



FUN WITH NUMBERS

QUEENA NGO LEE-CHUA, THE PHILIPPINES' SCIENCE COMMUNICATIONS QUEEN, IS TEACHING HER COUNTRYMEN AND COUNTRYWOMEN TO LOVE SCIENCE AND MATHS. THE TWAS REGIONAL OFFICE IN EAST AND SOUTH EAST ASIA (TWAS-ROESEAP) RECENTLY RECOGNIZED LEE-CHUA'S EFFORTS BY AWARDING HER THE 2010 PRIZE FOR THE POPULARIZATION OF SCIENCE.

"Help, I have a teenage daughter who is flunking maths!" "Help, I'm a high school student who hates trigonometry!" "Help, I'm a teacher in the hinterlands who doesn't have sufficient resources."



That's the way most of the letters begin that Queena Ngo Lee-Chua receives from readers of her weekly science and education column 'Eureka!' in *The Philippine Daily Inquirer*.

The calls for help would even be louder, were it not for Lee-Chua, the maths-cum-psychology major who has become the Philippines' science communications queen.

"I've been writing this column for 20 years, and readers still ask the same questions!" she exclaims.

In her columns she has written about how to prepare for examinations, what parents should look for when hiring a tutor and tips for teachers wanting to

spice up their lessons. Still, her readers clamour for more information and advice.

To say she is 'prolific' would be an understatement. In addition to her column for the *Inquirer* she also writes a monthly column on home-

work for *Working Mom Magazine*. She once hosted a television show, *'Fun with Math'*, and has published more than 20 books on topics ranging from science and maths to parenting and financial matters.

Add to that a full-time job teaching and conducting research in mathematics and psychology at the country's *Ateneo de Manila University*, and Lee-Chua's curriculum vitae reads like it belongs to someone much older than her 40-odd years.

She has received an avalanche of awards for her teaching, research and journalism. In 2005, *Marie Claire* magazine chose her as one of the 25 "most incredible" women in the Philippines. In 2008, the



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THE PHILIPPINES AT A GLANCE

The Philippines, comprised of more than 7,000 islands, may be famous for its natural beauty, friendly people and crystal clear waters. But it is also a natural disaster “hotspot” visited upon by earthquakes, volcanic eruptions and typhoons. Rising sea levels and global warming threaten the country’s coastal populations and bountiful coral reefs.

The islands were a Spanish colony for more than 300 years, and most Filipinos remain devoutly Catholic. The early 20th century saw a takeover by the United States until independence in 1946.

Post-colonial rule has been marred by corruption. Two of the country’s leaders have been deposed by mass demonstrations, so-called “people power” revolutions – the first in 1986 and the second in 2001.

The Philippines export electronics, clothing, food, chemicals and timber. But despite a buoyant economy, many Filipinos live in poverty. The country has the highest birth rate in Asia, and its 92 million strong population could double within three decades.

The country’s 2007 science budget only corresponded to 0.14% of the gross domestic product (GDP), significantly less than 0.69% of the GDP in neighbouring Malaysia and 2.12% of GDP in Singapore. Opportunities for science and technology professionals in the country are meagre, forcing many to go abroad to find work.

Department of Science and Technology (DOST) in the Philippines honoured her as one of the country’s great scientists. And last year, she won the TWAS Regional Office in East and South East (TWAS-ROESEAP) prize for the popularization of science (for information about the other winners, see ‘Popularizing Science in the Developing World’, p. 38).

Lee-Chua’s love of science – and maths in particular – is not par for the course in the Philippines. While students in many Asian countries excel in science and maths, her country scores dismally in international tests. The two times the Philippines participated in the

international Trends in International Mathematics and Science Study (TIMSS), it scored third from the bottom (see ‘Maths in the Philippines’, p. 41).

“Maths is the most disliked subject in the school curriculum in the Philippines. The students are not only anxious about it, they actually detest it,” Lee-Chua explains.

MINDFUL OF MATHS

So how did she come to study maths at university? Simply put, she liked it. Her choice was between maths or the arts because she also liked writing and reading. But some wise words from a counsellor tipped the scales in favour of maths. “If you want to write,” the counsellor advised, “you don’t

need a degree to do it. But if you want to go deep into maths, then you probably need expert guidance.”

For Lee-Chua, maths was also a refuge from the turbulent society she grew up in. In 1986, the year before she graduated with a bachelor’s degree, the 20-year reign of the authoritarian president Ferdinand Marcos came to an end in a series of peaceful protests known as the “People Power Revolution”. Although Lee-Chua was involved in the political movement, she longed for something more stable.

“We were campaigning for many things, and I was part of that. But I didn’t want to pursue studies in



fields like political theory or economics, which seemed just as confusing as the world around me. In mathematics, there are definitive proofs and answers. It provided an academic and a personal refuge,” Lee-Chua explains.

HOMEWARD BOUND

When she graduated *summa cum laude* in 1987, her maths career seemed to be on the verge of a sharp turn in direction. She was offered scholarships to pursue higher maths studies in the United States, but her family put a stop to her dreams of going overseas.

“Although I’m Filipino, I’m of Chinese descent, and

my parents were extremely protective. I’m the eldest, and they told me that if I were to go to the US for graduate studies, there was a good chance that I would never come back.

“They were probably right,” she admits. “And so, when they demanded that I stay, I decided to heed their warning.”

Nevertheless Lee-Chua’s academic advisors cautioned her

against entering postgraduate study in maths solely in the Philippines. While working out what to do next, Lee-Chua began teaching mathematics at the university after graduation.

Mathematics provided an academic and a personal refuge.

LEE-CHUA’S TOP FIVE TEACHING TIPS

Real-life. Students always want to know why they are supposed to learn something. At the start of a course, I explain to the students the real-life applications of what they are about to learn. But I also tell them that they will not be able to fully understand the applications until they have completed the course.

Humming along. For algebra, instead of memorizing the formulas, I tell the students to put it into a song that they like, or to turn the formulas into a rap. It helps them remember them, and it’s fun!

Story lines. Variation is the key to making classes fun. I sometimes ask students to write short stories on maths. I may ask them to surf the internet for maths poems, maths riddles or maths jokes.

Nerds no. The people who came up with the maths formulas we study were not nerds. Look at how handsome Galois, the 19th century French mathematician, conducted himself and how he died in a duel! If we have time, I may ask students to dramatize the lives of these people.

Compound interest. After the financial crisis I felt we needed to teach financial literacy at the most basic level. So, I gave my students lessons on how to calculate compound interests and why they should pay off their credit card bills in full. I even arranged for my students to see Wall Street 2, the movie with Michael Douglas, and discussed the picture’s overarching themes in class.

POPULARIZING SCIENCE IN THE DEVELOPING WORLD

The TWAS regional prizes, which are awarded by TWAS's five regional offices, carry a USD3,000 cash award. In 2010, the prizes were given to individuals who have made outstanding contributions to improving public understanding and appreciation of science.

In addition to Queena Ngo Lee-Chua, who received the award from the TWAS regional office in East and South East Asia and the Pacific (TWAS-ROESEAP), the other prize-winners are:

Elias Baydoun / TWAS Arab Regional Office (TWAS-ARO)

Elias Baydoun is professor of biology and biochemistry at the American University of Beirut in Jordan. Following the completion of postgraduate studies at the University of Cambridge, UK, he assumed a key role in the early development of Yarmouk University. In addition to his appointment as associate biology professor, he was assistant to the president, director of planning and development, and director of personnel. He later moved to the American University of Beirut, becoming chair of the department of biology at a critical phase in its development when he was the only full-time faculty member with a doctoral degree. More recently, he has organised a series of international scientific meetings leading to the creation of the Arab Academy of Sciences. Baydoun's other contributions include preparing biology curricula and textbooks for secondary schools and community colleges in Oman, writing biology textbooks for the ministry of education in Jordan and leading a project on health education in Jordanian schools. He has also translated into Arabic the region's most widely used university-level textbook in biochemistry.

Mahaletchumy Arujanan / TWAS Regional Office for East and South-East Asia and the Pacific (TWAS-ROSEAP)

Mahaletchumy Arujanan is executive director of the Malaysian Biotechnology Information Centre (MABIC). She is recognized for her role in promoting public understanding of science for human resource development. Under Arujanan's leadership, more than 50 institutions, including universities, research institutes, government agencies and ministries, have been engaged in programmes for public understanding of science. Arujanan has helped build MABIC into an internationally recognized biotechnology information centre. With support from the ministry of education, she was the first individual to organize hands-on biotechnology workshops for teachers. She has involved Islamic scholars in discussions of the critical role that public acceptance plays in advancing applications of biotechnologies. Mahaletchumy is Malaysia's only science communicator who conducts media workshop to ensure journalists have a basic understanding of biotechnology. Through her work, Arujanan has reached scientists, policy makers, industry officials, regulators, media representatives, religious leaders, teachers and students.

Guillermo Chong Díaz / TWAS Regional Office for Latin America and the Caribbean (TWAS-ROLAC)

Guillermo Chong Díaz is a professor of geology in the department of geological sciences at Chile's Catholic Uni-

Coming face-to-face with the aversion that most students had for maths helped her to realize something unexpected yet extraordinarily important for the future direction of her career: "I realized that I didn't need more maths skills," she says. "What I really needed was more psychology skills to teach students who

were so anxious about being bad at maths." She discussed the problem with professors and they suggested she study psychology.

Psychology could not be any more different than maths. Nevertheless, Lee-Chua found that she enjoyed the subject precisely because it provided her with the

versity of the North, and director of two scientific museums: the Humberto Fuenzalida Geological Museum at the Catholic University of the North and the Museum of the Atacama Desert. He is widely recognized for his promotion of the public understanding and popularization of science through his teaching, books and efforts to establish the two scientific museums that he currently heads. Díaz, a university professor for more than 35 years, has written over 170 scientific articles. He has also published two children's books on geology. Díaz has received the National Prize in Geology in 2003, the CONICYT (Chile's National Commission for Scientific and Technological Research) Prize Explora in 1997 and the Bicentennial Medal sponsored by the Regional Governor of Antofagasta, Chile, in 2010.

Arvind Gupta / TWAS Regional Office for Central and South Asia (TWAS-ROCASA)

Arvind Gupta works at the Muktangan Science Centre for Children located at the Inter-University Centre for Astronomy and Astrophysics in Pune, India. He is recognized for his role as a science popularizer and toymaker. Gupta has organized thousands of workshops in India and abroad, and has appeared on numerous television programmes showing viewers how to make science toys from discarded materials. He shares his passion for books and toys through his popular website arvindguptatoys.com. After earning a bachelors' degree from the Indian Institute of Technology (IIT) in Kanpur and working at Tata Motors, Gupta joined a village science teaching programme for children in Hoshanagabad, Madhya Pradesh, where he relied on ordinary things to do science. His first book *Matchstick Models and Other Science Experiments* was translated into 12 Indian languages and sold more than 500,000 copies. He has written 17 books and translated another 100 books on science, environment and education in Hindi, and has organized science workshops for children and teachers in over 2000 schools across the country. Arvind's outstanding contributions to the design of science teaching aids for young children has been recognized by UNESCO, UNICEF, MIT Media Lab and International Toy Research.

Felix Konotey-Ahulu / TWAS Regional Office for Sub-Saharan Africa (TWAS-ROSSA)

Felix Konotey-Ahulu is the Dr. Kwegyir Aggrey distinguished professor of human genetics at the University of Cape Coast, Ghana, and a physician and genetic counsellor in sickle cell disease and other haemoglobinopathies in the UK. He is recognized for his outstanding contributions to sickle cell disease research, especially for his efforts to increase public awareness about this disease. He traced the hereditary sickle cell disease in his own family back to 1670 and was the first to teach Ghanaians and the world that hereditary rheumatism was, in fact, sickle cell disease. He later gave public lectures that stressed one in three Ghanaians in Ghana and in the diaspora carry a beta globin gene that produces sickle haemoglobin 'S', haemoglobin 'C' or 'haemoglobin others'. He has encouraged people to determine their carrier status and has written *Sickle Cell Disease: The Case for Family Planning*. He continues to conduct genetic counselling. His websites www.sicklecell.md and www.konotey-ahulu.com provide valuable information for people worldwide who are concerned about this disease.

tools that she need to understand her student's deep-seated dislike for maths.

A master's degree in counselling psychology was followed by a doctorate degree in clinical psychology that she received in 1995. Her doctoral dissertation focused on the psychological dynamics of family busi-

nesses. "I was ready to start doing something on maths learning, but a management professor persuaded me to try looking into how family businesses thrive in the Philippines. Since my father was a businessman, I felt that this could be a good topic for a thesis," she says.



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Queená’s thesis was published in a book titled *Successful Family Businesses*. It won the Outstanding Monograph Award from the Philippines National Academy of Science and Technology in 2001.

More recently, Queená’s research has examined the psychology of maths and science learning. “I guess you could say that I experimented on my students,” she laughs, “since many of my insights were derived from careful observations of my students in the classroom.”

She has also investigated mathematical knowledge among indigenous tribes in the Philippines. “Several of them know basic maths. I looked at geometry in their art, their counting systems based on body parts, and their rhymes and games.”

As for Filipinos’ aversion to maths, Lee-Chua believes there are historical reasons. “Spain, which colonized the Philippines, didn’t think it was necessary to teach the natives maths or science. That colonial mindset seeped deep into our culture. We still struggle because of that.”

Her research once even brought her in close contact with the messy world of international politics. A few years ago, she assisted the government of the Philippines on how

to deal with the country’s claim to the Spratly islands – a cluster of islets in the South China Sea whose ownership is disputed by several countries, including China.

The diplomats wanted Lee-Chua and a US-based colleague, José Cruz, to use game theory to model whether the Philippines should turn to diplomacy, military intervention or both to defend its claim over the islands. The models suggested both approaches were needed, Lee-Chua says. “A diplomatic intervention on its own would not work – China would laugh at us, and a military conflict, we could simply not win.” So, we suggested a combined military and diplomatic approach.

Lee-Chua says that she was happy to see the project come to an end. She went into maths because it was safe and secure, not to play war games. “Quite frankly, I fretted about doing this kind of research,” she says.

I hope I am a role model.



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WRITING IT DOWN

Her writing came about at the same time as her interest in psychology. “One of my professors was a columnist for the *Inquirer*. I remember complaining to her that there were no science stories in the newspaper. She gazed at me and said: ‘That’s because nobody wants to write about science. Why don’t



<http://momahoutowntowniaaao.blogspot.com/>



MATHS IN THE PHILIPPINES

Asia produces some of the most mathematically literate students in the world. So it may come as a surprise that the Philippines scores abysmally in international mathematics studies.

Both times it participated in the Trends in International Mathematics and Science Study (TIMSS), the Philippines came third from the bottom. Out of the 38 participating countries in 1999, only Morocco and South Africa received lower scores. Four years later, in 2003, the Philippines retained its third-lowest score even though 46 countries participated. This time, only Morocco and Tunisia had lower scores.

Several reasons have been given for the Philippines' low scores, including overcrowded classrooms, a lack of interest among students and low educational levels among parents.

you?’ So I wrote a story with the title ‘Why be afraid of maths?’ and sent it to the paper.”

The *Inquirer* published the story in March 1991. Lee-Chua was an overnight success. “The editor called me the following week telling me that I was their most popular writer, and that they had received piles of letters addressed to me. She offered me my own column three months later. My first book, which was a compilation of my early articles, was published in December that year.”

What readers say about her writing is not always positive. “I remember writing about evolution and Darwin. Wow, did I get hate mail from the creationists!” Articles about genetic engineering also led to a barrage of disparaging comments. “I wrote about the pros and cons of genetically modified crops and tried to be as balanced as possible. However, I ended up getting hate mail from both sides,” she says.

But she also receives fan mail. “I even have a fan club,” she says sheepishly. Her youngest fan is five years old. “She wrote that I am her idol!”

Does she see herself as a role model? “I hope I am a role model,” she says. Her son Scott certainly seems to think so. The 12-year old is a maths whiz. He has also published three books – travel guides to foreign countries written for children. “My editor chanced upon an account my son had written about his trip for his family and friends. When she read it, she wanted Scott to

write travel books from the perspective of a child. She said that there were no travel books written for children by children, so she urged him to try to do one.”

Lee-Chua maintains that she gets her energy from her students.

“I genuinely care for them, even if they can sometimes be a handful and a nuisance.” She is convinced all students are hungry for knowledge.

“They’ve been given a bad rap and have often been scolded for not listening. But they do. When they come to my class they are noisy, but once you attract their interest, they don’t want to leave. They might despise maths when they first come through the door, but I am convinced that they despise it less when they leave for the next grade.”

For Lee-Chua, the Philippine’s maths queen, it all adds up to a better life for both her and her growing list of admirers – one that she plans to continue to pursue with the same purpose and dedication that she has maintained for the past two decades. ■

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