Re-thinking real-world mathematics

DAVID STOCKER

A response to 'Word problems as simulations of real-world situations: a proposed framework', Palm, 26(1): For all the talk about real-world mathematics, it seems like we still don't get it In looking at Palm's framework for evaluating sample questions, two criteria seem marginalized or altogether absent:

- relevancy to students' lives
- the transformative nature of the problem for the purpose of making the world a better place

The pizza party problem

Middle school (for students aged 13 and 14 years), where I work, is a wasteland of what I call 'pizza party' mathematics. You've probably seen the questions about finding fractions while cutting up a pizza, the youth in the textbook picture standing around looking gleeful. But I'm also speaking more broadly about problems that simply aren't relevant in students' lives. There are questions about the diameter of hamster wheels, the height of mountain peaks, the rate of CD sales in the month of June and the Swiss roll question in Palm's article If the criterion is *relevancy to students' lives*, the lift question and the Little League bus question are also 'pizza party' mathematics

Pizza-party mathematics is not transformative in nature. There is little, if anything, students will do with the knowledge that they need twenty lift loads or four busses Heart rates have not crept above their normal resting rates because there is little, if any, of what Palm talks about as the affective domain. I can state with considerable confidence that if it is "crucial that the students significantly engage in the figurative context" (p. 46) affectively, most textbook mathematics questions that I have seen are completely inadequate. One of my students writes:

> The real difference is that pizza party math does not stick with you for life. What happens is that you just go through the different sections, learning all the material and then completing the test, but then all of the information goes out of your head because it doesn't really matter. It's kind of like being on water on a windy day. One wave comes and picks you up, and then keeps going and disappears.

Relevancy and transformative capacity as prerequisites

Relevancy and transformative capacity must be prerequisite to the other aspects. It is immaterial if the event "has a fair chance of taking place" (p 44) if the event is not pertinent to the students. Whether or not the question "might be posed in the real-life event" (p 44) is of little value when students are quick to realize that the chance that they themselves will pose it is miniscule. I can develop a question about finding the number of buses required to go to a Little League game that will have a great deal of realism and specificity, and the question I will no doubt (and rightly) be asked is "Who cares?"

As a teacher of students aged 13 and 14 (grades seven and eight), I know firsthand the consequences of mathematics tasks 'dressed up' with an out-of-school context. Eyes glaze over. Attention moves to graffiti on the desk or the latest *iPod* download. Keiran is quick to ask "Why are we doing this?" and Malcolm follows up with "When would we ever need to know this in our lives?" While it is true that one of the hundreds of students who have passed through my classroom doors *will* need to build a fence to enclose a herd of cattle and so will need to be able to problem solve this scenario, most students recognize that they are not destined to be ranchers If Keiran and Malcolm, as skilled mathematics students, have doubts I worry deeply about those who join me at the beginning of grade seven with a clear distaste or downright fear of the subject.

Figurative contexts that put the real back in real-world problems

What, then, are real-world problems that are central to student lives that we as educators can use as the figurative context for mathematics learning? Actually, there are many, and in my experience the students engage with them intensely (and mathematically!). The real-world problems that provoke this response are those concerned with social justice Usually when I tell people this, they respond with bemused patronizing smiles and polite small talk, but there are compelling reasons that justice issues and mathematics are a perfect pairing

Why do my students return from lunch talking about how they've been followed around the convenience store by the owner and treated as petty thieves? If we looked at crime rates and compared youths to adults what would we find? What about if we began using statistics to look at racism in the criminal justice system? How about capital punishment? Or the privatization of the prison system?

What is the probability that those jobs that my students are looking for this summer will be minimum wage with no benefits and little training? If they work in the fast food industry or at one of the big mega-stores will they find unionized jobs? Why or why not? How do unionized jobs compare with non-unionized jobs? How many years does a minimum wage earner in Canada have to work to earn the same amount as a Chief Executive Officer does in one single year? What does the distribution of wealth in Canada look like? Do we think that the distribution is fair? These are all questions of justice, and ones where understanding the topic requires mathematics.

It's important to understand that mathematics is not an add-on to justice issues. How many of us have the number sense to fully appreciate the magnitude of the United State's military budget? I respectfully submit that it's very few of us. How many people know that we spend $319 billion dollars globally per year on advertising while the United Nations calls for an additional 19 billion a year to eliminate world hunger (this is a sure fire way to spark outrage in my classroom)? But mathematics can be used to "make the invisible visible" (to borrow from the title of Devlin's book) and in so doing set the stage for students and teachers alike to do something about the problem, to make the world more fair or more kind.

After studying the issue of domestic violence and interpreting graphs and charts, patterns and trends, my students develop a pamphlet on the issue and hit the streets of Toronto for a morning, talking to people and collecting donations for local women's shelters (we don't graph the number of pennies, nickels, dimes and quarters that we collect ....) After studying global warming and carbon dioxide equivalents, we all look at how a diet of food that comes from within 100 kilometres of Toronto has so much less environmental impact than if we eat our grapes from California and our mangos from Central America. The point is that mathematics empowers students to make informed choices about issues central to their lives in a way that may transform the world for the better.

Keeping relevancy, in the most honest sense of the word, at the heart of real-world problems must be our goal. And if we're not going to betray the idea of education, the notion that problems will encourage students to transform our society for the better must also take priority. Students love talking about fairness, and given the chance and a good reason to do so, will move mountains to be kind to others. Let's give them a *real* reason to do so.

Communication: simulation, reality, and mathematical word problems

SUSAN GEROFSKY

A comment after reading 'Word problems as simulations of real-world situations: a proposed framework', Palm, 26(1):

In contemporary theory, terms like 'real world', 'simulations' and 'language' are anything but transparent and unambiguous. Our networked electronic media have restructured the balance of our senses and our sense of the relationships amongst self, others and reality. We no longer live in a world in which frameworks, grids and checklists can capture the complex relationship between human-made simulations and an assumed external reality.

Baudrillard (1981/2001) is a key theorist addressing issues of simulation and reality in our electronically-mediated world. Baudrillard presents the idea that simulations now *precede*, and in fact *supplant* reality, existing entirely without any corresponding or matching referent, and interacting primarily with other simulations. Baudrillard writes that

> [i]t is no longer a question of imitation, nor of reduplication [...] It is rather a question of substituting signs of the real for the real itself [...] A hyperreal [...] sheltered [...] from any distinction between the real and the imaginary, leaving room only for the orbital recurrence of models and the simulated generation of difference. (Baudrillard, 1981/2001, p. 170)

Simulations ('reality' TV shows, computer games, faked political crises, theme parks) precede and create events which may be indistinguishable from simulated events, and which interact with other simulations.

Baudrillard's characterization of simulations bears a resemblance to characterizations of genres in language, literature and film. Examples of any particular genre are made in imitation, not of life but of other exemplars of the genre - so exemplars of a genre interact primarily with one another, rather than with any external 'reality'. (Think of the train of imitative genre references generated by a series of films like *Frankenstein, Bride of Frankenstein, Son of Frankenstein, Curse of Frankenstein*.) Examples of a genre refer in only the most cursory way to 'real' objects and processes, and the intentions embedded in the history of the genre are carried forward with its use, regardless of the conscious intentions of the person using the genre as a communicative medium. Similarly, word problems refer only glancingly to the realities of the workaday world, referring primarily to other word problems (Gerofsky, 2004).

Baudrillard's simulations and simulacra go beyond genre to create cultural worlds where there is no boundary between real and imaginary. I will attempt to address the place of word problems in relation to Baudrillard's insights on simulations, and to relate this to Palm's framework for judging the degree to which word problems simulate "real-world situations".

Simulations and reality

Baudrillard writes about the historical relationship of representation (or image) with the real, and offers the following "successive phases of the image":

1. It is the reflection of a basic reality.
2. It masks and perverts a basic reality.
3. It masks the *absence* of a basic reality.
4. It bears no relation to any reality whatever: it is its own pure simulacrum. (Baudrillard 1981/2001, p. 173)

A simple example of this progression relates to cultural meanings of money. If a gold coin is an example of a kind of reality, since the gold has intrinsic value, then a paper note that can be exchanged at any time for a lump of gold is a *reflection of a basic reality*; a counterfeit version of such a note would *mask and pervert a basic reality*, while leaving that reality intact. A system in which the 'gold standard' is removed but the paper money remains *masks the absence of a basic reality*, and a system in which electronic pulses travelling globally by satellite change numbers in electronically tallied accounts may *bear no relation to any reality whatever* insofar as gold is concerned.

What would constitute an image of Baudrillard's first type, a *reflection of a basic reality* within a mathematics education context? Perhaps an accurate map or diagram of an actual, physically existing place or object would qualify