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NIGERIA

Battling the odds: Science communication in an African state

Bankole Falade, Herbert Batta
and Diran Onifade

1. Introduction

Science and technology institutions, practices and policies abound in Nigeria but the phrase ‘science communication’ is not an entrenched one. At best, science communication practices can be described as fragmentary and incidental. A major issue is policy preferences, which do not elevate science communication to the same level as in Western societies. Closely related to this is education infrastructure and curriculum, which incorporates science communication as a subset of other disciplines.

Nigeria’s plurality of religions in a strongly contested democratic setting between the old North and South also poses constraints to the spread of scientific ideas, and quite often this has to be factored into campaign programs. The polio vaccine controversy in the North shows the strength of religious beliefs as an obstacle to the spread of scientific ideas. The reaction of the religious leaders in the south to the Ebola virus epidemic also shows that religion, as an obstacle, is independent of affiliation. Religion can however be double-edged in having both adverse and complementary effects. Also, prevalence rates for the Human Immunodeficiency Virus (HIV) and alarmingly high annual death statistics from malaria tend to support the argument that more needs to be done to encourage the citizenry to embrace modern scientific practices as premises for behaviour.

Notwithstanding, the country has made tremendous progress and the potential for science communication to accelerate the growth of science, technology and innovation (STI) indices, improve manufacturing, agriculture, health and wellbeing in Nigeria remains vast, awaiting more attention from both public and the private sector.

2. STI and Nigeria's growth and developmental challenges

Nigeria is Africa's most populated country with an estimated 186 million (2016) residents living on a land area of 923,768 km². It is the seventh most populous country in the world and although 14th in terms of land area in Africa; it accounts for 16 per cent of the continent's population. Nigeria is Africa's largest economy with gross domestic product (GDP) at \$481 billion and per capita income around US\$2,000 (current US\$ for 2015). It is followed by South Africa at US\$317 billion but with higher per capita income at about US\$6,000 (National Bureau of Statistics, 2020). According to the World Bank, between 2006 and 2016, Nigeria's GDP grew at an average rate of 5.7 per cent per year. Oil prices continue to dominate the country's growth pattern and their volatility imposes substantial constraints on planning and policy implementation. With a fertility rate of 5.5 births per 1,000 women, the population is expected to soar in the next few decades, raising developmental challenges (see World Bank, 2018). Science communication, embedded in STI performances, is critical to overcoming challenges in food production, health, manufacturing, the service sector and others.

3. Agricultural extension as precursor to science communication

Science communication in Nigeria has its origin in extension services, which date back to the early 20th century when agriculture accounted for over 90 per cent of the country's export earnings. Agriculture was soon overtaken by crude oil and although the petroleum sector is small, it is important for foreign exchange and fiscal revenues. Agriculture currently constitutes about 20–25 per cent of GDP; the oil industry accounts for 8–10 per cent; non-oil 13–14 per cent while the service sector is the highest at 52 per cent (Joseph-Raji and Timmis, 2018). Agricultural production thus remains very important to the economy.

Agricultural departments were established in Southern Nigeria in 1910 and Northern Nigeria in 1912, and a unified central body was formed in 1921 (Omotayo et al., 2001) after the amalgamation of both regions into present-day Nigeria in 1914. Constitutional reforms led to the creation of ministries of agriculture at federal and state levels (now 36 states) from where extension services were initiated for the commodity boards, the farm settlement schemes and the Agricultural Development Projects (ADPs), among others.

The farm settlement scheme was to train young school leavers in scientific innovations in farm practices with the expectation that these new technologies would diffuse into neighbouring farms and become linkages for the spread of future innovations. The ADPs, partly funded by the World Bank (World Bank, 2012) commenced in 1975, using the ‘Training and Demonstration’ method later replaced with the ‘Training and Visit’ method (Omotayo et al., 2001; Adebayo and Idowu, 2001). Subsequent programs such as the National Accelerated Food production program, the Green Revolution and Integrated Rural development programs were all very active examples of science communication, taking innovations to the farmers. The International Institute of Tropical Agriculture (IITA), established by the Ford and Rockefeller foundations, has also been active in research and innovation dissemination in Nigeria since it was founded in 1967. It is sited in Ibadan, the capital of Oyo State. With Africa producing more than half the world’s cassava, IITA has been instrumental in the development and distribution of high-yielding disease-resistant cassava clones and continues to use genomic selection to improve cassava productivity.



Figure 26.1: ICT and agricultural extension practices.

Source: IITA.

Nigeria's 2016–20 agricultural policy framework called 'The Green Alternative' (Federal Ministry of Agriculture and Rural Development, n.d.) adopted a stakeholder approach, which seeks to build linkages across the value chain. Information and communication technology (ICT) platforms such as mobile phone and e-wallet schemes are now playing significant roles in the sector (Asogwa et al., 2015; Fadairo et al., 2015). The IITA also recently launched Nuru (IITA, 2018), an artificially intelligent assistant. Nuru (Swahili for light) uses machine learning to recognise leaves damaged by two important viral diseases of cassava (cassava mosaic disease and cassava brown streak disease), as well as damage by red and green mites. ICT platforms thus join traditional media forms such as radio, television and newspapers, which continue to play significant roles in the communication of improved farm practices.

The soap opera *Cock Crow at Dawn*, shown nationwide by the national broadcaster Nigerian Television Authority (NTA) in the 1980s, captivated the national audience for its portrayal of life in the rural areas. Co-sponsored by the United Bank for Africa and shot in a rural agrarian community, it was a mix of entertainment, agricultural extension and rural life. Several radio programs in English and the various local languages also aid the diffusion of innovations to farmers. They include *Aye Agbe* and *AgbeLere* in Yoruba; *Harama Manoma* and *Ina Manoma* in Hausa; *Onye Oruubi* and *Onye Oruugbo* in Igbo; and *Telefarmer*, *Country Farmer*, *Radio Farmer* and *Agribiotech* in English (see Oladele, 2006).

4. Science communication and health campaigns

Like agricultural extension services, science communication is also the basis of health campaigns in Nigeria. With a life expectancy at 55/56 years (WHO, 2016), Nigeria's health challenges are wide and varied. The country suffers the world's greatest malaria burden with approximately 51 million cases annually (Dawaki et al., 2016). In 2016, an estimated 3.1 million people were living with HIV/AIDS (WHO, 2016). Nigeria was one of three countries worldwide with active transmission of the wild poliovirus type 2. None has been detected since 2016, but there are still outbreaks of circulating vaccine-derived poliovirus type 2. Case studies below indicate the context and constraints to effective science communication in the health sector.

4.1. Pfizer drug trials

In 1996, Hopkins and Pfizer's medical team gave Trovan, an experimental meningitis drug, to about 200 children during a major outbreak of meningitis in Kano State, Northern Nigeria (Pfizer, 2009). While Pfizer claims the study plainly proved that Trovan helped save lives with a survival rate of 94.4 per cent, against less than 90 per cent for the current best treatment available in Nigeria at the time, the trial was seen as having fallen short of ethical guidelines and international best practices. The company made a US\$75 million out of court settlement with the Kano state government (Okonta, 2014), but the event has continued to fuel conspiracy theories about Western health interventions.

4.2. Polio vaccine controversy

The international drive to eradicate poliomyelitis began in 1988. Nigeria's nationwide effort, led by the federal government, the World Health Organization, Rotary International, the United States Centers for Disease Control and Prevention, UNICEF and other international donor agencies provides a good case study of obstacles to science communication. It was a typical multimedia campaign but while it was very successful in the south, it met with resistance in the north, highlighting the negative effects of religious beliefs, the fragility of the relationship between the central government and the states and their combined effect on top-down science communication. The northern campaign was adversely affected by religious teachings against vaccination, rumours the vaccine had been contaminated by sterilising substances and reported deaths from taking the vaccine. It snowballed into a major vaccine revolt in July 2003 when two influential groups, the Supreme Council for Shari'ah in Nigeria (SCSN) and the Kaduna State Council of Imams and Ulamas, declared that the vaccine contained anti-fertility substances and was part of a Western conspiracy to sterilise Muslims (see Falade, 2015). Many northern states subsequently banned the distribution of the vaccine, fearing a backlash from their citizens.

The previous episode with Pfizer and ongoing wars in Afghanistan and Iraq added weight to the conspiracy theory of a plot to decimate Muslim populations worldwide. Opinion leaders in June 2004 eventually agreed to allow the campaign to resume: the death toll from polio had become unbearable and new findings led to conclusions that the polio vaccine-to-infertility rate may have been exaggerated. However, it was not until after a five-day immunisation tour of Egypt in 2007 that prominent Islamic scholars accepted the compatibility of vaccination with the Qur'an (Falade, 2015). Communicating the scientific approach to disease was not enough to change behaviour, religion had to accommodate science for lasting change.

4.3. Ebola in Nigeria

The campaign to prevent the transmission of Ebola to Nigeria from West Africa was led by the federal government through the Federal Ministry of Health. Posters (see Figure 26.2) were circulated in many local languages (Pidgin, Hausa, English, etc.) around the country, complementing radio and television announcements on symptoms and prevention. The virus was however transmitted to Nigeria by Patrick Sawyer, a Liberian-American who contracted the disease in Liberia before he flew into Nigeria (TheCable, 2015). Sawyer, who died of the disease, transmitted it to hospital staff; while some survived, others, including the consultant, Dr Ameyo Stella Adadevoh, died (more on Adadevoh below).

Like the polio vaccine controversy, the efforts to contain Ebola again raised the issue of a potential for conflict between science and religious beliefs in West Africa (Falade and Coultas, 2017). A Christian religious leader declined to postpone the church's annual convention, which attracted congregants from all over the world and told his pastors that those who had fasted for 100 days should have no fear of Ebola. A Muslim opinion said disease was with the 'permission of Allah'. When Nigeria was declared free of the virus by the World Health Organization, a pastor claimed that it was 'the hand of God on Nigeria' (Vanguard, 2014). However, some churches were active in the communication of prevention practices by suspending the practice of shaking hands during church services and serving Holy Communion in the mouth. Some churches also served as orphanages while others sourced medical equipment and consumables from abroad.

The epidemic also brought to public attention claims and counterclaims about local therapies. There were rumours the disease could be prevented by bathing in saltwater or eating bitter kola. Maurice Iwu, a professor of pharmacology, to whom the bitter kola claim was attributed, later clarified that he did not find a cure but findings from a 1999 research project showed that bitter kola can 'stop the replication of the virus' (Olawale, 2014). Another professor also claimed the virus could be cured using ewedu, a native vegetable (Vanguard, 2014).

Here again, as with polio, science communication was not sufficient. Religious beliefs and traditional medical practices about health also had to accommodate science.

4.4. HIV/AIDS

The first case of AIDS in Nigeria was reported in 1986 (FMH, 2014) and its prevalence increased exponentially until it peaked at 5.8 per cent in 2001 before progressively declining to 4.1 per cent in 2010. According to UNAIDS (2016), Nigeria has the second largest HIV epidemic in the world, with 3.4 million people living with HIV in 2014, including 380,000 children below the age of 14 (South Africa has the largest). A 2019 report titled 'Nigeria HIV/AIDS indicator and impact survey', however, shows that the prevalence of HIV among adults age 15–64 years is 1.5 per cent: 1.9 per cent among females and 1.1 per cent among males (NACA, 2019). Prevalence among children age 0–14 years is 0.2 per cent. The report, from a 2018 household survey, is regarded as the most comprehensive to date and involved 89,565 eligible households with 93.7 per cent response (NACA, 2019). HIV prevalence also varied by zone across Nigeria, with the highest prevalence in the South South Zone (3.1 per cent) and the lowest prevalence in the North West Zone (0.6 per cent). (Nigeria's 36 states and federal capital territory are divided into six zones: South South, South East, South West, North West, North Central and North East.)

As with Ebola, a Nigerian scientist also made claims for an effective treatment for HIV/AIDS. Dr Jeremiah Abalaka claimed to have developed a vaccine to prevent HIV infections. Before then, there were a plethora of claims in the media on instant cures for all manner of medical conditions such as AIDS, hypertension, diabetes, cancer, etc. paid for by herbalists and spiritualists. The difference with Abalaka's 1999/2000 claim was that he is a senior medical doctor and trained immunologist. The doctor became an instant celebrity with patronage from as high up as the military high command. One of the soldiers sent to him for treatment later said on national television that he was the only one of 30 referrals that survived (Ahmad, 2000). Abalaka's claims have not been independently verified using established testing methods and he has since been largely ignored by the media.

4.5. Malaria

Malaria is endemic in Nigeria and the country bears up to 25 per cent of the malaria disease burden in Africa (NMIS, 2015). It accounts for up to 11 per cent of maternal mortality, 25 per cent of infant mortality and 30 per cent of under-5 mortality. Added to this is person/hour losses for an average infection cycle to recovery, which may be up to a week.

Nigeria was one of the countries included in WHO's first large-scale multilateral initiative for malaria control between 1955 and 1969. The initiative, known as the Malaria Eradication Programme, relied on massive indoor spraying

of dichlorodiphenyltrichloroethane (DDT). Although the goal was the complete eradication of malaria globally, it only succeeded in eliminating the disease from some regions, including southern Europe, the former USSR, and some countries of North Africa and the Middle East (Alilio et al., 2004). The use of DDT has been discontinued over environmental concerns. Also, the cheap antimalarial drug, Chloroquine, which in the past saved millions of lives, is no longer effective against new strains of malaria. The new drugs, combining artemisinin and its derivatives with other compounds, cost more than 10 times the price of Chloroquine, raising the cost beyond the reach of the poor (Gelband et al., 2004).

Science communication activities against malaria have thus focused on awareness campaigns on effective over-the-counter treatments and prevention strategies. Prevention strategies, which are often cheaper, target the mosquito that spread the malaria parasite by eliminating them using insecticides, or provide effective barriers with insecticide-treated nets, mosquito coils, etc. In recent years these public campaigns have seen the involvement of local and foreign NGOs, major international corporations and local artists and celebrities. The artists and celebrities feature in audiovisual messages.

5. Campaign for a clean environment

Nigeria's first significant environmental event was the Koko town toxic waste dump of June 1988. Prior to 1988, Nigeria responded to most environmental problems on an ad hoc basis (see Ogbodo, 2009). The attendant international outcry led to the creation of the Federal Environment Protection Agency in 1988, with responsibility for the administration and enforcement of environmental laws.

The second event was over crude oil extraction-related pollution. The Ken Saro Wiwa-led Movement for the Survival of the Ogoni People (MOSOP) had engaged in international awareness campaigns on the extent and dangers posed by oil exploration activities in the Niger Delta. MOSOP was brutally suppressed by the military, culminating in the killing of Ken Saro Wiwa and nine others in 1995 by the military government (see Boele et al., 2001). Former British Prime Minister John Major described the killing as 'judicial murder' (Rowell and Lubbers, 2010). Sadly, it is a reminder of the delicate balance between environmental concerns, public wealth in developing countries and politics. No major organised campaign against environmental issues has occurred since then in Nigeria—it appears that the effects of the silencing of MOSOP continue to affect the public.



Figure 26.2: Oil spill in the Niger Delta region.

Source: The Will Nigeria (thewillnigeria.com).

The federal government has, however, set up a committee to reconcile the Ogoni people. It commissioned the United Nations Environment Programme (UNEP) to do an environmental assessment study of the sites between 2009 and 2011. A stakeholder meeting was held in Geneva, Switzerland, in November 2014, and Nigeria's current president, Muhammadu Buhari, launched the clean-up of Ogoniland on 2 June 2016 in Bodo (Federal Ministry of Environment, n.d.).

6. The public and engagement with science

Examining public engagement with science in Nigeria's *Guardian* newspaper, Falade (2016) found that coverage increased in intensity over the period 2001–09 from 6.8 per cent to 8.3 per cent of total available space. More stories were written by science writers in 2009 (28 per cent) than in 2001 (18 per cent), and the paper devoted 7 per cent of science coverage to alternative/herbal medical practices. The broadcast media mirrored the general trend in terms of attention paid to the coverage of science. However, television stations tend to focus more on agriculture, environment, climate change and health. In this category are *Health Matters* on Channels Television, *The Environment* on NTA and *Our Environment* on Television Continental (TVC). *Agribiotech* is on TVC and focuses on Nigeria's emerging agricultural biotechnology sector. *The Voyage of Discovery*, which debuted on the NTA in 2006 as a 30-minute weekly show, specifically focuses on research. It later moved to Africa Independent Television. The program was

conceived by the National Universities Commission to disseminate research findings using an easily digestible and entertaining media. Online, Nigerian issues feature frequently in the Africa section of SciDev.Net. SciDev.Net, the UK-based online portal (scidev.net), serves as an avenue for freelance journalists to publish science stories and get paid. Local websites devoted to science coverage such as AfricaSTI and EnvironNews are struggling from lack of funds.

A pilot public understanding of science survey (Falade and Bauer, 2018) using standard and modified questions from the Eurobarometer and National Science Foundation found that Nigerians have high levels of trust in scientists and religious leaders when compared with politicians, judiciary and the military. On the knowledge questions, issues where science and religion have similar interpretations produced interesting results. For example, 70 per cent of respondents agree ‘father’s gene decides sex of child’ and 75 per cent also agree ‘God decides sex of child’. Cross-tabulation shows that 82 per cent of respondents who agree it’s ‘Father’s gene’ are also happy it’s ‘God’ (12 per cent disagree and 6 per cent don’t know). When respondents were asked their first option for tackling health problems, 55 per cent selected Western medicine, 24 per cent prayers and 6 per cent traditional herbs. The second option for health was more revealing: 34 per cent selected prayers, 29 per cent Western medicine and 20 per cent traditional herbs. Only 12 per cent of the respondents chose Western medicine as first and second options. The results show that respondents consult science, religion and traditional medicine, albeit in different orderings. In addition, 84 per cent rated religion as playing a strong role in their lives, with 88 per cent believing in destiny.

7. Policy framework for science technology and innovation in Nigeria

7.1. Science education and communication

Nigeria’s policy on science education, technology and innovation is predicated on its national aspirations. The report of the Vision 2010 Committee, announced in September 1997, sees science, engineering and technology as critical to the nation’s development. The importance of science communication can be inferred from statements about the significance of health and environment, especially in the aftermath of the toxic waste dump in Nigeria from abroad. The National Policy on Education noted that radio and television educational broadcasting shall feature as part of the educational support service system (NERDC, 2004, 53). The section on science education stipulates that ‘government shall

popularise the study of the sciences and the production of adequate number of scientists to inspire and support national development' (p. 29). The National Mass Communication Policy (2004) seeks to promote Nigerian culture as the basis of creative expression and to facilitate the advancement of national unity, social co-existence, education, science and technology and the peaceful resolution of social problems and conflict.

The Federal Ministry of Science and Technology updated its National ST&I Policy in 2012.¹ Specifically, it seeks to popularise science through technology fairs, exhibitions, STI clubs and the mass media. Other strategies focused on human resources, biotechnology, research and innovation in natural (health) products, natural medicine and pharmaceutical research and energy, and ICT and emerging technologies such as nanotechnology. The country, it is argued, recognises the importance of STI to its development. However, the synergy among these policies and the extent to which science communication and popularisation components are implemented is not visible.

Perhaps it was in recognition of these shortcomings that the country came up with a new policy framework, the National Science, Technology and Innovation Roadmap (2017–30) (FMST, 2017). Nigeria's Minister of Science and Technology Ogbonnaya Onu said the new policy would coordinate and support the development of science and technology infrastructure for the country's socioeconomic development (FMST, 2018). Significantly, one of the new strategies is science literacy improvement and public/stakeholder engagement.

8. Science popularisation: Centres, museums and parks

8.1. Science centres and museums

Science centres, museums and parks lend themselves to the dissemination of scientific knowledge and the popularisation of science among lay publics. Cavalcanti and Persechini (2011) note the growing number and diversity of science museums in Brazil with scientists, educators, curators, journalists, etc. largely focusing on science popularisation. In comparison, Nigeria does not have a functioning science centre and a previous attempt by the Akwa Ibom state government, the Ibom Science Park, was abandoned in 2007. The state government, however, recently signed a Memorandum of Understanding to

¹ The Federal Ministry of Science and Technology uses the term ST&I (science, technology and innovation) in policy statements. The term is sometimes abbreviated to 'STI' by other users. The terms are interchangeable.

complete the park (Dada, 2018). The first university-based science park was initiated at the University of Nigeria, Nsukka, in southeast Nigeria. The Lion Science Park project was inaugurated in July 2018 and is a partnership between the university, Ideon Science Park, scientists from Lund University in Sweden and LundavisionAB. Edward-Ekpu (2017) notes a recent effort to complete the natural history museum at the University of Ife, South West Nigeria.

8.2. Science in the public sphere

An initiative on Goal 17 of the United Nations Sustainable Development Goals for equitable access to science, technology and innovation took off in January 2018. The initiative involved a non-government organisation, Journalists for Social Development (Odogwu, 2018). The project seeks to provide a hangout for public dialogue on science and technology, a weekly radio and television talk show and a monthly science digest publication focusing on issues and developments in science and technology. The Science Communication Hub Nigeria also offers a platform where scientists, Nigerians and Africans engage with the public. The hub's website has articles, interviews, opinions and mentoring essays from scientists and provides a forum for meeting mentors, collaborators and other interested parties.

8.3. Technology Innovation Expo

Nigeria held its first Science, Technology and Innovation Expo in April 2017 in Abuja, Nigeria's capital territory. The Federal Ministry of Science and Technology (FMST, n.d.) said the purpose of the expo was to highlight the capacities of scientists, engineers and inventors in the country and to encourage researchers and investors to collaborate and market Nigeria's research results, inventions and innovations. The second edition was held in March 2018 and the government used the occasion to announce US\$3 million support by the World Bank for emerging technological innovations and funding for setting up six technology and innovation hubs across the country (Soyombo, 2018).

9. Organisations engaged in communication activities

9.1. Federal Ministry of Science and Technology

The department charged with communication activities in the ministry oversees the formulation of policies and the promotion of science in rural areas and among women and children. It is also responsible for science fairs, exhibitions, workshops, conferences, mass media activities and the National

Science and Technology Museum (NSTM). The parastatals under the ministry, established for specific science and technology purposes, engage with the public directly. Such agencies include National Biotechnology Development Agency, National Centre for Technology Management, National Office for Technology Acquisition and Promotion and the Natural Medicine Development Agency. Nigeria's first science, technology and innovation policy was written in 2012.

9.2. Nigeria Academy of Science

The Academy is a leading self-accounting science body in Nigeria incorporated in 1986 but established earlier in 1977. Its mandate is to influence policies and strategies in science and encompasses the development and promotion of science, technology and innovation in Nigeria. The Academy's recent achievements include the development of a training manual for integrating research into policy and practice, accrediting agencies of the Ministry of Science and Technology, etc. The Academy publishes a journal, *The Proceedings of the Nigerian Academy of Science*, and hosts media roundtables and the NAS Science Media Awards. Instituted since 2010 for outstanding science reporting, the awards are intended to promote excellence in science and science-related journalism.

9.3. Science Association of Nigeria

The Association was formed in 1958 to provide a platform for Nigerian scientists to make their contributions to scientific and technological developments. Working in concert with UNESCO, the Association participated in the formulation of Nigeria's science policy. The *Nigeria Journal of Science* is published by the Association and reports original research outputs of scientists. The Association also organises annual science conferences.

9.4. NGOs in science communication

The Dr Ameyo Stella Adadevoh (DRASA) Health Trust² is a non-government organisation established in memory of the late Dr Adadevoh who treated Nigeria's first-ever Ebola patient, Patrick Sawyer, and contained the potential spread of infection, but lost her life in the process. DRASA's mission, according to Chief Executive Niniola Soleye³ is to strengthen Nigeria's preparedness for future outbreaks. Health communication to drive behaviour-change is at the core of DRASA's work, and the approach is to get the public to understand 'why' and to dispel myths and rumours about infectious diseases. It uses several strategies

2 See drasatrust.org.

3 Personal communication, 19 August 2019.

to turn scientific evidence into digestible information tailored to the needs of different stakeholders. DRASA organises science communication activities for different groups: at-risk health workers; women as role models and influencers; secondary school students and local communities. DRASA trains health workers to understand why practising universal infection control precautions for all patients is key to protecting themselves and the wider society, and on the need to share data with government to inform future policies and guidelines. For these stakeholders, DRASA found that making infection control a personal issue is very effective: explaining how an infectious disease contracted from a patient while on the job can be carried into the home and potentially infect their family and community members. This strategy builds on the fact that self-preservation, a basic instinct, is as important as the natural impulse to protect those we love. They also run simulation programs to equip health workers for future outbreaks.

For communities, DRASA utilises a mix of strategies to ensure effective communication. One very important strategy uses community influencers, people who have been identified through the course of DRASA's work. For example, DRASA engages women as influencers because when their children, husbands or other relatives are ill, they tend to be decision-makers regarding whether to refer them to a health facility, or self-medicate, or practise traditional medicine. The NGO also has a Youth Ambassadors program where students are equipped and trained to drive positive health and hygiene-related behaviour change within their schools, families and wider communities. These individuals and groups are expected to propagate these messages to peers, family and other community members. DRASA is funded through donations and grants from the public. It receives no government funding for now.

10. Science communication education

10.1. Undergraduate education in science communication

Nigeria currently has about 158 universities, 120 polytechnics and other tertiary institutions recognised by the relevant government agencies offering numerous courses in science and technology. The University of Nigeria, Nsukka, and the University of Lagos commenced courses in communication studies in the 1960s under the title mass communication. Similar programs are now offered at universities and polytechnics nationwide with other titles such as communication arts, communication and language arts, media studies, communication studies and journalism studies. The establishment of the National Universities Commission, the regulator of tertiary education in Nigeria, led to the setting up of minimum benchmarks for the accreditation of courses.

There is no first-degree university program in science, health or environmental communication. However, an examination of the standards for undergraduate programs in Nigerian universities (NUC, 2011) shows a provision for a second-year, one-semester course in specialised reporting to cover these areas. It also provides for a third-year, one-semester course in the practice of writing popular science articles for magazines and newspapers. The emphasis is on the translation of scientific language, familiarisation with the literature of science and interviewing scientists. Some universities and colleges have increased the minimum standards by introducing additional credit units in health communication, development communication and environmental communication or journalism in the second, third or fourth year⁴ to address the dynamics of science, technology and innovation in a digital age.

10.2. Postgraduate education in science communication

At the postgraduate level, the NUC (2011) guidelines provide for postgraduate diploma courses in specialised journalism, focusing on areas including environment, health and economics. However, the major focus is on reporting in areas such as sports, education, business and religion. For MSc and PhD programs, the NUC identifies areas of specialisation to include print journalism, broadcast journalism, advertising, public relations, behaviour change communication and health communication. In reality, students are awarded degrees in mass communication and they choose to develop their theses in any of these special areas. There is no postgraduate degree in science, health or environmental communication in Nigeria (Pate, 2018).

10.3. Review of communication programs

In an apparent recognition of the gaps in communication education in Nigeria, in September 2017, stakeholders (professional associations, regulatory bodies, tertiary institutions, civil society groups and United Nations agencies) convened at the Bayero University, Kano, to review the National Universities Commission draft Benchmark Minimum Academic Standards document (NUC, 2007). The conference recommended the study and award of bachelor's degrees in seven areas of communication studies: journalism and media studies, public relations, advertising, broadcasting, film and multimedia studies.

⁴ University of Uyo, Nigeria, Department of Communication Arts 2016 student handbook (in-house teaching manual).

10.4. Books, scholarly articles and conferences in Nigeria

Science communication programs in Nigeria have mostly relied on chapters in journalism textbooks that focus on science reporting or journalism. Curtis MacDougall's *Interpretative Reporting* is a prominent textbook in Nigeria (MacDougall and Reid, 1987). In the 1990s, the widely used reading material for science communication came through the effort of the African Council for Communication Education to develop books for African scholars and students. Kwame Boafo's edited module on specialised writing has three sections: business and finance; science, technology and health; and environment (Boafo, 1989). Nigerian authors have also developed science communication-related textbooks. Akinfeleye (1989) and Nwosu et al. (2008) focused on health communication and development, while Nwabueze (2007) and Soola et al. (2016) were on environmental communication. Wilson and Batta (2013) brought together the three main fields: science, health and environment. Notably the science communication section of Wilson and Batta included contributions from participants in Nigeria, India, China and Italy at the 12th Public Communication of Science and Technology (PCST) Conference in Florence, Italy, in 2012.

10.5. Scholarly articles on science communication by Nigerians

Articles on science communication in Nigeria are spread across high- and low-impact journals, open and pay-to-access journals, and others in non-indexed journals that are not online. Studies on the output of Nigerian scholars in science communication journals are yet to be conducted. A few examples here will show the spread of fields of research.

Soola (1988) examined agricultural communication and the African non-literate farmer; Olurundare (1988) assessed the role of science education in scientific literacy; Ehikhamenor (1990) examined informal scientific communication in Nigerian universities; Sanni et al. (2016) evaluated the quality of science, technology and innovation in Nigeria; Falade (2016) examined the role of religion in public understanding of and attitudes to science; Ekanem (2003) published communicating science information in a science-unfriendly environment.

In the field of health and environmental communication, Ajao and Ugwu (2011) studied the problems facing scientific medical information in Nigeria; Falade and Coultas (2017) studied the Ebola outbreak in west Africa; Nwabueze and Ekwughe (2014) analysed the coverage of Boko Haram's effects on the environment. Atinmo and Jimba (1998) conducted

a longitudinal study of environmental reporting in Nigerian newspapers. Batta, Ashong and Bashir (2013) examined the coverage of climate change in Nigerian Newspapers; Batta (2012) examined newspaper information on traditional medicine in Nigeria; Falade (2016) studied the science content of a Nigerian newspaper; and Ashong and Batta (2013) evaluated the public communication of aesthetic genital surgery. The list is by no means exhaustive, and follows no particular order, but it does reflect the writings of Nigerian authors in science communication research.

11. Notable scientists and science journalists

11.1. Prominent Nigerian scientists

There are several notable Nigerian figures who have contributed in tremendous ways to the development of science communication, science education as well as science journalism. Peter Okebukola, professor of science education at the Lagos State University and former executive secretary of Nigeria National Universities Commission, the statutory body that oversees all the country's universities, specialises in higher education, science, computer and environmental education. He has published over 130 papers and books on science education and is on the editorial board of many national and international journals. He is also a member of several science popularisation committees and is the first African to win the prestigious UNESCO Kalinga Prize for the Communication of Science. He has also served on a number of international organisations including UNESCO, UNICEF, the World Bank and the UNDP.

A very recent face of science is Nigeria-born and educated Oluyinka Olutoye, MD, PhD, professor of pediatric surgery, Balfour College of Medicine and co-director of Texas Children Hospital, United States. Professor Olutoye specialises in foetal and neonatal surgery with specific interest in congenital diaphragmatic hernia and complex wounds. His pioneering surgery to remove a tumour from an unborn child at 23 weeks and restore the foetus to the mother's womb for delivery at 36 weeks drew worldwide attention and became a reference for scientists and health communication in Nigeria. Olutoye was born in Lagos and studied medicine at the Obafemi Awolowo University (OAU) Ile-Ife before moving to the United States.

Dr Elisabeth Rasekoala is a chemical engineer and founding president of the African Gong, the Pan African Network for the Popularization of Science & Technology and Science Communication. Rasekoala is a member of the African Union Commission Monitoring and Evaluation Committee on the

Science, Technology and Innovation Strategy for Africa (STISA – 2024). She is the founder and director of the UK-based African-Caribbean Network for Science & Technology, an NGO that focuses on race and gender equality science. She is a member of the UK Qualifications and Curriculum Authority, American Educational Research Association (AERA) and the European Educational Research Association (EERA). Rasekoala and the African Gong, along with other partners, have played prominent roles in the African Conference on Emerging Infectious Diseases and Biosecurity Series.

11.2. Science in the media and science journalists

The Nigerian media has many notable science journalists who have distinguished themselves in their chosen fields. Diran Onifade is one of Nigeria's most celebrated television journalists who worked for many years with the NTA. His most outstanding works were on unreported or under-reported diseases, and he was one of the first to write in-depth reports of the devastating impact of HIV/AIDS on Nigerian communities.

Toyosi Ogunleye, a former editor of *Sunday Punch* and now head of language services (West Africa) at BBC World Service, has won several awards for her reporting on health and environmental issues. One of her works focused on the impact of the gases released by a steel company on the health of the residents of a nearby estate in Lagos. It detailed the results of blood and urine tests and confirmed the presence of abnormally high doses of metals in their bodies.

Alex Abutu, founding president of the Nigeria Association of Science Journalists (NASJ) brought science writers from across Nigeria under one platform, before moving to become the secretary general of the African Federation of Science Journalists.

12. Science communication: Projecting to the future

Science communication (or mass communication of science) has an important role to play in overcoming the many developmental challenges facing the Nigerian state in agriculture, health, industry and environment. While progress has been made in many areas, there is room for improvement.

Improvements in STI indices is a worldwide marker of economic advancement, and there is no reason to expect Nigeria will be different. New policy implementation initiatives are important, going forward, to tackle the challenges of a developing economy faced with high levels of religious

beliefs that may be antithetical to the spread of scientific ideas. We argue that if constraints to the diffusion of science are deliberately tackled by the relevant stakeholders—governments, religious leaders, science associations, science academics and institutes and civil society groups—modern science communication may yet emerge in Nigeria as a critical force in social and economic development.

However, science communication also needs to include debates about reducing the cost of treatment for malaria, HIV/AIDs and other diseases. This means facing up to established practices in the pharmaceutical industry and laws that protect them. We have to move from scaremongering statistics about how many have it, where they are, how they got it and when, to how to ensure access to cheap or free lifesaving medicine, where it is needed, when it is needed and ensuring availability for all those who need it. Currently, the cost of lifesaving medicine is beyond the reach of the world's poorest, the underinsured or those not insurable for 'pre-existing conditions', particularly in Africa. Modern drugs now treat HIV to the point where it is undetectable in the blood and the positive person can no longer transmit the virus (Rodger et al., 2016). The resurgence of measles in the United States, transmission of Ebola across Africa and the Zika virus disease to the Americas have shown that no country is free until all countries are free.

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Timeline

Event	Name	Date	Comment
First interactive science centre established.	Ibom Science Park. Started 2007	2007	Ibom abandoned and yet to open. 2018: Lion Science Park
First national (or large regional) science festival.	STI Expo	3–7 April 2017	In Abuja, capital city of Nigeria
An association of science writers or journalists or communicators established.	Science Communicators Association of Nigeria (SCAN)	2005	In 2006, SCAN was succeeded by Nigerian Association of Science Journalists (NASJ)
First university courses to train science communicators.		1980	Science and technology reporting as electives in a university course
National government program to support science communication established.	The national ST&I policy	2012	

Event	Name	Date	Comment
First significant initiative or report on science communication.	The Basel Convention and the Barmako Convention	1988	Report into storage of 18,000 drums of hazardous waste in a small fishing village of Koko
National Science Week founded.	The National Festival	2001	Sponsored by Nigeria's oil industry
First significant radio programs on science.	<i>Agbe Iere</i> (Yoruba)	1933	One of a number of programs
First significant TV programs on science.	A number of programs	1959	Programs on agriculture and health from 1959
First awards for scientists or journalists or others for science communication.	The Science Media Award	2010	Awarded by the Nigerian Academy of Science
Other significant events.	First science communication workshop involving journalists and teachers	3–6 July 2018	Nassarawa State University, SciDev.Net, Script and Robert Bosch Stiftung College workshop on science journalism and science communication curriculum
	Extension and communication in agriculture	1910	1910: Commenced Southern Nigeria 1912: Commenced Northern Nigeria
	International Institute of Tropical Agriculture (IITA) opened	1967	Located in Ibadan
	Global Polio Eradication Initiative	1988	2003–04: vaccine revolt in Nigeria
	Pfizer drug trials in Kano	1996	Experimental trial of trovafloxacin led to litigation and compensation
	Ebola virus disease	2014–16	A communication challenge
	HIV/AIDS Antiretroviral (ARV) guidelines released	2003	2014: HIV/AIDS: Consolidated guidelines
	Malaria control program with DDT	1955–69	2009–13: revised second strategic plan
	Koko toxic waste dump	1988	1990: MOSOP/Ogoni Bill of Rights

Contributors

Dr Bankole Falade is the South African Research Chair (SARChi) in Science Communication at the Centre for Research on Evaluation, Science and Technology (CREST), Stellenbosch University, South Africa.

Dr Herbert Batta is senior lecturer in the Department of Communication Arts, University of Uyo, Nigeria.

Diran Onifade is one of Nigeria's outstanding television journalists and now works as a consultant/trainer.

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