Mathematics Education for a Global Village

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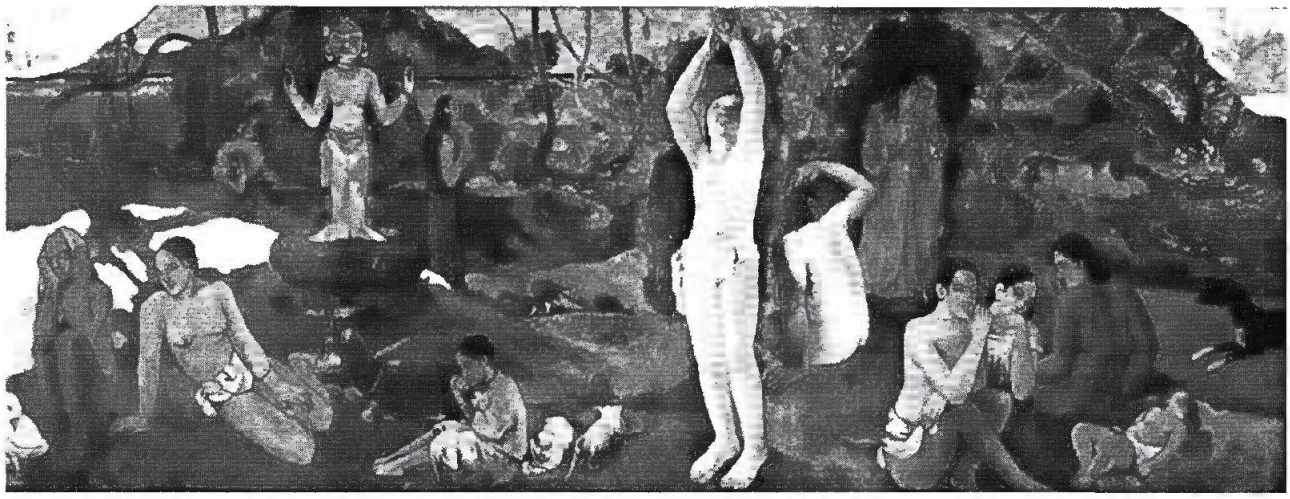
Introduction

In 1897, the tormented writer and artist Paul Gauguin painted a vast painting that he titled *D'Où Venons Nous? Que Sommes Nous? Où Allons Nous?* (Where do we come from? What are we? Where are we going?). Historian Ronald Wright used Gauguin's questions to frame his book *An Illustrated Short History of Progress* (2006), in which he warned of the inherent danger in humankind's progress. Wright began with the example of our progress in weapon technology and commented, "When the bang we can make can blow up our world, we have made rather too much progress" (p 5). I share my experience in wrestling with Gauguin's questions. My vision of a global village (McLuhan, 1962) informs my decisions as a mathematics teacher and leads to where I hope we are going.

D'Où Venons Nous (Where Do We Come From)?

I am not a historian and I do not propose to look at a history of humankind or evolution. However, I did have the opportunity to experience a place "2000 years and half a world away. Dying trees still grow greener when you pray" (Cockburn 1974). This experience gave me a sense of where humankind came from and provided me with a new lens through which to look critically at my Western society.

In high school, I became involved with a nongovernmental development organization that works in Nepal. As a group of high school students, we raised the money to build a school in Nepal. We trekked to the remote mountain village of Thulo Pokhara, where the school was to be built, and met the villagers there. There was no electricity; the people in the village shared one water pump. The villagers eked out meagre food supplies by terrace farming on the steep hillside and travelled hours each day to collect firewood and dung for cooking and to attend school. At first glance, with my Western eyes, I saw Thulo Pokhara as primitive and uncivilized. However, I saw during the week we were there that, despite the hardships, daily life was full of laughter and love and joy. When we arrived in Thulo Pokhara, the villagers insisted that we partake in tea and eggs, despite [the



D'Où Venons Nous? Que Sommes Nous? Où Allons Nous? Gauguin 1897

poverty demonstrated by] their children's bloated bellies. There was a boy in the village with a physical disability who was not able to walk; different members of the community carried him to every event. In a place with no accessibility laws, that child was never excluded. Unfortunately, the only viable site on which to build the school was where an ancient and huge tree stood; the entire village deliberated for a day about whether or not to cut down that tree.

Where do we come from? Gauguin ran away from European civilization seeking what he called the "savage—primordial man" in Tahiti and other South Sea islands, perhaps hoping to find an unspoiled paradise of the past (Wright 2006, 1). For me, visiting Thulo Pokhara was like taking a step back in time; I saw a small society that acted as a collective community in harmony with its environment. Gauguin remained tormented in the South Seas, so I do not think he found his paradise. I would not consider Thulo Pokhara a paradise, given the villagers' constant struggle to meet basic needs; however, when I returned to Canada I felt a void and a longing for the holistic way of being (mind, body and spirit) and the harmony with each other and the environment that I saw in Thulo Pokhara.

Que Sommes Nous (What Are We)?

I will take some liberty with Gauguin's question and speak to *where* humankind is now rather than *what* we are. Ronald Wright (2006) said that we have an ideology of "material progress" that coincides with "the rise of science and industry and the corresponding decline of traditional beliefs" (p 3). This was what I saw so blatantly when I returned from Nepal. In Canada, I saw people with plenty who just wanted more. I recognized that I, too, was acculturated in this ideology and felt unfulfilled. As Benjamin Franklin remarked, "The more a man has, the more he wants. Instead of filling a vacuum, it makes one" (as cited in Suzuki, McConnell and Mason 2007, 42).

Mathematics has been influenced by and influences modem Western culture. Western society has promoted a mathematics curriculum that fuels our economic progress. With globalization, the spread of this mathematics curriculum is increasing. In a way, capitalism is the new face of colonialism: for countries to be globally competitive, they align with and are assimilated into the mainstream ideology. In this way, school mathematics has become "a cultural homogenizing force" (Namukasa 2004, 211) because the world is adopting a Eurocentric, "industrially oriented curriculum" (p 222).

Coupled with the ideology of material progress we have a "dominant ideology of scientific determinism" (Namukasa 2004, 221) in the Western world: a belief that we can use our logical reasoning and powers of deduction to know everything about our world. As Namukasa (2004) put forth, "It appears the modern world is filled with the spirit of Descartes, a dream about a universal method whereby all human problems could be worked out rationally, systematically, and by logical computation" (pp 210–11). With this complete faith in logic and deduction, mathematics is seen as "a pure, perfect system and an infallible tool" (p 221). This philosophy has several ramifications. First, it gives undue power to mathematics. In education, I see too much emphasis placed on standardized achievement test results—the numbers are considered the best indicator of our success in schooling. Next, it is used as "a critical filter for status" (p 211). Most university programs require success in the standardized mathematics curriculum for entrance. It is a matter of debate how many of these students will actually need to use the industrially driven mathematics they were required to learn. Finally, it does not honour different ways of knowing about our world. In schools, I see the importance placed on mathematics over physical education or the arts.

> Scientific determinism has also resulted in fragmentation of our knowledge. The scientific method has reduced the world into disciplines, and within each discipline the focus of study is further narrowed and fragmented. This objective, precise scientific methodology has gained us detailed knowledge about snippets of our world, but this system also has its limits and unimagined consequences. When our world is reduced to minutiae, it is easier to treat everything as a commodity. (Suzuki, McConnell and Mason 2007, 36)

In school, the curriculum is divided into subjects, and within subjects knowledge is further classified (eg, algebra and geometry). There *is* a need to classify and, perhaps, specialize, given our vast amount of knowledge, but it is harmful when the connections between the ways of knowing are lost.

Where are we now? In Canada, I primarily see a society that is insular, fragmented and competitive. With all our progress, we have become specialized in our knowledge and our functions, and we have lost our connections to each other and the Earth. Unlike the villagers in Thulo Pokhara, in Canada I have plenty of food but I may not know who produced it, how, where or even what it is. But I also see a growing movement to use our technology to restore some of those connections. I see power in the shared language

of mathematics to come together and solve problems:

> Basic mathematics is a globally understood language; it is an approach to being in, engaging with, and relating to the world, and to perceiving and understanding the structure of our worlds. Both the social and physical worlds are being understood from a mathematical view at an increasing rate. (Namukasa 2004, 210).

Mathematics provides a shared language to examine our world and base our technology on. Technology can help us, as consumers, make informed decisions about how to live. I could go to the grocery store and Google information about the farmer who grew the apples I want to buy, thereby restoring my connection to the producer of my food, which impacts my health and the Earth.

Où Allons Nous (Where Are We Going)?

Path 1: Easter Island

If our current ideology of material and economic progress at all costs continues, I am afraid that we will repeat history, and our progress will lead to our demise. Wright (2006) provided the example of what happened on the remote Polynesian Island called Easter Island, or Rapa Nui. It was originally settled in fifth century AD, and the inhabitants developed a clan system in which they honoured their ancestors with huge stone carvings called *ahu*. Their quest for bigger and better statues led to deforestation of the island and, eventually, destruction of the population through clan warfare and cannibalism caused by their scant resources. Western society's drive for material progress is parallel to that of Easter Island, and Wright warned, "We are now at the stage when Easter Islanders could still have halted the senseless cutting and carving, could have gathered the last trees' seeds to plant out of reach of the rats" (p 190). Our current path is unsustainable, but I draw hope from Thulo Pokhara and I believe that educators can help shape our future.

Path 2: A Global Village Like Thulo Pokhara

Marshall McLuhan (1962) stunningly predicted that the new era of electronic technology would "recreate the world in the image of a global village" (p 31). With our technology and growth, we now make an impact on the entire planet—so Earth is our closed society or village. I hope to model our global village after Thulo Pokhara and not Easter Island. The villagers of Thulo Pokhara had scant resources, like the people of Easter Island. Why did they choose to work together and share their resources instead of going to war over them? I believe that it was because of their cohesive world view, which holistically integrated physical, spiritual and cognitive ways of knowing. The villagers' decision to cut down the tree to make room for a school was carefully considered because the tree was sacred and provided physical shelter and dead branches to use as a resource. In our global village, we have the challenge of creating a world view, a shared vision and a way of being for our planet, across cultures. As Suzuki, McConnell and Mason (2007) ask, "Can we combine the descriptive knowledge of modern science with the wisdom of the ancients to create a new world view, a story that includes us all?" (p 48). They suggest that we treat Earth as our larger sacred community according to ancient wisdom and hold "human needs and the needs of all our companions on the planet ... in balance with the sacred, self-renewing processes of Earth" (p 330). The electronic revolution can enable development of a shared vision for our global village and growing awareness of our place in its interconnected web.

Mathematics Education for a Global Village

Educators have immense power to shape this global village. "Daily classroom experiences constitute and perpetuate (and so are capable of transforming) pervasive mathematical ideologies" (Namukasa 2004, 216). As a mathematics teacher, I will not change the world in one class (nor would I know where to start!), but I can work towards "cultivating values" (p 209) and "the critical and mindful conscious" (p 224) of my students and myself.

Developing a sense of collective well-being starts in the community of my classroom. Instead of presenting my classroom rules, I can engage the class in a discussion of how we want our classroom to be. We can decide what our shared values are and how to respect them. This is not just a one-time discussion for the first day of school, but an ongoing evaluation of our actions (mine and my students') and how they affect others and our vision for the classroom. My vision is to build a caring and successful community that is respectful and values all diversity (cultural, ways of knowing, gender and so forth). "When community exists, learning is strengthened—everyone is smarter, more ambitious, and productive. Well-formed ideas and intentions amount to little without a community to bring them to life" (Peterson 1992, 2). I want to foster a mentality that each gives his best for the good of all instead of dog eat dog. I want to shape the future using Thulo Pokhara as a model, not Easter Island.

The inhabitants of Easter Island continued to use their diminishing wood supply to erect stone statues, likely because that was the tradition handed down to them and they did not question it. I want my students to be critical about the knowledge they are presented with or construct and ask, "Does this make sense?" In a traditional mathematics class, the teacher acts as a "broadcaster of information" (Schifter and Fosnot 1992, 13), while the students follow (usually mindlessly) the presented rules and procedures. I want my class to be a mathematics community that debates and discusses to further our understanding, rather than a teacher-directed model in which "a rigid notion of truth is reinforced" (Namukasa 2004, 220). Different ideas are valued as I guide my students towards understanding and learning the conventions of the mathematics community.

To restore the integrity of mathematical ideas, "learning mathematics should happen in context and as a social and human activity rather than a non-corporeal discipline" (Namukasa 2004, 212). I got a sense of the fragmentation of my own knowledge in learning about Pascal's triangle. I first encountered the numbers in Pascal's triangle as the coefficients in binomial expansions while teaching Pure Math 30. Then Pascal's triangle mysteriously appeared in pathways problems and combinatorics. I was curious about the connections but felt that I had to rush on to prepare my students for the diploma exam. When studying in my master of education program, I looked at geometric representations of triangular numbers and saw the patterns within Pascal's triangle in a whole new light. I also learned that "Pascal's triangle may have its origin in China 350 years before Pascal" (p 214). My path to knowledge about Pascal's triangle was fragmented and utilitarian and had no connection to the historical development of the ideas. To restore the connections severed by scientific determinism, I need to keep "things in place, nested in the deep communities of relations that make them whole, healthy and sane" (Jardine, LaGrange and Everest 2004, 324). If I were to teach Pure Math 30 again, I would try to find a problem that the Chinese mathematicians were exploring when they developed the idea and share the context. My students could struggle with the problem themselves by using different tools (geometry, algebra) and sharing ideas. This would provide a richer mathematical understanding and a historical context for the mathematical conventions. My students could learn that mathematics is an evolving, human field and that there are different ways of doing mathematics.

Conclusion

Wright (2006) concluded his book with his answers to Gauguin's questions. In the myths of humankind, we come from some sort of paradise and we are "an Ice Age hunter only half-evolved towards intelligence; clever but seldom wise" (p 189). To determine where we go, we must use the wisdom of our cultural capital to know that "... human beings drove themselves out of Eden, and they have done it again and again by fouling their own nests. If we want to live in an earthly paradise, it is up to us to shape it, share it, and look after it" (p 8).

In my mathematics classroom, I hope "to treat things that come to meet us with integrity, to heal the ways that things have become fragmented" (Jardine, LaGrange and Everest 2004, 328), to cultivate values and a "critical and mindful conscious" (Namukasa 2004, 224) to help shape my global village paradise.

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