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MALAYSIA

Science communication in a pluralistic society

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1. Malaysia in a nutshell

The British ruled Malaysia from the 17th century until 1957; before the British, parts of Malaysia were colonised by the Portuguese and Dutch. Prior to the Westerners' invasion of ancient Malaysia, the region was a hotbed for traders from around the world. Besides traders from Europe, Indians, Chinese and Arabs flocked to the peninsula as its location was a strategic place for traders to meet.

The migration of Indians, Chinese and the Indonesians formed the pluralistic society Malaysia has today. The main religions in Malaysia are Islam, Buddhism, Hinduism, Christianity and Taoism. Malay is the national language, English is the second official language, and Mandarin and Tamil are widely spoken.

Malaysia is the third largest economy in Southeast Asia, with a GDP of \$US296 billion (ASEAN UP, 2018). Since the late 1970s, the country has evolved from an agrarian economy to a diversified one with the manufacturing and service sectors comprising a larger proportion of the economic pie (World Bank, 2018). The share of the agricultural sector in GDP terms has declined steadily from 29.9 per cent in 1970 to 8.2 per cent in 2017 (Department of Statistics Malaysia, 2018).

The Malaysian population stands at 31.1 million people, with ethnic Bumiputera (Malay and indigenous) at 68.6 per cent, followed by Chinese (23.4 per cent), Indians (7.0 per cent) and others (1.0 per cent) (Department of Statistics Malaysia, 2018). The assimilation of all these races and the influences of the colonisers make modern Malaysia a melting pot with rich traditions of history, culture, languages and religions. The pluralistic society, diversity and historical background play a role in how science is effectively communicated, the tools and approaches employed, and also the issues and concerns.

2. The start of modern science communication in Malaysia

Science communication, enculturation of science, democratisation of science, and bridging science and society have become buzz phrases in Malaysia in the last 15 years. Today we see science communication initiatives garnering attention from Malaysian researchers and policymakers, although it is still not actively practised by most researchers. It is driven by a few individuals with many limitations in terms of resources.

While researchers, academia, ministries and policymakers are jumping on the bandwagon, policy measures to formalise this field are still lacking. Capacity building, academic programs, public outreach, media engagement, meeting politicians and Science, Technology, Engineering and Mathematics (STEM) promotion in schools are conducted in an ad-hoc manner through a bottom-up approach, with initiatives driven by individuals or organisations and not driven by policies. This should be strengthened through a coordinated effort between ministries, universities and research institutes. Funding and training are hurdles that can be overcome if there is a top-down effort, where the need to engage the public is spelled out in science, technology and innovation (STI) policies and becomes an obligation of the scientific community. But support must be provided so this does not become a burden to them. This is yet to happen.

There are two driving forces contributing to the emergence of this field in Malaysia. The main factor is an emphasis by the government in nurturing the country to be a knowledge-based economy. The momentum of science communication is growing in tandem with the number of STI policies and initiatives. These initiatives are largely attributed to Dr Mahathir Mohamad—the fourth (1981–2003) and seventh (since May 2018) Prime Minister of

Malaysia, and a visionary leader. However, while STI policies are strong in Malaysia, science communication has not been strengthened with dedicated funding, training and human capital.

The other driver is the decline in students wanting to pursue STEM education. In response to this challenge, researchers have started science communication initiatives, mainly with teachers and students as target audiences. Science communication initiatives in Malaysia are in response to the two factors. Most science communication players in Malaysia align their aims, strategies, messages and target audience to these factors, with STEM promotion at a higher priority.

2.1. The driving force from the government

Science-related policies in Malaysia give an impetus to researchers to bring science to the public domain and engage with their key stakeholders.

2.1.1. Policies related to STI policies: The Mahathir factor

Popularly known as Malaysia's Father of Modern Development, Dr Mahathir Mohamad was the man behind many science-anchored national policies in Malaysia. During the first term of his leadership, Malaysia saw the unfolding of many policies and initiatives related to STI. Major ones are shown in the timeline in Figure 23.1. Currently there are 56 national policies related to STI and under the purviews of various ministries.

2.2. STEM education policies in Malaysia

Talent development in STEM is one of the priorities for the country. There is a strong need to draw students into STEM as Malaysia is facing a decline in the number of students pursuing this field, both at schools and universities. This problem was identified in the late 1960s, way before the term STEM was coined. Malaysian students are streamed into either arts or science classes according to their results in the national examination at the age of 15. The Malaysian Higher Education Planning Committee (JPPT) reported in 1967 that out of the 3 per cent of Malaysian secondary school students who continue their education at a tertiary level, 70 per cent enrolled for arts and humanities programs. The low interest in pursuing science prompted JPPT to recommend that 60 per cent of upper secondary school students be enrolled in science programs to meet future needs (Curriculum Development Division, 2016; Ministry of Education, 1967).

Figure 23.1: Timeline of selected STI policies and milestones in Malaysia.

The last four decades saw Malaysia embarking on various initiatives (discussed below) to achieve the 60:40 ratio of science to arts students. To date this threshold has not been achieved and currently only 42 per cent of students in upper secondary school level opt for science and technical streams (Ministry of Education Malaysia, 2016). The Malaysian Education Blueprint (2013–2025) launched in 2012 further strengthened STEM initiatives and its implementation was outlined in the *Report on Strategies to Achieve the 60:40 Science/Technical: Arts Stream Policy* (Ministry of Education, 2012).

In 2017, the Ministry of Education in collaboration with Ministry of Science, Technology and Innovation (MOSTI), the Ministry of Higher Education and the private sector developed the National STEM Action Plan. This plan looks into many aspects of STEM such as awareness, education, infrastructure, research, career opportunities and information gathering. With the change of government administration in May 2018, the fate of this action plan is not yet known.

The onus of promoting STEM is largely taken up by NGOs and researchers who organise exhibitions, talks, workshops, science competitions, fashion shows and roadshows on a voluntary basis. This is further discussed under Section 6. Most of these activities are funded by universities and NGOs with minimal support from the government. Funding is the main challenge faced by these communicators.

3. Research in science communication

While communicating science is becoming a popular activity, research in this area is still limited in Malaysia. Current research focuses on science and religion, legal and ethics in STI, public understanding of science, indicators in STI, science and gender, and STI policies. The emphasis on ethics and religion is possibly due to the large Muslim population in Malaysia. Areas that could be strengthened are research on science communication strategies, tools and analysis of human cognition.

3.1. The researcher's perspective

One notable researcher producing empirical data on public understanding, awareness, appreciation, perception and psychology, and the factors that drive public attitudes is Professor Latifah Amin from the National University of Malaysia (UKM).¹ Professor Amin is trained in biochemistry and

1 Latifah Amin, personal communication, 21 September 2018.

molecular genetics, but chose to pursue her PhD in consumer behaviour on modern biotechnology due to her curiosity about Malaysians' attitudes and perceptions towards biotechnology. Latifah now teaches bioethics at UKM.

Her research covers consumer behaviour, bioethics, biosafety, communication and education, biotechnology in the religious perspective and technology diffusion. She has published about 200 works including journal articles, book chapters and proceedings; she has been doing research in this area for 17 years. She found that there is a growing interest in pursuing research on public understanding of science among graduates who aspire to be researchers and academic staff but discontinue their research in this field upon graduation. Based on her experience working with them, Amin attributes this to their background in social science (most have bachelor's degree in *Syariah*² or media studies) that makes them uncomfortable and not confident enough to tackle issues related to STI.

This was also found by Dr Mahaletchumy Arujanan, the first PhD graduate in science communication in Malaysia (and lead author of this chapter). She had difficulties being accepted as a PhD student by professors in media studies, journalism and social sciences due to her initial qualifications in natural sciences. There is a disconnect between social sciences and natural sciences in Malaysia. This is being addressed by Amin's Centre for Liberal Studies at UKM and the University of Malaysia's Department of Science Studies, with both conducting research in areas where science intersects with the society: ethics, humanity, religion, public acceptance. Despite this activity, research on effective science communication is rare.

Like many other countries, science communication is seen as a social science in Malaysia but due to its hybrid nature, both Professor Amin and Dr Arujanan concur that in the Malaysian context, with the disconnect between social and natural scientists, science graduates are a better fit for research in science communication and the public understanding of science. While researchers from a natural sciences background should be complemented with graduates from media studies, social sciences and journalism, a stronger network and supporting system (mentors, role models and collaborators) made up of senior social and natural scientists is needed to provide confidence and support to those with a background in social sciences.

2 *Syariah* (the Malay spelling of *Sharia*) refers to *Sharia* law in Islamic religious law and deals with exclusively Islamic laws, having jurisdiction upon every Muslim in Malaysia (Wikipedia: en.wikipedia.org/wiki/Syariah_Court (accessed 27 March 2020)).

Professor Amin will be retiring soon and hopes more researchers will show interest in research in the fields of science communication, bioethics, biosafety and religious perspective of STI in Malaysia.

3.2. Public awareness, interest, attitude and acceptance towards STI

The two main sources of data on public perceptions and attitudes towards science and emerging technologies in Malaysia are Latifah Amin and the Malaysian Science and Technology Information Centre (MASTIC) under the Ministry of Energy, Science, Technology, Environment and Climate Change (MESTECC, formerly known as MOSTI). MASTIC has conducted surveys to gauge public interests, attitudes, knowledge, understanding and awareness of the Malaysian public towards STI since 1996, with the last survey being conducted in 2014. The study was conducted biennially until 2004, after which it was conducted once every Malaysia Plan (five years), on the grounds that the trends do not show much change biennially. MASTIC's main objective of monitoring public attitudes and understanding of STI is to provide baseline information for drawing up STI policies.

Figure 23.2: Public knowledge, attitude and interest towards STI.

Source: MASTIC, 1998, 2000, 2002, 2004, 2008, 2014.

It is a challenge to do a comparative analysis based on MASTIC's survey as the results are not presented in a consistent manner. 'Mean score' is used in some years, whereas percentages are used in others. The average for each indicator is also not included in the reports. For example, the public knowledge on STI is based on STI topics such as environment, pollution, information technology, etc. The national average is not found in most of the reports, making it very difficult to compare them between years. The definitions used for public knowledge, attitude, awareness and interest are also not in agreement with

what most science communicators use internationally. The shortfalls in these reports show that research in science communication is still a relatively new field in Malaysia.

Figure 23.2 shows results extracted from MASTIC reports from 1998–2014 on public knowledge, attitude and interest that could serve as a baseline information to enhance public understanding of science and technology.

4. Islam, culture and ethics: The concerns and motivation

Malaysia is a multiracial and multi-religious country with Islam as the official religion. Out of 31.1 million population, 61.3 per cent are Muslims. Religion is an integral part of Malaysians' lifestyle.

Muslims take the concepts of *halal* (permissibility) and *haram* (forbidden) seriously and products developed through STI must adhere to principles of *Shariah* (Islamic law). Interpretation of Islam is often considered when approving new technologies and in labelling laws. So, ethics and religious consideration and principles play an important role in developing science communication messages. Although there are four main religions in Malaysia (Islam, Buddhism, Hinduism and Christianity), the role of Islam is presented here as more studies are done in this area.

Here is a conclusion from Amin's paper on 'Decision making on agro-biotechnology issues: An Islamic perspective' (Amin et al., 2013):

Islam is seen as more emphasising on protecting the major *maslahah* which are religion, life and health, progeny, intellect and property. This is to ensure the safe development of agro-biotechnology products for the benefits of mankind, environment and other living organisms in this world. If a certain GMOs or products largely benefit mankind as a whole, without any serious risks to the five purposes of *Maqasid-al-Syariah*, thus the use of the product is allowed. On the other hand, if the GMOs or products are proven to be harmful to the five purposes of *Maqasid-al-Syariah*, thus the use of it is prohibited, even if the product is beneficial to human and society. In cases of uncertainty of the risks, the permission to use the product must be withheld until evidence of either the benefits or risks can be proven.

Amin et al. (2011b) concluded that background variables such as religion, race, age, education level and gender have significant effect on some of the dimensions of Malaysians' ethical perception of modern biotechnology. These

findings demonstrate that communication strategies in Malaysia must be customised to include religious concerns. Research on genetically modified (GM) crops, stem cells and cloning do take religious views into account. *Fatwa* (Islamic decrees) are binding on researchers. Malaysia, for example, has a *fatwa* that decrees a genetically modified organism (GMO) made from a gene from forbidden animals as *haram* for Muslims.

Another aspect that affects the way science is communicated in Malaysia is the values and belief of the public. MASTIC (2014) showed that Malaysians have a varied perception of horoscopes, faith healing and fortune telling. About 54.5 per cent of total respondents believed that horoscopes were scientific (36.4 per cent) or sort-of scientific (18.1 per cent). Framing science information and addressing public concerns may have to take these values and beliefs into consideration, as well as cultural sensitivities.

4.1. Playing the mediator between researchers and religious scholars

The Malaysian Biotechnology Information Centre (MABIC),³ a not-for-profit organisation, is an important player in the area of science communication in Malaysia. MABIC's aim is to build public understanding in science and biotechnology. It is part of an international network of Biotechnology Information Centres (BICs) with the International Service for the Acquisition of Agribiotechnology Applications (ISAAA) as the parent organisation. Concerned that modern biotechnology can be wrongly perceived through the lens of Islam and vice versa, MABIC organised three dialogues between *ulama* (religious scholars) and researchers to bridge the knowledge gap and to help researchers understand Islam's stance on modern biotechnology, especially genetic modification.

Tackling religious issues in Malaysia is a delicate matter and it may lead to serious repercussions if the relevant sensitivities are neglected. Islamic law, education and other matters are under the jurisdiction of Department of Islamic Development (JAKIM) housed in the Prime Minister's Department.

The first attempt at dialogue was in 2010 but it attracted much scepticism, with MABIC's role and agenda questioned. The workshop fell apart and the initial aim to adopt a resolution on Islam's position on agribiotechnology was not achieved. There were useful lessons from this failure. Organisers understood the need for a credible Islamic partner, and that participants should be high-level religious scholars and not middle-level officers.

3 Lead author of this chapter, Dr Mahaletchumy Arujanan, is the Executive Director of MABIC.

Figure 23.3: The highest Islamic scholar from Iran at the dialogue organised by MABIC on agribiotechnology involving GM technology, 2010.

Source: MABIC (used with permission).

The second workshop was organised during the World Halal Forum 2010 in Kuala Lumpur with the International Halal Integrity Alliance (IHIA), a credible organisation with international standing and network. The workshop resulted in a resolution that said GM crops are *halal*, public awareness on biotechnology needs to be strengthened and the role of *ulama* in scientific discussions must be enhanced (World Halal Forum, 2010).

Reinforcement is important for high-concern issues, so MABIC organised another stakeholder engagement in December 2010 with IHIA. The workshop titled 'International Workshop for Islamic Scholars on Agribiotechnology: Shariah Compliance' yielded another set of resolutions (Shaikh Mohd Salleh, 2012). These resolutions are used as references in the Muslim world with regards to GM crops.

While approved GMOs are available in the Malaysian market, researchers of all faiths will not attempt to develop GMOs from non-*halal* genes so as not to exclude Muslim researchers. Further, this step would ensure that Muslim consumers would not be excluded from being able to purchase the end product—as these consumers make up more than 60 per cent of the market, this also makes good business sense. However, biosafety laws do not have any

prohibition on imports of GMOs that have been evaluated and approved as safe, even if they have *haram* genes, though this scenario is yet to arise. Clear labelling of such products would be needed to keep consumers informed.

4.2. The motivation

The scientific legacy of Islam during its renaissance is often used to motivate students to undertake STEM education and to create science literacy and public interest.

Petrosains, a major science centre in Kuala Lumpur, organised an exhibition on ‘Sultans of Science—Islamic Science Rediscovered’ from December 2012 to June 2013. The exhibition showcased the inventions and scientific breakthroughs achieved by Muslim scholars during the peak of the Islamic civilisation (700–1700 CE)⁴ in the fields of engineering, medicine, astronomy, geography and agriculture. Notable breakthroughs by ancient Muslim scientists were exhibited, including Al-Jazari, who authored *Book of Knowledge of Ingenious Mechanical Devices* (1206 AD), which describes 50 machines such as animal and humanoid automata, automatic gates and doors and clocks; and Al-Hambra’s work on landscaped gardens. The exhibition raised the possibility that the first aviator might have been Abbas ibn Firnas, a Kurdish Arab who took off from a hill near Cordoba, Spain, 1,000 years before Otto Lilienthal in Germany. Part of the exhibition included a rich history of Muslim physicians who pioneered modern medicine.

In 2007, MOSTI held the *Scientific Excellence in Islamic Civilisation* exhibition (IKIM, 2013). There is a need for more programs and exhibitions of this nature, to remind people of the proud Islamic record in science. The ancient Islamic legacy in STI could be used effectively to trigger Malaysian Muslim interest and curiosity in these fields. Communication strategies and messages could be developed, framed and aligned to create the requisite pride and affinity.

5. Democratising science through media

Science news takes a backseat in mainstream media in Malaysia. A dialogue organised by MABIC between researchers and journalists in 2012 revealed a number of reasons for this: reluctance among researchers to engage with the media due to lack of science communication skills; distrust between researchers and journalists; and the knowledge and cultural barriers between journalists and researchers. The other major problem is the priority

⁴ 1700 CE is the same as 1700 AD: ‘Common Era’ (CE) is a modern alternative for ‘Anno Domini’ (AD).

given to high-impact journal papers that help push a university's international ranking, but engaging the public does not help in career advancement of researchers. Universities and research institutes do not provide the grants, training and human resources to support researchers' involvement in engaging the public.

5.1. *The Petri Dish*

As the executive director of MABIC, the only organisation in Malaysia with a full-time mandate to create public understanding of biotechnology and science, Dr Arujanan wanted a platform for the scientific community to reach out to the public. Her vision was for a newspaper with empathy for researchers who are not able to translate their research into popular science articles, where science news hits the headline, and where science will be the topic of discussion at home and at coffee shops. She saw several national benefits. Science and research must be in the public domain to bridge the gap between research and the market. Media coverage would facilitate the development of enabling policies and regulations, and inform the public how taxpayer money is spent. It would inspire students to enter research careers and encourage the government to allocate more money for R&D, while helping the public to appreciate and accept emerging technologies.

With the help of a journalist friend, Joseph Masilamany, the newspaper *The Petri Dish* (www.thepetridish.my) was first published in February 2011 as a 12-page monthly English newspaper. The initial business model of a free newspaper supported by advertisements was not feasible and it was later tagged at RM8 per issue (US\$2). The newspaper was first circulated to all the universities, research institutes, government agencies, ministries and other relevant organisations. It received very good feedback from the scientific community and the circulation was extended to public places such as shopping malls, private hospitals, airports and Starbucks outlets to reach non-technical readers.

The main challenges to sustain and expand this newspaper are funding and active contributions from researchers. The aim of MABIC is to expand the newspaper beyond biosciences to other science fields and to add content in the national language, Malay, to garner more readers.

5.2. *Majalah Sains*

Majalah Sains [Science Magazine] is a Malay-language science portal, the brainchild of Mohd Fa isal Aziz.⁵ Aziz's aim was to inculcate interest in STI among the Malaysian public, especially the younger generation.

5 M. F. Aziz, personal communication, 13 September 2018.

As a researcher at the Institute of Micro and Nanoelectronic Engineering (IMEN) in UKM, Aziz had contributed to popular local science magazine *Dewan Kosmik* since 2004. He then wanted to expand his audience and share the advances in nanotechnology and microelectronics with the general public. Aziz wrote 40 science articles in Malay for *Dewan Kosmik* until 2009; he then looked for a platform to publish articles on the internet. He found hundreds of science portals in English but no Malay-medium portals, and he saw the need for a Malay platform to disseminate information that could reach locals. In his view, readers understand science better when presented in Malay language, especially in rural areas. This saw the birth of *Majalah Sains*.

Other researchers were roped in to support the editorial tasks. Dr Rosdiadee Nordin, Dr Ismayadi Ismail, Ahmad Amryl and Hasfazilah Hassan became part of the team. The portal receives an average of 8–12,000 visitors per day depending on the issues carried—bauxite mining, for instance, was a hot story in Malaysia; special interviews with Nur Adlyka Ainul Annuar about the discovery of the Supermassive Black Holes were also popular. *Majalah Sains* has more than 300 contributors from universities and research institutes, and receives more than 20 articles a week. Dr Nordin said *Majalah Sains* has become a platform for aspiring researchers to communicate their research, although there is one challenge: persuading contributors to write in a manner that laypersons understand. This problem could be solved by offering seminars in how to write popular science articles.

5.3. *Dewan Kosmik*

Dewan Kosmik is a monthly science magazine in the Malay language that aims to raise public awareness of science and how it relates to life and humanity.⁶ The first issue was published in January 1993 by Dewan Bahasa dan Pustaka, a department under the Ministry of Education. With 68 pages, the magazine covers a wide range of topics including engineering, technology, geology, medicine, psychology, astronomy, biology, pharmacy, film technology, information technology, botany and science fiction. Target readers are professionals, researchers, industry executive, students, teachers, professors, trainee teachers, high school students and the general public. The magazine accepts articles from the public, and an honorarium is paid to encourage citizen journalism.

6 K. A. Mohd Isa, personal communication, 22 October 2018.

5.4. *Estidotmy*

Estidotmy was Malaysia's favourite science magazine published by *Utusan Malaysia*, a mainstream Malay-language newspaper.⁷ With 36 pages, this free magazine was circulated as a pull-out every last Wednesday of the month from 2002 to 2012. MOSTI funded the venture to increase the interest and awareness of STI among communities, especially students, while the Academy of Sciences Malaysia (ASM) provided the content. The content was in both English and Malay. It was an excellent partnership between the ministry, media and the ASM, but had to be halted due to limited funding.

The magazine had a big impact on its readers. Zamir Mohyedin, through his Facebook post,⁸ said that he loved science because of *Estidotmy*. Zamir, a Solid-State-Physics researcher at Institute of Science, University of Technology MARA (UiTM), attributes his career to *Estidotmy* as he says science was taught in a boring way in school. Many are hoping for the magazine to make a comeback.

5.5. Mainstream media

STI is not a main feature of mainstream media in Malaysia and the only newspaper to have either a science desk or journalists trained in science is the main Malay daily *Utusan Malaysia*. Health and medical articles form the bulk of science news in Malaysian newspapers as they are the most relevant topics for the general public (Arujanan, 2013). Science coverage is intermittent and typically occurs during times of crisis such as an epidemic or to report a major breakthrough in research. Most science articles are sourced from wire services.

6. STEM promotion

The government is concerned that the shortage of highly skilled talent in the area of STEM will be a handicap for Malaysia in its goal of becoming a knowledge-based economy. Players from the research fraternity are working to create awareness in STEM education, disciplines and careers. These players want to achieve the 60:40 ratio of science to arts students set by the government, and science communication efforts in Malaysia focusing on this objective are targeted at students and teachers.

7 Z. Mohyedin, personal communication, 21 October 2018.

8 www.facebook.com/profile/100000305631702/search/?q=estidotmy, 14 February 2016.

6.1. Government-driven initiatives

With 56 national policies related to STI in Malaysia cutting across various ministries, the government takes promotion of STI and STEM seriously and has promulgated various national-level mega activities.

During these national-level programs, a host of carnival-like activities are organised throughout the country. Some attract more than 10,000 visitors in a week. While there is much rhetoric during these thematic mega-events, the impact of these activities is often not measured (possible measures include measuring an increase in media coverage on science, or the number of STEM students, or public knowledge, awareness and acceptance on science). This is one area for improvement.

Table 23.1: Government-driven initiatives to promote STEM education

Initiative	Aim	Target audience	Ministries
Innovate Malaysia, 2010	To encourage a culture of creativity and innovation among Malaysians	Researchers, students, industry players, NGOs and the general public	MOSTI
Promotion of Science and Mathematics Year, 2011	To foster interest and participation of Malaysians in mathematics and the sciences	Students, general public and NGOs	MOSTI; Education; Youth and Sports; Women, Family and Community Development
Year of Science and National Innovation Movement, 2012 (SGI2012)	To encourage Malaysians to adopt a culture of science and innovation	Malaysian youths	MOSTI
National Science Week, 2018	To increase consciousness of the role of STI and how it affects the country's social economic state	Students, teachers, general public	MOSTI (MESTECC) ¹

¹ In 2018 MOSTI was restructured and became part of the Ministry of Energy, Science, Technology, Environment and Climate Change (MESTECC). It was subsequently restructured in 2020 and reverted to MOSTI.

6.2. Scientist-driven initiatives

Many Malaysian researchers promote science literacy among students and teachers in their own time. Individual researchers have championed this cause and mobilised others to join forces.

The Malaysian High School Biotechnology Awareness Program was initiated in 2001, and involved roadshows to schools in Malaysia. Academics and researchers from universities and research institutes facilitated hands-on

sessions in schools and spoke about careers in biotechnology (Firdaus-Raih et al., 2005). Standard modules were prepared with two sessions: one consisting of lectures and series of talks; and the other of three different hands-on sessions (games, wet labs and a multimedia self-exploration fun quiz). In 2005, the program reached 563 schools and 18,000 students. It was funded by MOSTI.

The National STEM Movement is led by Professor Dr Noraini Idris.⁹ It partners with universities around Malaysia, the Ministry of Education, MESTECC and industry players to organise activities for schools. A number of private players who offer STEM-based educational programs joined forces with the movement as a STEM Content Providers Network. Science fairs and exhibitions are organised at malls and convention centres, targeting schools, parents and the general public with content and exhibits coming from universities and industry players. The network of academics from universities in all 13 Malaysian states allows events to be organised at the state level. This addresses a big challenge where students from states distant from the capital city are often left out as events are usually organised in cities around the capital.

The STEM Mentor–Mentee Program was launched in 2016. Lecturers, researchers, engineers and mathematicians from universities and industry act as mentors to provide guidance to students to pursue their education and career in STEM. To date, more than 25 universities have introduced the STEM Mentor–Mentee Program, with more than 100 schools and 3,000 students participating in various STEM activities involving hands-on laboratory sessions and field visits. The mentors also train teachers to enhance their pedagogy to make science and mathematics lessons more interesting in classrooms.

6.3. STEM promotion by MABIC

Biotechnology workshops in schools are MABIC's regular events, but the major engagement with schools was nation-wide competitions with biotechnology as the theme. These were organised in collaboration with the Ministry of Education, Malaysian Biotechnology Corporation (BiotechCorp), the National Science Centre and Taylor's University in 2010 and 2011, with more than 2,000 students participating. Public speaking, debates, quizzes, spelling competitions, essay writing and poster drawing were open to schools nationwide.

9 S. Thirugnana, personal communication, 5 October 2018.

Figure 23.4: Science-based board game at MyBio Carnival 2011 organised by Ministry of Science, Technology and Innovation (MOSTI), now known as Ministry of Energy, Science, Technology, Environment and Climate Change (MESTECC).

Source: MABIC (used with permission).

Between 2007 and 2012, MABIC organised a series of teacher workshops to enhance pedagogy and delivery of science in classrooms in several states, in collaboration with the Ministry of Education and universities. The focus was on biotechnology and the topics were based on the expertise of the partnering academics at the universities.

A non-traditional approach from MABIC was a fashion show organised with a fashion school at University Technology Mara (UiTM) in 2010 in collaboration with BiotechCorp. It was later replicated at other outreach events, including one in Nairobi by MABIC's sister organisation, ISAAA AfriCenter. It included a competition for fashion students to design fabrics and outfits based on any biotechnology theme. Students came out with designs inspired by Dolly the Sheep, cloning, stem cells, neuron cells, genetically modified crops, palm oil hybrids, bacteria and viruses. The fashion show was covered by women's magazines and pull-outs in mainstream newspapers, a space often not occupied by biotechnology stories.

Figure 23.5: Outfit designs inspired by biotech and life science motifs during a fashion show organised by MABIC and BiotechCorp in 2010. Clockwise from top left: inspiration from neuron cells, Dolly the Sheep, DNA and palm oil. The outfits were designed by fashion students from University Technology Mara (UiTM).

Source: MABIC (used with permission).

7. Influencing policies and regulations

One aim of science communicators is to influence policymaking and regulations on science-based decisions. Policymakers and politicians need to be well informed to ensure R&D and commercialisation are not stifled by hurdles created by scaremongers and misinformation about science.

7.1. MABIC's role

Science communication efforts in Malaysia hinge heavily on STEM promotion. Science communication is still not well understood in Malaysia, even by those who are involved. Almost all players assume it is about getting the general public and students interested in science, and focus on STEM promotion. Outreach on regulations and policies related to science with target audiences such as policymakers, parliamentarians and religious scholars are not attempted by universities, research institutes or industry players.

MABIC fills in the gap to reach out to policymakers, politicians and regulators through a number of initiatives:

- *The Petri Dish*
- forums/conferences/seminars related to policies, regulations and Islam's position on new technologies
- media engagements to enable balanced coverage of biotechnology in the media
- media–scientist dialogue to bridge the knowledge and cultural barrier so science gets into the public domain to influence policymaking.

7.2. Outreach programs on agribiotechnology regulations

Two key players in this area are MABIC and the Department of Biosafety (DOB), under the Ministry of Water, Land and Natural Resources. Prior to the passing of the Biosafety Act in the parliament in 2007, MABIC regularly organised a number of conferences and seminars to create awareness among researchers, policymakers, politicians, industry players, regulators and traders to enable the development of science-based laws and regulations. These took place between 2006 and 2007. In 2013, MABIC organised a session for members of parliament from both the government and opposition parties to discuss agribiotechnology. MABIC understands the need to have 'Scientists meet MPs' sessions on a regular basis; strong champions and partners are needed to break the firewall for science to enter the corridors of the law-

making house. In 2010, a study tour to the US was organised for regulators to understand the entire agriculture value chain involving the development of seeds, farming techniques, regulations, transportation and trade.

The DOB enforces the Biosafety Act, and monitors and regulates the activities related to GMOs: R&D, environmental releases, trade and commercialisation (Department of Biosafety, n.d.). It creates awareness in these areas among researchers, regulators, traders, enforcement officers, farmers, media and the general public. Various aspects of GMOs are covered in their outreach and capacity-building programs, ranging from how GMOs are regulated, their safety, the science involved in developing GMOs, their benefits and potential risks, and how risks are assessed and managed.

A number of educational materials developed by the DOB disseminate information on biosafety and agricultural biotechnology to the public, including Q&A kits, biosafety guideline handbooks, model farm and field trials, brochures and replicas of GM crops. MABIC provides technical input and content to the DOB for some of its public awareness material. Two main challenges the DOB faces are limited personnel and the budget to do countrywide outreach programs.

8. Capacity building in science communication: Academic programs

Malaysia lacks academic programs in science communication at all levels, from bachelor's degrees to PhDs. Science communication is not taught as a unit for undergraduates in the STEM fields. Monash University Malaysia makes it compulsory for its undergraduates at the School of Science to take a unit with components in science communication, making it the only university in Malaysia to do so.

The closest to a science communication program is the Master of Communication (Science and Environmental Journalism) offered by Universiti Sains Malaysia (USM), although the focus is on environment. It is offered by USM's School of Communication and is described on the university's website:

The programme is designed mainly to prepare students for a professional career as science and environmental writers, reporters and editors in the media industry, research institutions and environment-related organisations.¹⁰

¹⁰ web.usm.my/comm/acd.asp?tag=p2 (accessed 27 March 2020).

Dr Arujanan was the first to receive a PhD in science communication in Malaysia. It was awarded by the University of Malaya (UM) in 2013:

I tailor-made my PhD in science communication as this was not a research field at any Malaysian university and there were no experts in this field. Knowing that I would not be able to secure a job in Malaysia as a science communicator if I left my position as the Executive Director of MABIC to pursue a PhD overseas, I chose a professor from UM whose work is related to science and society. Science communication is not a mainstream profession in Malaysia and there are few employers in this field except for the National Science Centre and a handful of other science centres. In 2008, science communication was still a relatively new area of research (and it still is today). It was a tough journey without any proper guidance and expertise, and irrelevant questions and comments during defence seminars.

Two years passed by without much progress and groping in the dark, and I was devastated. My previous background on microbiology, biochemistry and biotechnology was not helping me comprehend research methodologies in social science, and there were no colleagues in this field for any intellectual discourses. Finally, after lots of discussion with the dean, a concrete suggestion was made: that I find a consultant to help me. Having worked in this area for five years, I had built my network, so suggested Dr Craig Cormick from Australia as a consultant, and he unofficially stepped up to be my supervisor.

I submitted my thesis in 2012 and received my PhD in 2013, for my study on 'Biotechnology Communications in Malaysia: Understanding the Issues, Influence and Audience towards Developing a Better Communication Matrix.

MABIC hopes to develop a postgraduate diploma in science communication in collaboration with a local university and has been invited by USM to develop online microcredential modules for this field. These will be the first structured academic programs in science communication in Malaysia. Work is in progress in these areas.

MABIC also plays a key role in providing short courses and training workshops in science communication and developed the first home-grown science communication module in 2018. The two-day module was endorsed by Monash University Australia as a School of Science Monash Doctoral Program (MDP) for PhD students in the natural sciences. It is also used to train researchers, policymakers, STEM practitioners and government officers. The module covers translating research into media articles, understanding media culture, creating the 'hook' to attract readers and audiences, developing

metaphors and analogies, humanising research, translating research titles to headlines, and common blunders made by researchers when communicating to the public.

Another one-day module was developed on risk communication and the first workshop was carried out for Department of Biosafety for regulators and researchers in the field of genetic engineering research on June 2018. A one-day science communication module was also developed by MABIC for MESTECC officers from various agencies, and training was conducted in October 2018. MABIC's training modules are gaining traction and in the pipeline are modules on media training, risk communication (two-day module), non-traditional approaches and storytelling in communicating science. MABIC also attempts to customise its modules to suit the objectives of the training workshops and its participants.

9. Science and society: Reaching out to the public

The Young Scientists Network (YSN), under the ASM reaches thousands of children and members of the public annually through their activities.¹¹ Professor Abhimanyu Veerakumarasivam, chairman and founding member of YSN–ASM, says what he found most compelling is that most of the members assert that engaging the public actually helped elevate their research by broadening their network, increasing research collaborations and diversifying their source of research funds.

In collaboration with British Council and Malaysian Industry-Government Group for High Technology (MIGHT), YSN–ASM through its science communication working group organised science communication training for researchers in 2016 and science journalism training for journalists in 2017. The training focused on enabling researchers to communicate to non-technical audiences and journalists to appreciate science and do balanced reporting, as well as bridge the knowledge and cultural barriers between them. YSN–ASM acknowledged that while its members are eager to reach out to the public, their communication skills are still lacking, hence they strive to empower their members with such training.

11 A. Veerakumarasivam, personal communication, 30 August 2018.

Science Café is another initiative. To feed her curiosity about science, Liuyi Yeoh, founder of Science Café KL, frequented Science Café in the United Kingdom where she lived for 15 years.¹² On returning to Kuala Lumpur in 2016, she wanted to replicate it and, being a die-hard science fan, she started Science Café KL at The Bee, a casual café in the upscale Publika shopping mall. Yeoh, a full-time business development manager in a local infrastructure company, said that patrons would be able to discover new, curious and interesting things in the world of science at Science Café KL. She initially made cold calls to researchers asking them to share their research with the public but now she gets her contacts from YSN.

Shawn Keng, co-chair of YSN's science communication working group and a PhD student in science communication, hopes Science Café KL can help overcome public perceptions that science is boring, and also debunk pseudoscience and misinformation. He said the talks contain a higher dose of technical content than the average TV documentary and yet are palatable to laypeople. Science Café KL has tackled a diverse array of topics, from quantum physics to the link between the human genome and cancer, from nanotechnology to how the zebra fish may one day save human lives. The open format allows audience to interrupt and ask questions, and gives it a casual and relaxed air.

A third initiative, the National Science Centre (PSN) program, was a culmination of one of the strategic challenges listed by Prime Minister Dr Mahathir Mohamad in a paper entitled 'Malaysia: The Way Forward' in 1991:

The sixth is the challenge of establishing a scientific and progressive society, a society that is innovative and forward-looking, one that is not only a consumer of technology but also a contributor to the scientific and technological civilisation of the future.

In November 1996, Malaysia formed its first science centre with a mandate to raise awareness, understanding and appreciation towards science and technology towards the creation of scientific society. The centre is interactive with explorative, hands-on exhibits requiring visitors' active participation. Facilitators conduct demonstrations and often researchers are invited to give talks on scientific phenomena. According to Elena Mazlan, science officer at PSN, the centre receives about 10–18,000 visitors during weekends.¹³ In 2006, the PSN established its first branch in the Northern Region, Alor

12 S. Keng, personal communication, 27 August 2018; L. Yeoh, personal communication, 15 September 2018.

13 E. Mazlan, personal communication, 17 September 2018.

Setar, Kedah. In addition to the main exhibition, the centre also organises activities such as ‘Special Science Day’, ‘Meet the Scientist’ and ‘Education Innovation for Teachers’. Besides the PSN, there are other public and private science centres such as Petrosains, planetaria and Tech Dome Penang.

10. Current challenges and the way forward

The main challenges for effective science communication in Malaysia are:

1. There is no policy that makes science communication an obligation among researchers.
2. Lack of funding and training for researchers to get involved.
3. Lack of understanding and knowledge of science communication among researchers currently involved in engaging with the public.
4. Lack of cooperation and coordination among the players who are involved in science communication.
5. Disproportionate emphasis given to STEM promotion, neglecting communicating science to policymakers, politicians and regulators.

A few recommendations are:

1. Establish a science communication office at all universities and research institutes where trained science communicators can help researchers to develop messages for their outreach programs, translate research into media articles, create social media platforms, provide science communication training, engage with the public through various activities, and promote STEM.
2. All grants received for research must allocate a small portion for public engagement activities. The science communication office could help researchers to develop their programs.
3. Academic programs in science communication at bachelor’s and postgraduate levels should be initiated.
4. A science communicator association should be launched given the growing number of players in this space. This will promote collaboration and exchange of experience and knowledge.

The current landscape shows a progressive environment in the area of science communication and Malaysia could be in the forefront in southeast Asia in this field if measures are taken to fill the void.

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Timeline

Event	Name	Date	Comments
First interactive science centre.	Pusat Sains Negara (PSN) [National Science Centre]	Nov 1996	
First national (or large regional) science festival.	Different organisations run events with different names	2010	NGOs and researchers run exhibitions, talks, workshops, fashion shows and roadshows
First university courses to train science communicators.	No formal courses in science communication	-	Master's and PhD candidates customise their research in bioethics, science communication, public perception
First master's students in science communication graduate.			There is a master's program in environmental journalism
First PhD students in science communication graduate.	The lead author, Mahaletchumy Arujanan	2013	Dr Arujanan is Malaysia's only PhD graduate in this area
National government program to support science communication established.	National Science, Technology and Innovation Policy	2011	Science communication is covered under this policy
National Science Week founded.	Theme was <i>Negaraku Berinovasi</i> [My Innovative Country]	2018	Launched by the Science, Technology and Innovation Ministry
First significant TV programs on science.			Used to have children's programs
First awards for scientists or journalists or others for science communication.	Special STEM Award presented by minister	2018	Awarded to Kuala Lumpur Engineering Science Fair and others
Other significant events.	<i>The Petri Dish</i> , first science newspaper	Feb 2011	

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