B	4	89
School C	4	95
School D	2	69

their students being involved in kitchen garden programs that included growing, preparing and pricing fresh produce and home-made goods and/or other fundraising initiatives. For this reason, financial dilemmas exploring enterprise, entrepreneurship and financial management were not included in this iteration of the project.

Each financial dilemma was intended to be the focus of one 60–90-min mathematics lesson, with enabling, consolidating and extending versions of each task being available (Sullivan et al. 2006). Financial dilemmas are intended to be taught using the launch, explore and summary lesson structure described by Lappan et al. (2006) and Sullivan et al. (2014). Launch refers to the ways a task is posed in the lesson introduction; the idea being that minimal instruction sets the expectation that students attempt a task by themselves. Explore refers to actions taken to facilitate individual problem-solving and differentiate the task for diverse learners. After students make an initial attempt at the task, those who are struggling may be assisted with an enabling prompt while those who require additional challenge may be provided with an extending prompt (Sullivan et al. 2006). Summary refers to the ways by which student activity on the task is reviewed. In this phase, the teacher invites pre-selected students to share their strategies and reasoning with the class, while the teacher and classmates pose open, sometimes provocative questions that might stimulate different ways of thinking.

Data collection

This article focuses on pre- and post-intervention student data. Students were asked to complete two surveys online: one before and one after they had completed the series of ten lessons. The pre-intervention survey was open for 1 week in April and consisted of three multiple choice items seeking to find out about students' attitudes to mathematical challenge and seven financial mathematics assessment items. It was completed by 331 students. The post-intervention survey was open for 1 week in August. While it was similar to the pre-intervention survey, one item was modified, a new financial mathematics assessment item was added, and two open-ended questions about learning through challenging problem-solving tasks were included to collect data related to feedback from teacher participants about students' financial literacy learning through the educational intervention. The post-intervention survey was completed by 302 students. The attrition from pre- to post-intervention is mostly explained by student absences and turnover across the four participating schools. The pre- and post-intervention survey data were tabulated and analysed in preparation for the student focus group discussions, the intention being that preliminary findings might guide and inform the choice of issues and questions to be explored further.

A total of 28 students (seven groups of four students drawn from each of the four participating schools) were nominated by their teachers and participated in 20-min focus group discussions where they shared insights into their observations and experiences with money in their family and community life, as well as their learning through the series of ten lessons. These questions included, "What words would you use to describe these lessons?" "Did you have a favourite lesson – if so, what did you like about it?" "Was there a task that you found particularly challenging – if so, what made it hard?" and "What's the most important thing you learned about money by doing these tasks?"

Data analysis techniques are described in detail in the next section, where findings related to two financial mathematics assessment items that were included as part of the student surveys and a financial dilemma that was presented as part of the student focus group discussions are presented and analysed. These particular items were selected for analysis and discussion because they reveal that student error on seemingly simple financial mathematics assessment items can be explained not just by miscalculation, but by a range of other complex factors.

Using a grounded theory approach (Strauss and Corbin 1990), three categories of analysis were applied to student survey and discussion group data: loss-making; break-even; and profit-making. Subsequently, responses within these three categories were evaluated as being mathematical and/or financial and/or entrepreneurial. We defined the various solutions we encountered as mathematical if they were based on precise and defensible calculations. We defined financial solutions as revealing broader language, literacy and conceptual understandings of the HaSS: Economics and Business curriculum—including terms such as "cost", "price" and "profit". We defined entrepreneurial solutions as revealing commercial and financial acumen (i.e., a profit motivation), but also personal values that showed awareness of and care for possible social and environmental objectives.

Findings

The findings are presented in two parts: insights from the student survey data and insights from the student discussion group data.

Insights from the student survey data

Seven financial mathematics assessment items were included on the pre-intervention student survey. These were not financial dilemmas, but rather original, closed questions developed in the style of NAPLAN items. The format was intended to be somewhat familiar to students. Table 4 presents item 7a. This item requires students to employ a simple mathematical operation, i.e., to divide the total cost ($6) by the number of items (12). To be able to perform such a calculation is well within the expectations of the upper primary years of the Mathematics curriculum. The options presented provide two loss-making, a break-even and a profit response—the intention was to give the students a range within which a solution was situated. While not referred to in the problem, the cost per cupcake is otherwise known as the break-even price. This concept is typically explored through the upper primary years of the HaSS: Economics & Business curriculum. This financial mathematics assessment item was included because the ability to execute such a calculation is prerequisite to identifying the price beyond which a sale is profitable. While the survey was to be completed online, students were encouraged to use pen and paper to note their working. They were also allowed to use a calculator.

Pre-intervention, 325 students completed this item and 60% responded correctly. Post-intervention, 298 students completed this item and 66% responded correctly (c.). On both occasions, there was a very low non-response rate. While there was some improvement in students' performance on this item, the number of students unable to

Table 4 Item 7a. It costs $6 to make 12 cupcakes. What is the cost per cupcake?

	Pre-intervention, $n = 331$		Post-intervention, $n = 302$	
Option	No.	%	No.	%
a. 30c	46	14	24	8
b. 40c	35	10	33	11
c. 50c	*198*	*60*	*200*	*66*
d. 60c	46	14	41	14
No response	6	2	4	1

The correct response, the number and percentage of students giving that response are italicised

achieve success is interesting when you consider that mathematical problem-solving of this nature is essential to complete simple everyday financial transactions. For example, a visit to the supermarket presents a similar scenario—should I pay 50c per lemon, or buy a bag of five for $2?

An additional, related financial mathematics assessment item was included in the post-intervention student survey. Table 5 presents item 7b, which requires students to reason that money can be raised when the price per cupcake is higher than the cost per cupcake or break-even price. Such reasoning, which relies on a correct response to item 7a, necessitates an understanding of profit—a concept that is generally explored through the upper primary years of the HaSS: Economics & Business curriculum. The decision to link item 7a and item 7b in this way, while not typical, meant that one problem context was able to be leveraged in two ways, thereby limiting the language and literacy demands associated with the assessment. Again, the options presented provide two loss-making, a break-even and a profit response.

Post-intervention, 258 students completed this item. The most common response (41%) was for students to nominate the break-even price (c.). It is particularly interesting to observe so many students suggest pricing the cupcakes at cost, rather than profit. We speculate these students were unable to distinguish between "the cost per cupcake" as described in 7a and the goal to raise money in 7b, and this affected how they mathematised 7b. Then again, nearly as many (36%) nominated the profit-making

Table 5 Item 7b. If grade 6 wants to make and sell cupcakes to raise money for an end of year party, how much should they charge per cupcake?

	Post-intervention, $n = 302$	
Option	No.	%
a. 30c	8	2
b. 40c	18	6
c. 50c	124	41
d. 60c	*108*	*36*
No response	44	14

The correct response, the number and percentage of students giving that response are italicised

price (d.). Note the relatively high no-response rate—14% of the sample did not even attempt this question, compared with 2% and 1% no-response rates to item 7a in the pre- and post-surveys respectively.

The fact that students struggled with this item is particularly interesting given that the four participating schools reported their students being involved in kitchen garden programs that included growing, preparing and pricing fresh produce and home-made goods and/or other fundraising initiatives. In fact, the problem context—a cake sale to raise money for an end of year party—was selected on the basis that upper primary students routinely organise fundraising activities like this as they plan and budget for year 6 graduation celebrations. At various times over the course of the study, the teachers described these sorts of practical initiatives as being popular at their schools and rich in experiential learning related to enterprise, entrepreneurship and financial management. Hence, there was no reason to believe that students would be unfamiliar with a problem context involving profit-making activities associated with fundraising.

Students' responses to these items stimulated a desire to explore what influences students as they consider problem contexts related to pricing and profit—might the high error and no-response rates be explained by miscalculation, or other factors? In keeping with the responsive and iterative nature of design-based research, this was done through the student focus group discussions.

Insights from the student discussion group data

As part of the student focus group discussions, students were asked a series of questions intended to elicit feedback and insights about their learning experiences with the series of ten lessons that formed the educational intervention. Additionally, the following financial dilemma was presented:

> Year 6 would like to raise money to donate to the RSPCA. The teacher has suggested making lolly bags to sell at school. Each lolly bag will cost $2 to make. What price should Year 6 sell the lolly bags for? Justify your thinking…

Note that while item 7b described year 6 students as the beneficiaries of the fundraising activity, in this case the beneficiary is a well-known Australian charity providing animal care and protection services. Also, note the shift in the language used to pose the question—in item 7b, the word "charge" was used and here the word "price" was used. This was intended to bring the inquiry into sharper focus.

In each focus group discussion, the researcher adopted a launch, explore and summary process (Lappan et al. 2006; Sullivan et al. 2014) to engage students in conversation about this financial dilemma. The task was introduced by saying, "I've got a problem here and there's probably more than one answer. I'm interested in your thinking." Students were then given time to read the task and pose questions. A range of questions were raised, examples of which include:

> How much money do they need to raise?

> How many students are there?

How big are the bags?

Are we selling to the whole school?

Is there a budget?

These early reactions signal that while some students were inquisitive as to the possibilities associated with the problem context, they seemed to draw on experiential knowledge in ways that were beyond the scope of and so not immediately relevant to the task at hand. In fact, these questions were deflected and remained unanswered. To re-focus students on the financial dilemma and initiate quiet problem-solving time, the researcher asked, "So, how much do you think we should sell these lolly bags for?" On occasions, the researcher reframed the question so as to vary the language and clarify meaning, "What price should we charge?"

Transcripts of the student discussion group audio recordings were analysed and students' mathematical responses assigned to one of three categories: loss-making responses; break-even responses; and profit-making responses. Within these categories, student contributions were further analysed as revealing reasoning that was mathematical and/or financial and/or entrepreneurial. Examples of conversations within each category are discussed in the sections that follow, with a view to highlighting two findings:

1. Students who gave loss-making and break-even responses were price conscious; and
2. Profit-oriented students applied reasoning that was mathematical, financial and entrepreneurial.

Students who gave loss-making and break-even responses were price conscious

Students who gave loss-making and break-even responses were price conscious and preoccupied with providing value for money to the market. Three students from school C agreed to sell the lolly bags for $1.50, giving the following explanations:

Amelie: $1.50. Because $2 is a lot to be spending on a lolly bag.

Stephanie: I'd probably do $1.50. So it's not so expensive.

Nicholas: I reckon $1.50 In the shops you'll find lolly bags are normally $1.50. I reckon $2 is too much.

In this conversation, the students seem to be guided by experiential knowledge. They draw on their observations and experiences with similar products in the market to judge a price point they believe purchasers will reasonably tolerate (typically referred to as price tolerance). They infer a need for the price point to be competitive. Similarly, two students, one at school A and one at school B, determined that the price should be $1.50. Their explanations revealed an emerging understanding of demand and supply

theory. For example, one commented, "If the price is lower, more people might buy them. Then they'll make more money." A price that would enable more children to participate in purchasing lolly bags reveals sensitivity to others' financial circumstances. However, with a price point below break-even, their reasoning was not mathematically precise or defensible. Further, in making sense of the problem context, the students seem to confuse what is meant by "cost" and what is meant by "price". There is no evidence that they understand the meaning of "profit"—a concept that is explored through the years 5 and 6 Mathematics and HaSS: Economics & Business and central to any enterprise activity.

Break-even responses (to price the lolly bags at $2) were justified in similar ways. As one student from school A explained, "It's not too expensive or too cheap. Plus that's what it costs to make the lolly bag." This particular response seems to be motivated to avoid financial gain—a goal that is contrary to that specified by the problem context, which involved raising funds for a charity. Again, being conscious of what might be a fair price to ask other students in the school community to pay seemed to reveal an almost intuitive awareness of price tolerance and sensitivity to others' financial circumstances.

Profit-oriented students applied reasoning that was mathematical, financial and entrepreneurial

Students who gave profit-making responses revealed more sophisticated understandings of the problem context. They applied reasoning that was mathematical, financial and entrepreneurial. Consider this conversation between three students from school D:

> Joey: I doubled the cost to make the lolly bags. So $4.
>
> Michelle: That's what I put. I did the same thing. Because just to make it is $2 so I think it is only fair to double it.
>
> Sarah: I think the Year 6 kids should sell the lolly bags for $5 because - so they can raise more money for the RSPCA.

Implicit in the above conversation is that the students take the cost or break-even price as the starting point for pricing decisions, reasoning that the price set must be higher than the cost to make the lolly bags if money is to be raised. These three students were the most profit-oriented to the extent that in setting a price at least double the cost to make the lolly bags, they established the highest profit margin noted over the seven discussion groups. Absent in this conversation is recognition of notions of price tolerance within the market.

Profit-oriented students tended to use the term "profit" in their explanations, as shown by this interaction between the researcher and students from school B:

> Gen: You can't sell it for $2 because you need to make a profit. And the profit is the money that will go to the RSPCA.
>
> George: I reckon around $2.50 or $3.00.

Gen: Yeah.

I: Just explain to me, how do you know about this word "profit"? That's a nice word you've used there.

Gen: For a field day at our school, we were making chutney…

George: And rosella jam… And we needed to make a profit out of it so we were adding up how much it cost and deciding what the profit should be. How much profit we'd get. And then what the price should be.

Here, the students reference prior learning through their school kitchen garden program. George clearly distinguishes between cost, price and profit. It seems that these students' mathematics learning was situated within an enterprise initiative where financial concepts in Mathematics and HaSS: Economics & Business were meaningfully explored. Further, to the extent that students' vocabulary was added to, language and literacy learning outcomes were achieved. For these students from school B, what was learned in their school kitchen garden program was able to be transferred to the lolly bags task—a similar problem context.

The following interaction between the researcher and students from school D is even more sophisticated to the extent that the students discuss cost, price and profit while drawing on mathematics to explain their thinking:

I: So, how much do you think we should sell these lolly bags for?

Danny: The same. $2.

Jesse: But you're not making a profit out of that. So you'll end up making the same money as before.

Danny: Oh yeah.

Jesse: I think $3 because after two sales you've made $2 profit out of it.

I: That's an interesting word. What does profit mean?

Jesse: It's where if you bought something for $2 and you sell it for $3, you're profiting $1. There's $1 difference out of it. And you earn that much out of it.

I: What if you sell 50 lolly bags?

Jesse: 50 lolly bags - yeah, that's $150 for the RSPCA.

I: Is it?

Rebecca: No, you've just done 3 x 50.

Jesse: Yeah, it's 3 x 50.

I: Is that how much you've made for the RSPCA?

Jesse: No, you haven't made that much. You have to take off what everything has cost all up. I think you profit $50 out of all of that.

I: Donna, what do you think?

Donna: I think they should add 50c to the cost of the bags. So $2.50. Just a little bit more.

I: And Danny?

Danny: Yeah, I think $2.50 because at least they'll get 50c from the people that buy.

Here, Jesse explains that Danny's initial suggestion to sell the lolly bags will meet costs, but not allow for a profit to be made. While Jesse's calculation and comment, "50 lolly bags - yeah, that's $150 for the RSPCA" seems to be flawed, upon questioning by his classmate Rebecca, he competently qualifies his response, suggesting that total sales minus costs equals profit. By the end of the conversation, Danny has been convinced by his peers to sell the lolly bags for more than $2. This highlights an unanticipated finding associated with the student focus group discussions: that being the potential for this simple financial dilemma to stimulate students to converse in ways where they educated each other.

Likewise, consider this interaction between the researcher and students from school C:

Leah: $2. Because it's cheap. It will make them quite cheap.

Jade: Maybe $1 or $2. Because you have $2 to make them and you're fundraising, so… I can't think of the words to describe it.

I: Keep thinking. I'm interested in your thinking and I'm going to come back to you.

Matt: I think it should be $3. It costs $2 to make them, so you need that money back. And also you're trying to raise money. So you want more money. So I think $1 more would be good.

Zoe: I'm thinking pretty cheap – like 50c or $1. If it's cheap, more people are going to buy them. People are more likely to have 50c than $2 or $3.

Jade: Yeah, I understand what Matt's saying. You want the money back because you've used it and then you need to get more money.

Remember that the researcher simply posed the problem, suggested there might be more than one answer, and emphasised her interest in student thinking. In the above

conversation, loss-making, break-even and profit-making responses are given. It is through Matt's explanation—an explanation weaving mathematical, financial and entrepreneurial reasoning—that Jade comes to change her mind and shift from a loss- to profit-making response. While Zoe was focused on a price that would enable more children to affordably participate in buying, we do not know whether she too, may have become convinced to change her mind. Regardless, the conversation highlights the importance of inquiry approaches that encourage students to accept challenge and become involved in critical discussions about their thinking.

Discussion and conclusion

The research sought to discover what seems to influence 10–12-year-old students in pricing goods for sale. We were particularly interested to understand what seems to constrain compared with what seems to shape a profit-orientation.

Students were presented with two financial mathematics assessment items based on problem contexts involving fundraising as an example of an enterprise activity. While 66% of students were able to calculate the cost per cupcake or break-even price—the typical starting point for pricing decisions—only 36% of students nominated a sale price that would enable a profit to be made for the purpose of raising money.

Subsequent student focus group discussion data revealed that students' responses to a similar task were influenced by their familiarity with fundraising initiatives, personal values, and language and literacy skills. Students who gave loss-making and break-even responses to the lolly bags problem were price conscious and preoccupied with providing value for money to the market. They inferred a price tolerance within the market, being motivated that the price per lolly bag be affordable for the majority of students, rather than "too expensive". These considerations reveal sensitivity to others' financial circumstances. This is likely due to social and cultural norms within their families and school communities and emerging ethical understandings. Interestingly, there seemed to be a gap in these students' language and literacy skills in terms of important understandings that underpin the mathematical calculations and reasoning necessitated by a financial problem context—i.e., "cost", "price" and "profit".

By contrast, students who gave profit-making responses applied reasoning that was mathematical, financial and entrepreneurial. They seemed to be less influenced by social and cultural sensitivities in relation to the affordability of the lolly bags, and more concerned with achieving the aim of the hypothetical exercise—to generate a profit so as to raise funds for the RSPCA. They interpreted that the price per lolly bag must be higher than the cost to make one and were more likely to use the term "profit" to explain their thinking. This reminds us of Zevenbergen's (2000) argument that language can impact numeracy learning and assessment outcomes. Inevitably, children's socialisation to consumerism, enterprise and entrepreneurship, including notions of affordability, may be influenced by family and socioeconomic background.

Tasks that are mathematical, financial and entrepreneurial (like the lolly bags task) are well within the scope of the Australian Curriculum for years 5 and 6 students (10–12 years of age). The student discussion groups confirmed that financial problem contexts are in fact interdisciplinary, values-laden and language-based. In this

study, the lolly bags problem seemed to resonate with students' previous learning experiences and appeal to their personal values. However, the implicit language and literacy demands that meant students were required to apply Mathematics alongside HaSS: Economics & Business proved an obstacle for some. Given the strong correlation between financial literacy and reading literacy (0.75) noted in the 2015 OECD PISA financial literacy results (Thomson and de Bortoli, 2017), this is unsurprising. Nevertheless, there seems to be more to the story than meets the eye. It is arguable that because the problem contexts involved fundraising as an example of an enterprise activity, financial language and literacy was prerequisite to students' capacity to demonstrate mathematical reasoning. Hence, it seems that finance, enterprise and entrepreneurship education is an intersection where the language that is specific to, but also shared between Mathematics and HaSS: Economics & Business must be explicitly explored and developed.

The findings reveal a number of insights and implications for schools and teachers. To mathematise fundraising problem contexts competently and with confidence, students need meaningful and synergistic exposure to Mathematics and HaSS: Economics & Business knowledge and skills, with a particular emphasis on terminology influencing mathematisation—i.e., "cost", "price" and "profit". Additionally, if teachers are to effectively attend to the issues and misconceptions that seem to contribute to mathematical error, they need to be aware of the potential impact of problem context familiarity, personal values, and language and literacy on students' ability to adequately deal with financial problems and make informed financial decisions. Related to this, while financial literacy assessment items may seem interesting and simple to adults, they can be complex and potentially ambiguous for students. There is a need for caution that closed questions—presented as classroom tasks and/or assessment items—tell us only so much about students' knowledge and skills. Since students bring to their learning knowledge and understanding filtered through their social and cultural lenses (Vale et al. 2016), it is only through exposing and seeking to understand the factors that influence them as they engage in financial problem-solving and decision-making that teachers can perhaps begin to address tensions between neoliberal and social justice ideologies noted earlier in this article in ways that are sensitive to local conditions, needs and interests.

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Compliance with ethical standards

Disclaimer The views expressed are those of the authors.

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