

Developing a science journalism course for developing countries

A report on the UNESCO workshop and questionnaire conducted in association with the World Conference of Science Journalists, April 16–19 2007

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1. Executive summary

Science journalists working in developing countries face a number of challenges, such as getting local stories, dealing with reluctant or unskilled scientists, dealing with press officers who do not understand the science, being looked down on by scientists as well as fellow journalists, and being poorly paid.

They often have to deal with multiple languages, face the difficult task of translating science from English, and consider how scientific knowledge connects with indigenous knowledge. And if they get to report on science at all, it is usually driven by health issues or the latest environmental crisis.

There has been some media coverage in recent years on topics such as the growing digital divide, the role of information technology in development, and the perceived opportunities and risks of biotechnology. But there has not been coverage to the same degree of research programs and policies concerning critical public health issues such as malaria and HIV/AIDS; or of controversial issues such as genetically modified plants, the impact of climatic change, loss of biodiversity, protection of traditional knowledge and the brain drain.

A genuine obstacle to addressing these issues is the absence of training in how to report on them. There is a need to train and support science journalists in developing countries.

We developed a generic course outline and then sought feedback from science journalists and experts at a UNESCO workshop held in association with the 2007 World Conference of Science Journalists. Based on our findings, we make the following recommendations to UNESCO:

1. Continue developing a generic course to train science journalists. The course will be a one-year post-graduate course suitable for people with qualifications in science or journalism, and delivered by local universities or other appropriate institutions. The content and scope of the generic course should be developed and refined to meet local needs at regional workshops and through consultation.
2. Work at a regional level to adapt the specific science-based modules of the generic course to suit local needs and conditions. These modules would then be provided to working journalists on a part-time or short course basis.
3. Work with local universities to adapt the science-based modules of the generic course for incorporation into existing undergraduate journalism courses.
4. Support the provision of media skills training workshops for scientists by developing a generic one or two day course outlines, and then training local people to run these workshops through a “train the trainer” program.
5. Identify and support networks of science communicators and press officers to improve scientists’ access to the media and to develop their professional skills in interfacing between scientists and the media.
6. Support regional networks of science journalists, to develop their professional skills and promote opportunities for professional development and support.
7. Work with regional media agencies to gain their understanding and support for science journalism.

2. Introduction

2.1 This report

In this report, we summarise the discussions and results from the UNESCO workshop on 'Science journalism in developing countries' that we conducted on April 16 2007 in conjunction with the World Conference of Science Journalists (WCSJ) in Melbourne, Australia. We also include the results of an associated questionnaire that we provided to the 628 delegates at the conference.

2.2 Background to project

To meet the science communication needs of emerging and developing economies, UNESCO is investing in a project to develop a generic science journalism curriculum that can be delivered in a 12 month period.

UNESCO believes that a curriculum that can be easily distributed (online and offline) and delivered to science and humanities students in developing countries will result in:

- greater coverage of science in the media
- improved quality of science coverage
- improved health, agricultural practices and environment
- stimulus to economic development
- more science-literate populations who can take part in and respond to development challenges
- more informed decision-making about science and technology issues and options, at both personal and policy levels
- greater access to scientific information for all

The objectives of the project are as follows:

1. **Writing and reporting skills**

Develop a high quality, intensive science journalism course for students in science writing and reporting, which teaches students how to explain science clearly through print, radio, TV and the Internet. This includes how to identify messages and get them across, and how to tell stories.

2. **Critical thinking**

Produce a curriculum that includes methods for teaching students to think critically about scientific issues and controversies so they can judge the value of competing arguments.

3. **Understanding the media**

Increase scientists' understanding of how the media operates and how science news, features and editorials can be produced without compromising the quality of the scientific information.

4. **Networking**

Develop a flexible science journalism curriculum that can be further developed as teachers and students provide feedback and share ideas.

5. **Accessibility**

Improve journalists' accessibility to international ideas and practices in science communication.

2.3 First steps

Econnect Communication, The University of Queensland and Boston University were commissioned by UNESCO to take the first steps in developing the curriculum for discussion at the expert workshop held in conjunction with the WCSJ.

We prepared a draft broad outline of the curriculum and made contact with specialists in both developed and developing countries to get their feedback. Based on this feedback, we produced an initial curriculum outline (see Appendix A) which we used to prompt discussion at the UNESCO workshop.

In this report we summarise these discussions and make recommendations for further developing and delivering a science journalism curriculum for developing countries.

We recognise that the further developing and delivery the curriculum relies on:

- more input and ownership from science journalists and relevant specialists from developing countries
- negotiating and liaising with suitable agents within developing countries—especially universities—for delivering the curriculum

3. Activities at the 2007 World Conference of Science Journalists

3.1 UNESCO workshop

We invited WCSJ delegates and experts from both developing and developed countries to attend the workshop hosted by UNESCO on Monday, 16 April 2007.

The objectives of the workshop were as follows:

1. discuss the training, mentoring and support needs of science journalists in developing countries
2. review and discuss the initial results of a UNESCO project to develop a generic science journalism course for developing countries
3. discuss current mentoring programs for developing country science journalists and future opportunities for collaboration
4. hear the experience and learning of science journalism teachers

Forty-four delegates from 33 countries registered and attended the workshop (see Appendix D). An additional 75 people (approx.) attended without registering for the workshop.

See Appendix B for the workshop program.

We include some quotes from the workshop in this report. While we had someone take notes throughout the workshop, they were not always able to identify speakers, so we are unable to attribute all quotes to a country. However, we have chosen quotes that were representative of the discussion and the ideas expressed by a number of the participants.

3.2 Questionnaire

We included a questionnaire on the national nature and scope of science journalism in the satchels of all WCSJ delegates. Our aim was to collect data on delegates' views of science journalism training needs. See Appendix C for a copy of the questionnaire and our analysis of the data collected.

We received 23 completed questionnaires from delegates from 16 countries, 13 of which are considered developing nations: Bosnia & Herzegovina, Cameroon, Colombia, Costa Rica, Kenya, Nigeria, Pakistan, the Philippines, Thailand, Uganda, Jordan, South Africa and China.

While the response rate was low, the responses we got backed up the discussions held during the workshop.

3.3 Presentation of workshop results

Following the UNESCO workshop, Professor Philip J Hilts from Boston University presented the major results of the workshop at a plenary session of the WCSJ on 19 April 2007. He also invited all interested conference delegates to attend a lunchtime briefing and discussion session on the same day; 41 people attended for at least some of the time.

We summarise the main discussion points and outcomes of all the above activities in Sections 4, 5, 6 and 7 below.

4. Training in science journalism

4.1 The overall demand for training

There was agreement about the need for more training in science journalism in both developing and developed countries. Interestingly, delegates from the majority of the developed countries perceived a need almost as great as those from developed countries. The demand for training relates to the need to:

- make science locally and culturally relevant
- provide greater access to scientific information
- have a greater pool of science journalists or specialist science writers
- have greater coverage of science in the media
- report more objectively on science
- improve public perceptions about science and increase local scientists' awareness of the role of media in science communication
- connect science to health and environmental reporting
- raise the status of science journalism, especially with editors
- report about science in different languages

4.2 The number of science journalists

The questionnaire respondents were asked to estimate the number of science journalists in their country. Nine out of 13 respondents from developing countries responded that they had fewer than 50 science journalists in their country; five of these indicated that they had fewer than 10. Respondents from developing countries indicated they had more than 100 or 1000, but it is possible they misinterpreted the question to record the total number of all journalists in their country.

Questionnaire respondents indicated that print media (magazines and newspapers) were the most important form of media in developing nations. However, it is likely that this reflects the view of print media science journalists rather than broadcast journalists, who are less likely to specialise in science and were far less likely to attend the WCSJ where their opinions would have been sought. Other discussion at the WCSJ indicated that radio and or television were the most likely forms of the media to be accessed by the general public in developing countries.

Respondents from both developing and developed countries most commonly reported low numbers (fewer than 10) of print, radio, television, and internet science journalists in their countries. A greater number of print and internet journalists were reported compared to television and radio.

4.3 Training scientists in journalism

Workshop participants agreed that training in journalism skills could be targeted at scientists. However, there were varying views on whether having a science qualification was an important prerequisite for becoming a science journalist:

The job is basically journalism and science is your subject. [It's about] how to ask questions and how to get people to trust you... the science is something you acquire on the ground (USA delegate who has worked in Africa).

Some of the best science reporters in South Africa were crime reporters and don't have a background in science, but did have an interest. But along the way you have to get in touch with scientists and build trust (South Africa).

Some workshop participants believed a science background was detrimental to becoming a science journalist:

I believe science journalists should not have a science background – it makes them too close to the scientist and too far away from the audience (Japan).

Most workshop participants thought the most important skills for a science journalist were basic journalism skills, and that these skills were needed prior to developing specific science journalism skills. Some typical comments in the discussion were (countries unknown):

You have to be a journalist first and then second be able to translate science to public. Journalists have good talent to talk to the public. The main thing is to have a talent to talk to public and get the information out of the scientists.

In general what makes you a science journalist is your reporting experience. A good science journalist will have a reporting experience.

Interestingly, there was a perceived need to train journalists in basic journalism skills in developing countries, where such courses were currently not available in many regions. This was seen as a priority need, ahead of developing specific science journalism skills.

4.4 Training journalists in science

There was general consensus that science journalists needed skills additional to basic journalistic skills, and these include understanding:

- balance versus scientific consensus
- how to read a scientific paper
- how to gain the trust of sceptical scientific sources
- the competitive nature of science and the power plays that can happen
- the limits of science
- the nature of science and how it grows and solves problems
- the nature and philosophy of science and knowledge
- the scientific literacy level of the audience
- statistics and their relevance to the audience
- ethical science reporting

5. Challenges in science journalism training

The challenges to delivering science journalism training, as perceived by the questionnaire respondents, varied from country to country. However, lack of a developed curriculum, resources, experienced trainers, funding and other support were commonly referred to. Some respondents were sceptical about the demand by media outlets for science journalists.

The key issues discussed at the UNESCO workshop, the WCSJ and through the questionnaires are summarised below.

5.1 Low status of science journalism

Many involved in the workshop and other discussions believed the status of science journalism in developing countries was an issue that needed addressing if science journalism training were to be successful. This low status was seen to be reflected in the low pay that many journalists, especially science journalists, get in developing countries. . It was a reflection of the junior role of science journalists in media outlets, and also a reflection of the comparative status of journalists and scientists.

5.1.1 Competition with reporting on crime and politics

Some spoke of the competition that science journalism faces with other reporting rounds, especially crime and politics:

The emphasis is on crime and on politics and they don't get around to doing the other things.

Crime and corruption are still important issues.

5.1.2 Dominance of health in science reporting

Workshop participants discussed the fact that most science reporting in developing countries was about health issues and to a lesser extent, environmental issues:

The science is dominated by health and especially HIV and to a small extent environment, which makes scientists in other fields feel left out.

5.1.3 The balance of power between journalists and scientists

There was also a perceived difference in power between journalists and scientists in developing countries, making it difficult for journalists to confidently interview scientific sources:

It is important to train journalists to develop confidence and skills that don't just glorify the science. Journalists are not intimidated by businessmen or politicians but feel less able to deal with scientists (South Africa).

It was thought that many scientists are reluctant to use the media, and can perceive that the media are wasting their time with "stupid questions":

Journalists need to feel that they are not treated as stupid. They need to be on the same level. It is the job of journalists to take stories like climate change and translate it to a level that is relevant and accessible to poor and disadvantaged communities. This is a big need (South Africa).

There is this intimidation of journalists to scientists – how do you build this self-confidence? This is a key thing. The science journalist dares to interview scientists – this is the difference between general and science journalists.

It was perceived that that trust needed to be developed between journalists and scientists.

5.1.4 Science as a specialisation

Discrimination against science journalists by media outlets was also perceived to be an issue, as was the inability of editors to understand the importance of science in relation to other issues:

Science journalists are very low on hierarchy and it takes them a while to get past editors. General journalists who venture into science have a problem (South Africa).

5.2 Finding local stories

There is an issue in developing countries of accessing local scientists for media stories:

A lot of local journalists say it is easier to talk about research from UK and USA than to talk about local science as there is no system for making it easier for the journalists. How to find science stories locally is a key challenge (South Africa).

Sometimes this problem is related to scientists' lack of skills in dealing with the media, and / or press officers' lack of science communication skills:

In the developed world I would set up a service to bring research news direct from Asia to journalists around the world. The problem is not getting to journalists but getting the information out of universities and laboratories. I have spoken to many universities and press officers and many do not want to read research papers etc. This is a key issue with the developing world (UK).

Often private laboratories and the corporate sector want journalistic coverage but only on their own terms.

5.3 Resources

Resources for science journalists in developing countries are often limited:

They have a hard time looking up things. If they want to find journal article, then it is much more difficult. There's the additional barrier of resources. In the past few years there has been movement to give people support in developing countries (USA participant of work on Zambia and Botswana).

5.3.1 Internet/web access in developing nations

Internet access is a problem. Participants in the workshop reported that the limited availability of computers, the lack of access to the internet at work, and erratic power supplies combined to make reliable access to the internet difficult.

But most questionnaire respondents from developing countries indicated that they personally had easy access to the internet. Representatives from several countries (Bosnia & Herzegovina, Cameroon, Colombia, Nigeria, Pakistan, the Philippines and Uganda) reported that, while they had common or easy access, not everyone in their country did. The most common venue for accessing the internet was at work, followed closely by home. Representatives from Kenya and Nigeria listed internet cafes as their only access portal.

Workshop participants agreed that internet access was limited and varied in their countries. Some also mentioned that electricity supplies could pose a problem for computer and internet access:

It is a problem to have access to computers. In our country, public electricity will vary even if you have a computer. In most cases internet is so slow that by the time you open a page, you have forgotten why you tried to open it (Kenya).

Interestingly, workshop participants and questionnaire respondents from developed countries also noted internet access as an issue; however, their concerns were more about the speed of access than about having no or limited access.

5.3.2 Access to scientific information

Questionnaire respondents from most countries—with the exception of Bosnia & Herzegovina, Cameroon, Nigeria and Pakistan—reported that their access to journal articles about research and science, including articles in magazines and newspapers, was good. Respondents from South Africa and Thailand reported that they did not have very good access to scientific journal articles, but their access to science articles in magazines and newspapers was better. Respondents from about half the countries reported that general access to science stories in articles and magazines (by anyone) was not easy.

Workshop participants also noted this as an issue, and were also concerned about journalists' ability to understand and interpret scientific publications.

5.4 Language and culture issues

In developing countries, most people do not speak English and many countries have multiple local languages. For example, in Pakistan most people can not read English; in South Africa there are 11 official languages, including English; and there are 18 official languages listed in India's constitution. There is an overall identified need to include information on how to translate science from English into the local language. Much of science is so badly translated in the local newspapers that it loses its message. When local researchers do come up with good results, most of it is published in Western journals and for most science reporters these are still out of reach. In some languages there are no terms to express scientific concepts, which means that English becomes the default language.

There was also some discussion about the need to be able to translate science journalism training materials into different languages.

Workshop participants also thought there needed to be consideration in training of science journalists of how to connect indigenous knowledge and culture with scientific knowledge.

5.5 Career opportunities

A presentation about Japan's Waseda University science journalism program at the UNESCO workshop indicated that graduates are expected to have career opportunities as researchers, science teachers, curators, public relations officers, and journalists specialising in science and technology. However, many workshop participants were concerned about career opportunities for trained science journalists, especially given the status issues outlined above.

The questionnaire responses indicated that the projected employment opportunities for graduates of the proposed science journalism curriculum were varied.

Occupations that were listed by developing country representatives include: science

journalist, mainstream journalist, communication or press officer, information officer, call centre specialist, and positions in government-funded organisations.

Representatives from developed countries appeared more optimistic about graduates working in a science journalism field, and also listed museums, media organisations, educators, public relations and freelancing.

5.6 Lack of support and networking skills

There was some discussion about the isolation of science journalists in developing countries where there may only be one or two science journalists. There was a perceived need by workshop participants for support for networking, perhaps through the World Federation of Science Journalists and associated local science journalism associations.

6. Needs from science journalism training

6.1 Developing the course

After we presented the broad outline of a proposed UNESCO generic science journalism course at the workshop (see Appendix A), there was some concern that the course development process did not include input from developing countries. One participant argued that this approach was acceptable in the short term:

Developed country experts need to develop this course. No-one from a developing country can do this. We need to look at courses that have already been developed (Nigeria).

UNESCO's Iskra Paneska emphasised that this was an initial step and that future development would actively involve developing countries through regional consultations:

The situation varies from region to region and country to country; UNESCO builds strategic partnerships with a view to help institutional capacity building. Building the capacity of journalists, including of science journalists, and promoting to high professional standards is at the heart of UNESCO's communication mandate. During the regional consultations there would be an opportunity for specific inputs which will render the modules locally relevant. The regional consultations will also provide valuable feedback with regard to specific training needs and challenges for science journalists in developing countries.

The overall response to the course outline was positive. However, the need for further development in a local context was stressed.

6.2 Course content

The UNESCO workshop discussions confirmed that the content outlined in the generic science journalism curriculum presented (see Appendix A) represented what was needed in such a course, as also referred to in section 4.4 above.

Respondents to the questionnaire indicated that successful science journalists, with either a science or journalism background, were expected to develop skills in the following categories:

- general journalism
- finding science stories
- clear writing
- effective communication
- sourcing information
- understanding science
- ethical science reporting
- networking

Science graduates were also expected to learn the differences between science and science reporting. However, there was also a heavy emphasis on journalism graduates learning about science. Other recommended qualities for journalism graduates included curiosity, patience, critical thinking and accuracy.

Discussions at the UNESCO workshop brought out similar themes:

If you are a good journalist then science journalism is a valuable addition. Most don't see science journalism as being different to the general journalism, but it does need some specialist knowledge... A basic good journalist will need some additional skills: how do you find science stories, understanding peer review journals; international and national conferences; checking substantiation of press statements. We have accepted that we need to first understand and give them confidence to write in the local media about local scientists and local peer reviewed journals (India).

At the workshop, Ms Hiroko Ueno presented the MAJESTy program from Waseda University—the first graduate-level program for educating journalists in science and technology in Japan. The program focuses on five elements: an understanding of scientific knowledge, professional communication skills, field-based experience, insight into the role of journalism and the media, and critical thinking competencies.

Others at the workshop talked about programs in their countries and some thought training for those with a predominantly science background should be separate to those with a journalism background:

In Latin America, we have two graduate programs in Brazil and Mexico. This year Colombia is starting graduate programs and they are very similar to the proposed outline [see Appendix A], but taught differently because of the participants. There are scientists who are participants and there are journalists who want to develop skills in science journalists. They need to split the group to give journalists science skills and scientists journalism skills (Colombia).

Another suggestion was to get journalists out in the field: "It would be good to approach local associations and institutions to get scientists willing to be 'guinea pigs'." Overall, workshop participants stressed the need to support local science journalists in interacting with local scientists.

There was some comment in the workshop about a course being just about science journalism:

At university level it would be good to have a specialised course with modules. I wonder if universities would want to specialise just on science journalism. A more generic journalism course that includes modules on science journalism, sports journalism, etc., would be useful.

Iskra Panevska mentioned that a UNESCO Model Curricula for Journalism Education already exists and will be available online as of September 2007.

Workshop participants generally agreed that there was a need for:

1. a 12-month postgraduate course for those with a science background who want to become science journalists, which would be similar to the outline presented at the workshop (see Appendix A)
2. modules (sourced from the above course) for working journalists to improve their science reporting skills, which would be presented part-time or as a series of evening, or one to five day long workshops
3. modules for undergraduate/cadet journalists in science reporting, which would also be sourced from the generic course (1.) and presented part-time or as a series of workshops

6.3 Course delivery

6.3.1 Rate and length

Survey respondents most commonly indicated that the proposed curriculum should be offered part-time and full-time in an academic institution. The workshop also looked at other delivery methods such as short courses or workshops:

Journalists will be reluctant to go back to school especially if it costs them money... In the Arab world there are a number of science journalists in some countries but in others only a couple. It would be good to gather them together for a short course and then they go back to their own countries (Egypt).

At the workshop, Mitsutaka Fujita described the Training Course for Science Journalists established in 2002 by the Japanese Association of Science and Technology Journalists (JASTJ). Many members of the organisation play a role in delivering the course. The curriculum consists of 12 lessons over six months (two per month), which are offered in evening sessions to allow working students to attend. Many graduates of the program have become freelance journalists and contributed to Tokyo Shimbun, JST News and JASTJ News.

While many people felt that short courses in both science and journalism could be effective with working journalists, many people also felt that a one-year program or longer would be required for a science graduate.

6.3.2 Agents

Overall, universities were recommended as an appropriate level for teaching the proposed curriculum. See Appendix C for a full list of the institutions recommended by questionnaire respondents.

Workshop participants recommended that some consideration be given to ‘train the trainer’ programs that support the implementation of various training courses within countries.

Some participants suggested that it would be more effective to send journalism teachers to other countries, rather than start up programs in local universities. Others thought it would be useful to know what skills in-country presenters needed:

I think it is wonderful to have a place to start with something like this. If countries are given this content, many could do it. So it would be good to know what sorts of presenters are needed or what sort of classes could be used (South Africa).

6.3.3 Materials

Although the web/internet was listed most frequently by questionnaire respondents as a way of disseminating training materials, four developing countries listed an alternative method first or did not mention web/internet at all: Pakistan, South Africa, Nigeria and the Philippines. The representative from Uganda also suggested a contact media manager to distribute printed material. Other suggested methods for delivery include on-site training, podcasting, and “integration of media, live web conferencing, videocasts with offline/online downloadable components structured for contextual building”.

Many of the workshop participants agreed that online delivery of the curriculum might not be the most suitable method due to limited or unreliable internet access.

We need to facilitate the introduction of broadband internet to all countries. We should all work hard to make this happen. We need to make all materials developed accessible to developing countries.

It was pointed out that the availability of online material did not make the information any easier to absorb. It was suggested that a mix of tools as well as online tutoring would be best.

The possibility of memory sticks was proposed for areas where broadband is not available. However, participants suggested that computer access, in general, might be a problem.

In Egypt, as an example, many of our media organisations do not have access to a computer – they don't have a computer on their desk.

Text messaging was listed as an increasingly popular method of delivering information.

80 percent of my news is by text messages. The penetration of the mobile phone is everywhere (India).

7. Complementary activities

7.1 Training scientists

7.1.1 Media skills

Many workshop participants suggested that an ideal course would also incorporate communication training for scientists:

When we talk about science journalism, we also need to focus on scientists in developing countries. Most scientists in Pakistan do not have any idea how to communicate with the journalists. Scientists criticise the journalists when it is often their own fault in not being able to communicate. We need to improve the skills of scientists to communicate in a jargon-free language accurately to the journalists.

Scientists need media training as they can become absorbed in their research.

7.1.2 Undergraduate modules

Some workshop participants thought it would be good if communication modules could be included in the undergraduate training of science students:

It would be good to have an elective for science students so they understand how the media operate.

7.2 Press officers

There was discussion at the workshop about the need to train press officers attached to universities and research institutions in science communication skills, so they can build a better interface between the scientists and the media. Catherine Mgendei from the Consultative Group on International Agriculture talked about having good international media connections:

We have two kinds of training – our spokespeople have media training; and we are beginning to run programs where we help the public awareness people see what is going on in the centres. We try and work out their plans; and we try to get them to think about how they can engage the media in those stories in relation to the news criteria.

7.3 Mentoring programs for science journalists in developing countries

At the workshop, representatives from various organisations provided an overview of their science journalism mentoring schemes. Many thought that such mentoring schemes could link with the UNESCO project by providing networking opportunities and supporting local associations of science journalists.

7.3.1 Evaluating mentoring programs

Evaluation proved to be a useful tool for improving mentoring programs. Jan Lublinski from Germany said:

We thought we could just take a group of experienced journalists with inexperienced journalists that this would work, but we realised this did not work and we only became conscious of this with evaluation.

The importance of monitoring behaviour change was discussed:

Being in touch is a behavioural change, and using various outlets several times is behavioural change. We don't give money – they get the trips and network but they need to make the effort.

Kashmir Hill described the formal evaluation process of the J2J program:

We do training before AIDS conference, then the journalists attend, and we then evaluate the effects of the training after the conference. We trained them in journalism skills and HIV knowledge. We gave journalists preparatory knowledge before they went into the conference. We do an article search after the conference. We plan to start comparing the work done before and after the program to see if quantitative improvement in the coverage.

Maintaining ongoing communication research was listed as a major challenge to evaluation. However, a representative from Kenya indicated having a partner organisation in the country that the journalists could stay in contact with was effective for them.

7.3.2 Relationships

Finding new sources and building relationships was listed as a concern for mentorship programs, but, as mentioned above, is also crucial for training science journalists to access local scientific sources. Techniques for maintaining dialogue between the mentors and mentored were discussed.

We have learnt that you need additional activities, which is why we have an online tutor. We will have additional strategies such as training of trainers; national associations of science writers – it is constant work to keep people online. I see the necessity for good public relations to help journalists.

Having a person dedicated to one forum is important for sustainability. We bring in mentors who are regional and continue to run the email lists – they are really dedicated to keeping conversation going. They are always bringing in new materials. We build into our budgets a helpdesk person. Conferences like this are so effective at building the bridges between these programs. There is a lot of overlap and opportunity to bring networks together.

8. Recommendations

We make the following recommendations for developing and implementing a successful generic science journalism course for developing countries.

8.1 Develop a generic one-year postgraduate course

We recommend developing a one-year postgraduate course, especially targeting scientists who want to get into science journalism. This course could also be taken by journalists wanting to further develop their journalistic skills and specialise as a science journalist, even without undergraduate qualifications.

The course would be further developed in liaison with universities, media agencies and the local science journalism association in developing countries through a process of UNESCO regional consultations and ongoing liaison and negotiation.

The course would be delivered by local universities or other appropriate agencies using a mix of methods for distributing course materials, including online, printed and new media. Lecturers may need to be trained to deliver the course through an online program and/or workshops.

The content of this course should be similar to that developed in this project and outlined in Appendix A, and should include more on:

- networking skills
- interview confidence-building skills
- connecting indigenous and scientific knowledge

8.2 Make modules available to working journalists

We recommend that modules from the generic one-year postgraduate course that are specific to the reporting of science, as opposed to general journalism skills, are further developed in local regions. These modules should be made available to working journalists on a part-time or a short-course basis. Delivery of these modules is likely to require a 'train the trainer' program.

8.3 Promote modules to become part of existing undergraduate journalism courses

We recommend that UNESCO work with identified universities to develop a module or series of modules on reporting science for incorporation into existing courses for journalists at universities and other institutions.

8.4 Train scientists in media skills

We recommend that UNESCO supports a program to train scientists in media skills in developing countries. This could be implemented through a 'train the trainer' program that uses the resources and format of workshops already developed, to train local people to run their own workshops.

Media skills training workshops, especially designed for scientists, have been run successfully in many countries, including Australia and South Africa.

8.5 Support networks and training of science communicators / press officers

We recommend that UNESCO conduct regional surveys to identify science journalists/communicators and press officers who could become part of regional networks. The networks would need to be supported, but would in turn support science journalism by:

- looking at ways to improve the links at a local level between scientists and journalists
- training press officers in understanding and communicating science to journalists
- developing professional skills in communicating about science, including through the media

In some areas it may be useful to establish a network for all people interested in science communication, in order to ensure the vigour of the network. In Australia, for instance, there are not have enough science journalists to sustain their own network, but a general network involving journalists, communication officers, media officers, scientists, editors and others has worked well.

8.6 Support regional networks of journalists

We recommend that UNESCO continue discussion with the World Federation of Science Journalists and local associations of science journalists to support:

- input into further development of science journalism courses
- regional networking of science journalists
- professional development workshops for science journalists, run on a regional basis
- mentoring programs between science journalists from developed and developing countries
- providing career advice to science journalism graduates
- access to regional resources and research organisations

8.7 Work with media agencies

We recommend that UNESCO work with regional media agencies to better position science and the role of the science journalist in the media. This will mean meeting with editors, directors and producers and could form part of regional workshops.

Appendix A: Draft generic science journalism outline

Course objectives

4. **WRITING AND REPORTING SKILLS:** To develop a high quality and intensive science journalism course for students in science writing and broadcasting that teaches clear explanations, messages and story telling
5. **CRITICAL THINKING:** To produce a curriculum that includes methods for teaching students critical thinking about scientific issues and controversies so they can judge the value of competing arguments
6. **MEDIA UNDERSTANDING:** To increase understanding of how the media operates and how science news, features and editorial can be produced without compromising the quality of the scientific information
7. **NETWORKING:** To provide a basic and flexible science journalism course that can be further developed as those using it provide input and share ideas
8. **ACCESSIBILITY:** To provide access to international ideas and practices

Target audiences

The one year curriculum is targeting science, social science and humanities graduate and undergraduate students in developing countries. These could be journalism or science students or graduates in either area. Given that many in developing countries are likely to be science students/graduates, the model curriculum will emphasise interview and writing skills.

Project outcome

The result of this project is a generic science journalism curriculum that can be distributed by UNESCO/UNITWIN to Chairs and other networks, and which can easily be taught by lecturers with a range of backgrounds. It will have the flexibility to be adaptable to local circumstances and the skills and abilities of students from different cultures and experiences. It will be capable of being delivered on-line. Given this outcome, it is essential that the model curriculum is easy to use by people with limited science journalism skills or background. However, it is important that train-the-trainer programs or backup training is available for those who have not already taught science journalism or science communication.

Course outline

The following modules would be taught over 2 X 13 week semesters with one two hour class per week. Modules 4 and 5 would be taught throughout both semesters in the second hour of each session, since they emphasise skills development. *The arrangement of modules across semesters still needs to be determined.*

Module 1: The context

Key Messages

1. The institutional context of science means that effective science journalists must intersect with scientific institutions
2. Science and scientific values differ from those of journalism and the communication fields. Acknowledging and working strategically with these differences is crucial for building working relationships between scientists and journalists.
3. While science is global, its impacts and work can be local. Working between the global and the local means covering as broad a range of stories as possible and seeing local stories as part of the global story of science.
4. The ethics of science journalism include standard journalistic ethics as well as recognising the particular issues that arise in the context of science.
5. Science journalism works within legal frameworks specific to the country or state in which it operates. It is affected by regulations on how science is reported, and media legislation relevant to issues such as libel, defamation, and freedom of information.

Components:

This module is comprised of ten one hour lecture sessions with associated research/practical activities:

1. **The institutional context of science:** Students will examine the institutional nature of science with reference to specific institutions and infrastructure in their local region.
2. **The nature of science and science journalism Part 1:** Students will contrast the norms and culture of science with the values and culture of journalists. What are the differences in the way they approach their work? This session will compare developed and developing countries and will look at the role of science journalism and its function in society.
3. **The nature of science and science journalism Part 2:** Students will continue the look at the themes in Part 1 with a focus on examining what it meant by 'balance' and 'objectivity'.
4. **Local science and local knowledge:** Students will look at local scientific knowledge and its relevance to local audiences, as expressed through the media, lay experts and government involvement. This section will also look at ways to develop relationships between scientists and journalists.
5. **Models of science communication:** Students will view the current theoretical frameworks for understanding science communication, including the theory of how information can be provided, how it is interpreted and understood, and how the public will engage with different forms of information.

6. **Popularisation and its perils:** Students will explore ways scientists can be encouraged to communicate about their work, and how these activities can have a negative effect on their career. This session will also look at the impact of being a successful science journalist.
7. **Evaluation of media coverage:** Students will look at methods for assessing the impact of media coverage on audiences in terms of understanding, awareness and attitudes.
8. **Legal frameworks:** Students will learn about typical legal frameworks affecting the communication of science in the media with particular reference to their local situations.
9. **Risk and responsibility:** Students will discuss the nature of 'risk' and uncertainty in the reporting of science and the responsibilities of the scientist and the journalist when reporting about risk.
10. **The ethics of science journalism:** Students will review typical generic ethics for journalists and how these need to be expanded or detailed to consider issues relevant to the reporting of science.

Format

This module would be taught as one hour lecture/discussion sessions throughout both semesters of the course. Module materials would consist of printed scholarly articles, relevant case studies, and practical assignments as described below. It will also incorporate visiting speakers where relevant.

Assignments

Assignment #1

Gather names and contact details for key science institutions in your region and include information on each institution according to range of research, funding sources and media activity and profile.

Assignment #2

Investigate how local science organisations communicate with the 'audiences' for their research and what role media plays in this communication.

Assignment #3

Interview 3 local scientists. Ask them about their work and the impact it might have on ordinary people; and find out their attitudes and beliefs about communicating their work through the media.

Assignment #4

Collect newspaper articles on a recent scientific development or debate and analyse the messages in the articles using content analysis techniques.

Module 2: Arenas of science journalism

Key Messages

1. Science journalism can take many forms and can be distributed through a variety of outlets
2. Science journalism can have a variety of objectives that include informing, educating, creating debate and dialogue, preparing people for change, involving the general public and providing critical investigation and analysis

3. Reporting styles will differ according to the needs of the particular media (radio, TV, print, internet); and whether the story is news, features, current affairs or editorial
4. There are a variety of traditional and new media outlets for reporting science

Components:

This module is comprised of five one hour lecture/discussion sessions with associated research/practical activities:

1. **The forms and outlets for science journalism:** Students will discuss and research the various local, national and international forms and outlets for science journalism. They will identify the varying aims of a science journalist working in these different outlets.
2. **Making science news:** Students will explore how science is reported in the news through print, radio, television and the Internet.
3. **Making science personal:** Students will look at feature/magazine style stories and how these stories can be used in all forms of the media to make connections with the audience. This session will also look at the role and value of editorial science.
4. **Investigative science:** Students will learn about how to investigate scientific activities and results in the critical manner typical of current affairs and investigative journalism. They will explore opportunities for this style of reporting in their local region.
5. **Using the new media:** Students will discuss opportunities for using the Internet and other new media to report science...

Format

This module would be taught throughout both semesters of the course and will be linked to the more practical sessions of modules 4 and 5. Module materials would consist of generic lecture information, discussion points, relevant examples of science journalism through various types of media, and practical assignments as described below. It will also incorporate visiting journalists to discuss their experiences in reporting different forms of stories through a variety of outlets...

Assignments

Assignment #1

Students will make a list of organisations which employ scientists. How many people work there? Add in another column on the science that is done in each institution. What problems are they trying to solve? Chose which pieces of work would most interest the people living in your country/region.

Assignment #2

Students will critically review the aims of and differences between news, current affairs, and editorial and feature science journalism using examples in their region

Module 3: Good practice in science journalism

Key Messages

1. Science journalists play an important, but challenging role in bridging the gap (and potential conflict) between scientists and non-scientists

2. Scientific and journalistic aims may differ, but there are some techniques that can minimise conflict and create rapport
3. Science stories vary in their newsworthiness for various reasons

Components:

This module is comprised of seven one hour lecture sessions with associated research/practical activities:

1. **Qualities of a effective science journalism:** Students will learn the qualities of effective science journalism, such as considering the audience, researching the topic, asking the right questions, considering different points of view, etc
2. **Finding the real science news:** Students will (a) identify 'good' and 'bad' science, and be able to distinguish real science news from corporate spin, through an introduction to science in the social context and the scientific method. Students will (b) recognise the key ingredients for a good science story - in the news, features and current affairs – including (c) how to appropriately balance conflicting views
3. **Knowing the audience:** Students will be taught the importance of understanding how to make science relevant and appealing to the audience – particularly poor urban and rural communities; research will focus on local examples; the importance of framing science in the social context will be emphasised
4. **Understanding the data:** Students will learn what science they need to know to be good science journalists; they will also learn basic skills in interpreting statistics, probability estimates and data from scientific research
5. **Risk communication:** Students will discuss issues in reporting levels of risk and technical uncertainty and how to best deal with such issues. This will include looking at how scientists deal with risk.
6. **The rights and responsibilities of the science journalist:** Students will consider the rights and responsibilities of the science journalist and gain confidence to report science in a critical and analytical way
7. **The rights and responsibilities of the interviewee:** Students will discuss the rights and responsibilities of the scientist (interviewee)

Format

This module would be taught throughout the first semester of the course... Module materials would consist of printed scholarly articles, examples of science journalism through various types of media, and practical assignments as described below. It will also incorporate visiting speakers (scientists and journalists) to discuss the challenges in their work and experiences with science journalism.

Assignments

Assignment #1

A critical analysis of science journalism in the local media: What is the story about? What is the main point? Why should the audience be interested? Do you understand the explanations of the science?

Assignment #2

Write three pieces of science journalism on the same topic, but written for different audiences.

Assignment #3

Choose a local audience and research their current level of science literacy, interest in science and awareness of local science issues.

Module 4: Sourcing stories and interview skills

Key Messages

1. Finding stories requires a real interest in the subjects that journalists encounter and a willingness to learn and search out relevant topics from a variety of sources including the Internet, personal contacts, other media, media releases etc
2. The centre of every journalistic enterprise is the ability to ask questions and explore every aspect of a subject and to keep asking: what does that mean? How does that work? What implications does it have for ordinary people? And how does that fit with what else is known?
3. Different 'sources' of stories have varying reliability and credibility. It is important to check sources and their facts, even respected sources.
4. A science journalist needs to keep an open mind and listen and record different views and arguments in a scientific issue. The neutral posture is central to journalism and vital to society.
5. The key principle when conducting interviews is trust; the subject of your interview should know who you are and what you are working on for what outlet.

Components:

This module is comprised of eight one hour discussion and practical sessions that follow the more theoretical one hour lecture/discussion sessions of other components.

1. **Finding stories:** Students will learn techniques for identifying potential stories and sources to interview on those stories
2. **Evaluating sources:** Students will discuss techniques for evaluating the credibility and reliability of interviewees and other information sources
3. **Preparing for an interview:** Students will learn and apply techniques for developing questions and researching the interviewee prior to the actual interview
4. **Conducting the interview – Part 1 News interviews:** Students will be taught the importance how to conduct a respectful interview for print, radio, TV or electronic news and still get the desired information
5. **Conducting the interview – Part 2 Feature/magazine interviews:** Students will learn and apply techniques for conducting feature/magazine interviews for print, radio, TV or electronic outlets
6. **Conducting the interview – Part 3 Investigative reporting:** Students will learn and apply the skills of investigative reporting for various media outlets
7. **Following up and interview:** Students will look at what should be done after the interview process to put the story together

8. **Trouble shooting:** Students will learn skills in dealing with difficult interviewees or interview situations

Format

This module would be taught throughout both semesters of the course. Module materials will largely consist of tips and practical assignments. Every session outlined above will include a practical exercise which will be started in class but completed as an assignment after the class.

Module 5: Writing clear stories and scripts

Key Messages

1. News is what is important, interesting or both. It is written in a different way (inverted pyramid) to scientific reports or feature stories.
2. Science journalists are the 'honest broker' in reporting information rather than the 'authority'.
3. The best science story combines the human angle with the factual data and uses real examples relevant to the audience.
4. Different types of stories – news, feature, current affairs – have different formats, which will also vary with the type of outlet (print, radio, TV, electronic) that the story is being produced for.
5. Stories need to be written with the specific audience in mind, which will influence language, style and format.
6. Accuracy is paramount in writing scientific stories. Science journalists need to be continually vigilant in checking the facts.

Components:

This module is comprised of 18 one hour discussion and practical sessions that follow the more theoretical one hour lecture/discussion sessions of other components.

1. **Checking for accuracy:** Students will discuss and apply techniques for ensuring their science stories are accurate and meet the needs of the specified media audience
2. **Clear writing:** Students will learn skills in translating science into the language of their specified audiences
3. **Writing news stories:** Students will learn the basic format of news and how this applies to the print, radio, TV and electronic media
4. **Writing newspaper news Part 1:** Students will discuss and apply techniques for reporting science news in newspapers
5. **Writing newspaper news Part 2:** Students will continue to apply techniques for reporting science news in newspapers
6. **Writing and producing radio news Part 1:** Students will discuss and apply techniques for reporting science news in the radio
7. **Writing and producing radio news Part 2:** Students will continue to apply techniques for reporting science news in the radio
8. **Writing and producing TV news Part 1:** Students will discuss and apply techniques for reporting science news in TV

- 9. Writing and producing TV news Part 2:** Students will continue to apply techniques for reporting science news in TV
- 10. Writing electronic news Part 1:** Students will discuss and apply techniques for reporting science news on the Internet and through other new media sources
- 11. Writing newspaper news Part 2:** Students will continue to apply techniques for reporting science news through new media
- 12. Writing magazine/newspaper features:** Students will discuss and apply techniques for writing feature articles for newspaper or magazines
- 13. Writing and producing radio programs and features Part 1:** Students will discuss and apply techniques for producing radio program and features
- 14. Writing and producing radio programs and features Part 2:** Students will continue to apply techniques for producing radio features/programs
- 15. Writing and producing TV programs and features Part 1:** Students will discuss and apply techniques for producing TV program and features
- 16. Writing and producing radio programs and features Part 2:** Students will continue to apply techniques for producing TV features/programs
- 17. Writing investigative stories Part 1:** Students will discuss and apply techniques for writing investigate stories
- 18. Writing investigative stories Part 2:** Students will continue to apply techniques for writing investigative stories

Format

This module would be taught throughout both semesters of the course. Module materials will largely consist of tips and practical assignments. Every session outlined above will include a practical exercise which will be started in class but completed as an assignment after the class and/or in additional tutorial sessions.

Module 6: Getting the story out

Key Messages

1. Science journalism like all journalism is a collaborative effort. It is essential that science journalists learn to work with others - sub-editors, editors, news directors, photographers, camera people, etc
2. Adding visuals (photographs, diagrams, illustrations, etc) to your story will make it more attractive to editors and news directors, but more importantly will help explain your story to the audience
3. Inaccuracies may creep into your stories during the sub-editing process. If these are likely to adversely affect your audience's understanding, attitudes and behaviour, then it is important that you work with your interview sources and media outlets to correct such misconceptions.
4. There are major scientific stories in developing country that should be reported. These include issues such as: HIV/AIDS, neglected diseases, sanitation, climate change, agricultural production etc
5. Science journalism offers a range of job opportunities in developing countries.

Components:

This module is comprised of four one hour lecture sessions with associated research/practical activities:

1. **Working in a collaborative environment:** Students will look at how media teams work and techniques for fitting within those teams.
2. **Using visuals to enhance your story:** Students will look at how visual material can help sell a story as well as explain complex ideas to the audience.
3. **Dealing with inaccuracies:** Students will discuss ways of dealing with serious inaccuracies in stories that need to be corrected.
4. **Work opportunities:** Students will look at current scientific issues in their local region and employment opportunities

Format

This module would be taught as one hour lecture/discussion sessions throughout both semesters of the course. Module materials would consist of printed scholarly articles, relevant case studies, and practical assignments as described below. It will also incorporate visiting speakers where relevant.

Assignments

Assignment #1

Choose one local media outlet and investigate how teams work within that outlet to produce stories. Who does a journalist report to? How do they work together?

Assignment #2

Choose one of your newspaper stories and provide accompanying visual material that would help support and explain the story.

Assignment #3

Identify potential science story topics and media outlets in your region

Appendix B: UNESCO workshop program

Workshop objectives

1. Discuss the training, mentoring and support needs of science journalists in developing countries
2. Review and discuss the initial results of a UNESCO project to develop a generic science journalism course for developing countries
3. Discuss current mentoring programs for developing country science journalists and future opportunities for collaboration
4. Hear of the experiences and learning of teachers of science journalism

Participants

Experts from both developed and developing countries were invited to participate in this workshop. Conference delegates were also invited to participate in the workshop.

Facilitation

The workshop was chaired by Toss Gascoigne who is working on the UNESCO project.

Jenni Metcalfe, also working on the UNESCO project, recorded presentations and discussions and used this information to further facilitate discussion during the workshop.

Melanie McKenzie and Joan Leach, who are also working on the UNESCO project, supported the organisation and facilitation of the workshop and participated in discussions.

Workshop outline

Welcome, participant introductions

Video address by Dr Abdul Waheed Khan, UNESCO's Assistant Director-General for Communication and Information

Panel discussion of challenges to and key ideas for teaching science journalism; initially there will be questions from the Chair to the panel, followed by questions and comments from the floor.

Takeshi Tanikawa, program manager of Master of Arts Program for Journalist Education in Science and Technology, Waseda University, Japan

Professor Philip Hilts, Center for Science and Medical Reporting, Boston University, USA

Marina Joubert, Convenor of workshops for journalists in South Africa, Southern Science

Hiroko Ueno is a graduate student of MAJESTy (Master of Arts Program for Journalist Education in Science and Technology), Waseda University.

Mitstaka Fujita, Japanese Association of Science & Technology Journalists

Present UNESCO draft outline of one year course for science journalists in developing countries – Jenni Metcalfe, Philip J Hilts, Joan Leach, Toss Gascoigne, Melanie McKenzie

Questions and initial discussion on draft outline

Structured discussion of draft UNESCO outline presented (including discussion of any shortcomings and prioritisation exercise by representatives from developing countries)

Mentoring programs for science journalists in developing countries – short presentations (8 mins) about current programs by:

Gervais Mbarga, SjCOOP Mentoring Programme run by World Federation of Science Journalists

Julie Clayton, SciDevNet, UK

Kashmir Hill, National Press Foundation and J2J, USA

Catherine Mgendi, Consultative Group on International Agriculture (CGIAR)

Jan Lublinski, Bertelsmann Foundation, Germany

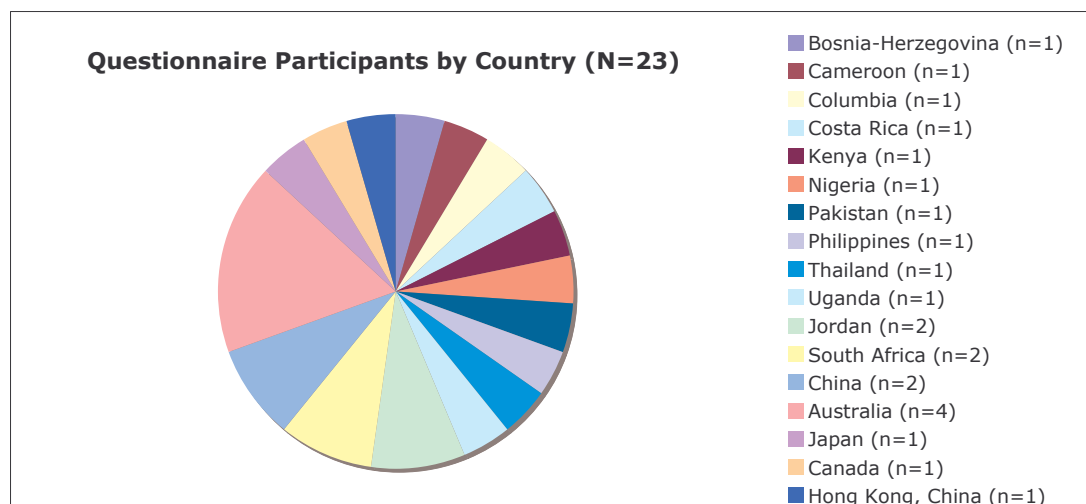
Discussion of training, mentoring and support needs of science journalists in developing countries

Where to from here? Jenni Metcalfe sum up

Appendix C: WCSJ questionnaire and results

Q1. Which country are you from?

A total of 23 questionnaires were received from representatives in 16 different countries, of which 13 are considered developing nations. Hong Kong, while part of China, has been categorised as a developed nation for purposes of this study.



Q2. Please circle the most important form of media in your country: print (magazines, newspapers), radio, television, internet

Table 1. Most important forms of media

| | print | Radio | television | internet |
|-------------------|-------|-------|------------|----------|
| Developing (n=16) | 9 | 6 | 6 | 6 |
| Developed (n=7) | 2 | 2 | 4 | 4 |
| TOTAL (n=23) | 11 | 8 | 10 | 10 |

Note that the total number of responses overall is more than 23 as people were permitted to circle more than one option.

Q3. How many science journalists work in your country?

Table 2. Estimated number of science journalists in country

| | 0-10 | 11-50 | 51-100 | 101-1000 | 1001+ |
|-------------------|------|-------|--------|----------|-------|
| Developing (n=13) | 5 | 4 | 0 | 2 | 3 |
| Developed (n=5) | 1 | 1 | 0 | 2 | 0 |
| TOTAL (n=18) | 6 | 5 | 0 | 4 | 3 |

Q4. If you can, please estimate the number of journalists who work in... newspapers and magazines, radio, television, internet.

Table 3. Estimated numbers of newspaper/magazine journalists in country

| | 0-10 | 11-50 | 51-100 | 101-1000 | 1001+ |
|-------------------|------|-------|--------|----------|-------|
| Developing (n=11) | 5 | 2 | 0 | 2 | 2 |
| Developed (n=3) | 0 | 1 | 1 | 1 | 0 |
| TOTAL (n=14) | 5 | 3 | 1 | 3 | 2 |

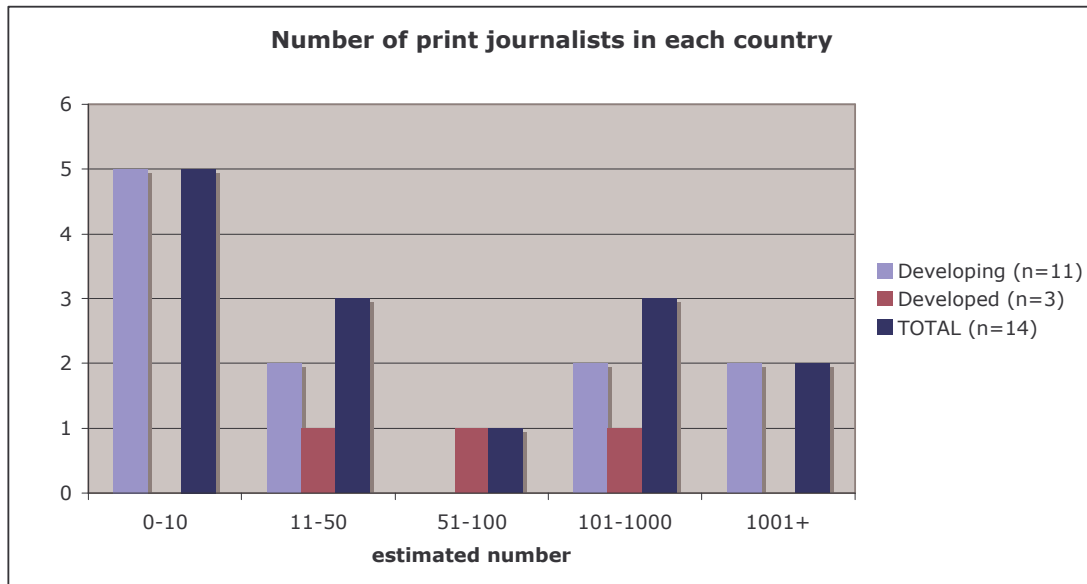


Table 4. Estimated numbers of radio journalists in country

| | 0-10 | 11-50 | 51-100 | 101-1000 | 1001+ |
|-------------------|------|-------|--------|----------|-------|
| Developing (n=11) | 7 | 0 | 1 | 3 | 0 |
| Developed (n=3) | 1 | 2 | 0 | 0 | 0 |
| TOTAL (n=14) | 8 | 2 | 1 | 3 | 0 |

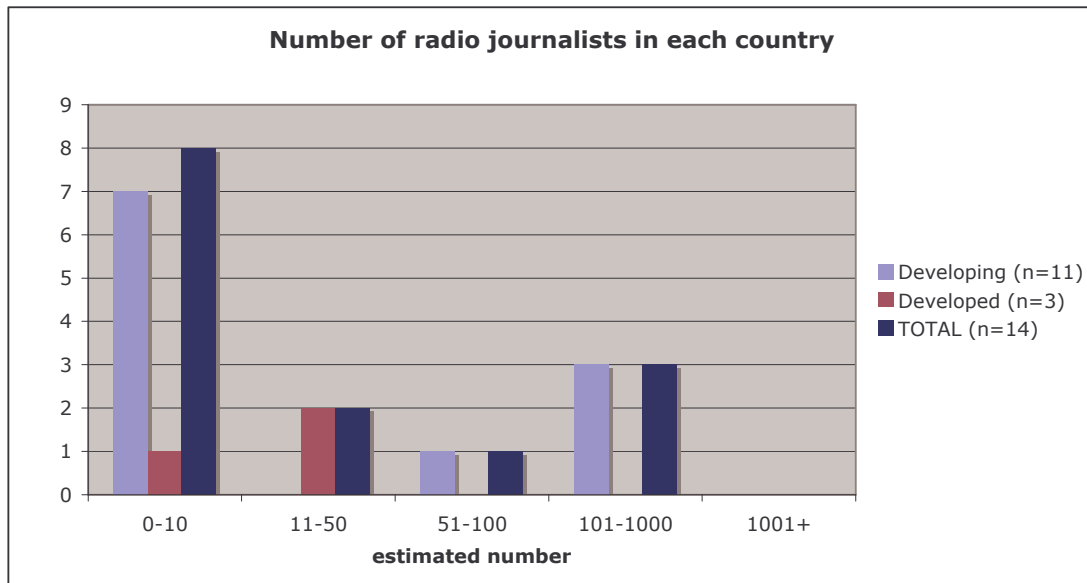


Table 5. Estimated numbers of television journalists in country

| | 0-10 | 11-50 | 51-100 | 101-1000 | 1001+ |
|-------------------|------|-------|--------|----------|-------|
| Developing (n=11) | 7 | 0 | 1 | 3 | 0 |
| Developed (n=3) | 1 | 2 | 0 | 0 | 0 |
| TOTAL (n=14) | 8 | 2 | 1 | 3 | 0 |

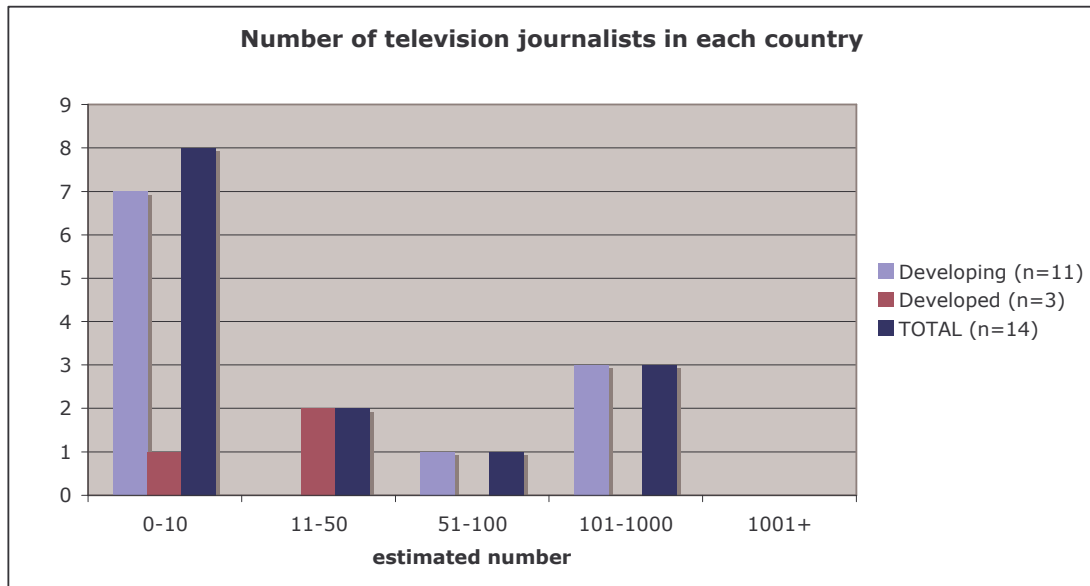
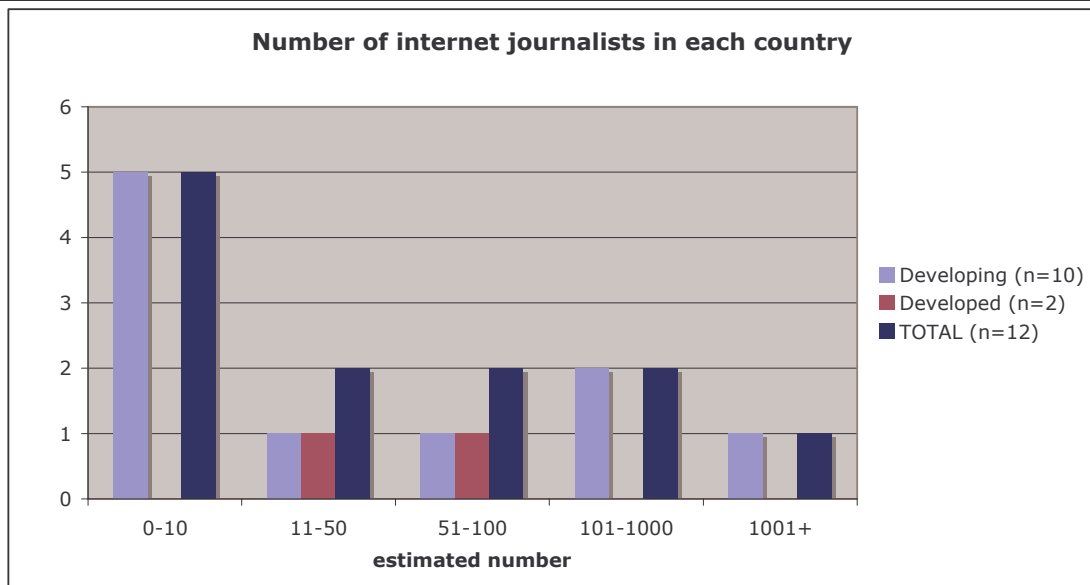


Table 6. Estimated numbers of internet journalists in country

| | 0-10 | 11-50 | 51-100 | 101-1000 | 1001+ |
|-------------------|------|-------|--------|----------|-------|
| Developing (n=10) | 5 | 1 | 1 | 2 | 1 |
| Developed (n=2) | 0 | 1 | 1 | 0 | 0 |
| TOTAL (n=12) | 5 | 2 | 2 | 2 | 1 |



Q5. What sort of jobs would graduates of this course be able to get?

Developing nation responses

- Communication Offices in Research Institutes
- background in science- skills of Journo. Journo. no science background- science knowledge
- journalism skill for scientists + knowledge for those who background is journalism
- Lucky ones get into mainstream media. Most go to co-operatives
- Science journalists, science communicators, PIO
- senior journalists/editors/communicators, press office

- specialised journalists in the field of science and other publication institutions
- Government funded organisations
- call centre specialists/ analysts
- none in science journalism
- Freelance jobs at media outlets, press officers at uni or research institutions
- Science reporter

Developed nation responses

- Any area in Q4 plus opportunity to specialise in one or two areas
- With science/ media organisations
- Journalists, educators, museums, media, PR, ICT
- reporters, broadcasters, media planners, PR, advertising, marketing
- Freelance... Not many staff jobs
- Very restricted

Q6. What are the three most important things that science graduates need to learn to be successful science journalists?

Table 7. Developing country responses (science graduates need)

| Category | Responses |
|----------------------------------|---|
| Identifying science stories | <ul style="list-style-type: none"> • what is science news • getting the best out of a story • know to get the most important point in story • Become Good journalists (able to address community issues) • Work with others to share issues of public concern and neighbourhoods • How the Media works- what is news, etc • How to pitch material to a certain audience • looking for stories • Learn to get in touch with the peoples' interests and to smell the news • know the natural news |
| Journalism skills and techniques | <ul style="list-style-type: none"> • skills of Journalism • skills of Journalism • Rules of Journalism • journalism • journalism techniques • journalism skills |
| Writing clearly | <ul style="list-style-type: none"> • writing • writing in plain English • write in simple language and explain jargon • How to write a news story |
| Communicating effectively | <ul style="list-style-type: none"> • can communicate they are understanding • skills in communication • timeliness of communication • How to communicate in plain language • find a way to create examples to explain science easily • communicate their work to be understood by others • grip on the languages • grip on the art and craft of presentations • how to use the media right way (radio, internet) to spread |

| | |
|---|--|
| | awareness |
| Sourcing information | <ul style="list-style-type: none"> • How to get information • internet for research • How to get information • interviewing skills |
| Understanding science | <ul style="list-style-type: none"> • sociology of science • History of science • Basic of science • grip on the subject matter • how to deal with scientific research |
| Ethical science reporting | <ul style="list-style-type: none"> • ethics in reporting objectively • scientific fraud |
| Networking | <ul style="list-style-type: none"> • networking with media • networking skills |
| Differences between science and reporting science | <ul style="list-style-type: none"> • to let go of the technicism in science and focus on bigger picture • remember that communication is not same as experiment |
| Other | <ul style="list-style-type: none"> • new technologies (like web 2.0) • widely read • the importance of emerging economies • reporting newest scientific research |

Table 8. Developed nation responses (science graduates need)

| Category | Responses |
|----------------------------------|---|
| Identifying science stories | <ul style="list-style-type: none"> • understands your audience + your source |
| Journalism skills and techniques | <ul style="list-style-type: none"> • how to sell themselves + stories |
| Writing clearly | <ul style="list-style-type: none"> • write a good story |
| Communicating effectively | <ul style="list-style-type: none"> • Clarity • Succinctness • explain their story to Grandma (kiss principle) • how to write • Language and writing + communication skills • Plain writing • correct writing (grammar and science) • how to hone down words to write scientifically |
| Sourcing information | <ul style="list-style-type: none"> • how to interview • |
| Understanding science | <ul style="list-style-type: none"> • fundamental concepts in the main disciplines |
| Ethical science reporting | <ul style="list-style-type: none"> • ethics and code of practice in journalism • Journalistic ethics |
| Other | <ul style="list-style-type: none"> • How to deal with non-scientific argument • appropriate integration of media + collaborative structures (audience, scientists, editors, etc) • engage other scientific "communicativeness" • be aware of world views, cultural, political, economic perspectives |

Q7. What are the three most important things that journalism graduates need to learn to be successful science journalists?

Table 9. Developing nation responses (journalism graduates need)

| Category | Responses |
|----------------------------------|---|
| Identifying science stories | <ul style="list-style-type: none"> • Report on science by engaging the scientific community |
| Journalism skills and techniques | <ul style="list-style-type: none"> • Skills of Journalism • Basic journalism |
| Writing clearly | <ul style="list-style-type: none"> • science writing • Undertake course in writing science stories |
| Communicating effectively | <ul style="list-style-type: none"> • Good English • needs to be a good communicator and able to read/research • Grip on the languages |
| Sourcing information | <ul style="list-style-type: none"> • How to negotiate with the scientists & get the knowledge • How to collect right information about science • How to get the right information + resources • research, research • How to find news in a scientific journal • always ask. Read about the topic + if doubtful ask an expert |
| Understanding science | <ul style="list-style-type: none"> • understand the science to be able to write about it. • basic principles & method science • how to deal with scientific information • basic knowledge of science • complete appreciation of science • Dynamics of science • sociology of science • History of science • Basic of science • know about scientific issues like the palm of their hand • The scientific process • Learn how the peer review system works, how science is created + evaluated, how to tell the real form the unreal • science knowledge • has a dictionary with help of experts that has science jargon meaning • grip on the subject matter • what scientists do |
| Ethical science reporting | <ul style="list-style-type: none"> • scientific fraud • always be objective- don't fully trust what scientists say • how to avoid inaccuracies/bias/over (index) statement without losing the actual thrust of a science story |
| Networking | <ul style="list-style-type: none"> • How to gain trust from a few members in scientific community • networking with science workers and experts |
| Other | <ul style="list-style-type: none"> • curiosity of knowing the unknown world • try to learn and read more • new technologies (like web 2.0) • reporting newest scientific research • Fear not to venture into the unknown |

| | |
|--|--|
| | <ul style="list-style-type: none"> • the importance of emerging economies • Patience • equate science with enviro and society |
|--|--|

Table 10. Developed nation responses (journalism graduates need)

| Category | Responses |
|-----------------------------|--|
| Identifying science stories | <ul style="list-style-type: none"> • understands your audience + your source |
| Sourcing information | <ul style="list-style-type: none"> • happy to ask a lot of questions • resources • idea of where to direct questions • how to find good science |
| Understanding science | <ul style="list-style-type: none"> • scientific method • Fundamental concepts in the main disciplines • understanding of scientific method • understanding major branches of sciences • how models work and are applied • interest in learning about scientific detail • science method • scientific methods |
| Ethical science reporting | <ul style="list-style-type: none"> • how to not blow a story out of proportion |
| Networking | <ul style="list-style-type: none"> • engage and listen to scientists |
| Other | <ul style="list-style-type: none"> • accuracy • critical thinking • appropriate integration of media + collaborative structures (audience, scientists, editors, etc) • be aware of world views, cultural, political, economic perspectives |

Q8. Do you think that this course should be taught full-time in an institution (like a university or college), or part time while they are working?

Table 11. Rate of delivery of course

| | Part-time | Full-time | Both | Either | “Other” |
|-------------------|-----------|-----------|------|--------|---------|
| Developing (n=16) | 8 | 1 | 4 | 0 | 3 |
| Developed (n=6) | 0 | 0 | 4 | 2 | 0 |
| TOTAL (n=22) | 8 | 1 | 8 | 2 | 3 |

“Other” responses:

- depends on circumstances
- Science journalism now being taught in Philippines but is limited to agricultural science
- To begin with, it may be better taught as a certificate course, during semester breaks

Q9. What would be the best institution to teach a course like this in your country?

| | |
|-----------|---|
| Australia | University for the science at least |
| Australia | University |
| Australia | University of Melbourne/RMIT |
| Australia | flexible (depends upon the delivery method – possibly partnerships) |

| | |
|----------------------|---|
| Bosnia & Herzegovina | Academy of science and art, School for science and technology – Sarajevo |
| Cameroon | Schools of Journalism |
| Canada | Somewhere in Ontario or Toronto, but combine journalism with science schools |
| China | Graduate school, Chinese Academy of Science and Hong Kong Uni or Shantou University |
| China | Tsinghua University or Chinese Academy of Science |
| Colombia | University |
| Costa Rica | University of Costa Rica |
| Bosnia & Herzegovina | Academy of science and art, School for science and technology – Sarajevo |
| Hong Kong | The Chinese Uni of Hong Kong |
| Japan | University |
| Jordan | University of Jordan/Jordanian Media centre |
| Jordan | Jordanian Media centre |
| Kenya | Kenya Institute of Mass Communication |
| Nigeria | University |
| Pakistan | Institutes of higher education (universities) |
| Philippines | College of Mass Communication |
| South Africa | University, as well as working environment through proper arrangements |
| South Africa | University- Pretoria, Stellenbosch, Cape Town |
| Thailand | Chulalongkon University, Thammasat Uni |
| Uganda | Universities, in partnership with newsrooms |

Q10. How much additional training do you think science graduates need? How long would this training take?

Table 12. Duration of additional training for science graduates

| | <6 months (inclusive) | 6 months – 1 year | >1 year (inclusive) | Other |
|-------------------|-----------------------|-------------------|---------------------|-------|
| Developing (n=15) | 4 | 1 | 7 | 3 |
| Developed (n=6) | 0 | 0 | 5 | 1 |
| TOTAL (n=21) | 4 | 1 | 12 | 4 |

“Other” responses and comments include:

- Science graduated reporters need more skills about communication, writing and news worth
- Short courses on insights in science journalism
- As much as they can to be a good science journalist
- Internship in the media industry
- Constant workshops on emerging technology
- Rigorous practice of science journalism in media organisations
- Depends on focus, resources, and logistics
- Why not have several levels (cert, diploma, degree, masters)
- Many of the skills learned in science are useful in journalism, but they need to learn to write and tell stories

Q11. How much additional training do you think journalism graduates need? How long would this training take?

Table 13. Duration of additional training for journalism graduates

| | <6 months (inclusive) | 6 months – 1 year | >1 year (inclusive) | Other |
|-------------------|-----------------------|-------------------|---------------------|-------|
| Developing (n=16) | 1 | 2 | 9 | 4 |
| Developed (n=5) | 0 | 0 | 5 | 0 |
| TOTAL (n=21) | 1 | 2 | 14 | 4 |

“Other” responses and comments include:

- Need the knowledge of science. I think training should be case-by-case study. Setting current science topic and to talk to scientist about knowledge
- Training in the field of science of their work
- Short course on insights in science
- As much as they can to understand basic principles of basic science
- A short course while they are working
- Internship in the science sector
- Rigorous practice of science dedicated to cover only science related material
- A bachelor’s degree in science, they need to understand the scientific method.

Q12. Which of the following methods would be the best way to make training material available? (please circle)... on the web/internet, providing booklets and printed material, providing a DVD or CD with course materials

Table 14. Methods for delivering curriculum

| | Web/internet | Booklets and printed material | DVD or CD | Other |
|-------------------|--------------|-------------------------------|-----------|-------|
| Developing (n=15) | 13 | 10 | 5 | 1 |
| Developed (n=6) | 5 | 3 | 1 | 3 |
| TOTAL (n=21) | 18 | 13 | 6 | 4 |

*Note that respondents were permitted to list more than one option.

Although web/internet was listed most frequently, four developing countries listed a different method first or did not mention web/internet at all: Pakistan, South Africa, Nigeria and the Philippines. The representative from Uganda also suggested a contact media manager to distribute printed material.

Other suggested methods include:

- Podcasting
- Integration of media, live web conferencing, videocasts, offline/online downloadable components structured for local contextual building
- On site training

Q13. Please tell us about the resources in your country.

- Is it easy for you to access the internet?*
- Is it easy for everyone in your country to use the internet?*
- Where do you use the internet? At work, at home, other places?*
- Is it easy for you to find journal articles about research?*
- Is it easy for you to find science articles in magazines or newspapers?*
- Is it easy for everyone in your country to find science articles in magazines or newspapers?*

Table 15. Resource availability by country

| Country | A | B | C | D | E | F |
|----------------------|--|---|--------------------|--|---|---|
| Australia | speed hopeless | No | Work, home | very variable | Often | I don't think so |
| Australia | Yes | Yes | Work, home, other | Yes online | Yes | Yes |
| Australia | Yes | Yes speed + access varies | Work, home, mobile | Yes | Yes | Yes |
| Canada | Very easy | Yes | Home | Yes | Yes | Yes- public libraries are easy |
| Hong Kong | Yes | yes for the many | Work, home | yes- in uni setting | yes- in uni setting | No |
| Japan | Yes | No | Work, home | Yes | Yes | Yes |
| Bosnia & Herzegovina | Yes | No | Work, home | No | No | No |
| Cameroon | medium | No | Work, home | Not easy | Not easy | Not easy |
| China | Yes | Yes | Work, home, other | Yes | Yes | Yes |
| China | Yes | Yes, in medium to big cities | Work | Yes | Yes | Can find them in science articles. But many articles are not scientifically written |
| Colombia | Yes, in Bogotá but not all regions have access | No | Work, home, other | | Yes | Not always |
| Costa Rica | Yes | Yes | Work, home, other | Yes | Yes | Yes |
| Jordan | Yes | Yes | Work, home, other | Yes | Yes | Yes |
| Jordan | Yes | Yes | Work, home | Sometimes | Yes | Not usually |
| Kenya | Yes | Quite easily | Cyber cafe | Yes | Yes | Yes |
| Nigeria | No | No | Cyber cafe | No | No | No |
| Pakistan | Common but not easy | Only younger generation | Work | Not from local sources, only international | Not very difficult. But clear articles are rare | Not very difficult. But clear articles are rare |
| Philippines | Yes-expensive | No | Work, Home, campus | No | No | no |
| South Africa | Yes | possible with the emerging internet cafes | Both | no | Yes | readership is diverse its possible to subscribe |
| South Africa | Yes | No expensive | Work, home | no | Yes | No mostly radio |
| Thailand | yes very easy but bandwidth busy in rush hrs | No | Work, home, mobile | No don't have much source | Yes | No not to much |
| Uganda | Yes | No 10% population and 40% journos | Work, home | No | Yes | No |

Q14. What do you think is the most difficult thing for science journalism training in your country?

Table 16. Challenges to science journalism training by country

| | |
|----------------------|--|
| Australia | Only a few venues in Aust do it well (QLD, ANU) |
| Australia | understanding audience needs designing + developing effective training + structures in truly collaborative way |
| Canada | No jobs once trained |
| Japan | low employment opportunities |
| Bosnia & Herzegovina | Don't have any strategy developed concerning science or science journalism |
| Cameroon | Pedagogical tools for field production |
| China | experienced trainers |
| China | the funds, as students may require financial support especially in less developed areas |
| Colombia | getting students and convincing editor to run a story |
| Costa Rica | There is only one short course (one semester) that is more about PR than science journalism |
| Jordan | There is nothing difficult |
| Kenya | lack of curriculum |
| Nigeria | absence of training materials and resources |
| Pakistan | No jobs for science journalists - as it is classed as a extra journalists activity |
| Philippines | resource permission, and funding |
| South Africa | the interest is not there as it needs to be developed by aspiring journalists |
| South Africa | Motivation because they will not find jobs as a science journo easy |
| Thailand | Time, Our job always busy. I'm not sure most reporters can join in |
| Uganda | Access to internet/info |

Appendix D: Workshop participants

| | | | |
|--------------|------|--------------------|------------------|
| Country | | | |
| Australia | Dr | Andrea | Hirschfeld |
| Australia | Dr | Joan | Leach |
| Bangladesh | | Mir Lutful Kabir | Saadi |
| Canada | Mr | Jean-Marc | Fleury |
| China | Miss | Chong | Wu |
| China | Mrs | Xiuhua | Xu |
| China | ms | Piyaporn | Wongruang |
| Chillie | Mr | Bennen Buma | Gana |
| Columbia | | Lisbeth | Fog |
| Columbia | mr | Robert | Federick |
| Germany | | Jan | Lublinski |
| Holland | | Shira | Tabachinkoff |
| India | Mr | Talent | Ngandwe |
| India | Mr | Ochieng | Ogodoi |
| India | | Padma | TV |
| Japan | Mrs | Masumi | Nasukawa |
| Japan | | Mitsutaka | Fujita |
| Japan | | Kunio | Iwatsuki |
| Japan | Ms | Mariko | Takahashi |
| Japan | Ms | Hiroko | Ueno |
| Kenya | Ms | Catherine | Karong'o |
| South Africa | Ms | Catherine (Marina) | Joubert |
| Switzerland | Mr | Jacopo | Pasotti |
| Uganda | Ms | Hellen | Mukiibi |
| UK | | Julie | Clayton |
| UK | Dr | Magdeline | Pokar |
| UK | Dr | Mike | Shanahan |
| USA | Ms | Kashmir | Hill |
| USA | | Philip | Hilts |
| USA | | Earl | Lane |
| | Ms | Nina | Kujansivu |
| UNESCO | | Iskra | Panevska |
| | Mr | Fida | Al Absi Al Jundi |
| SciDevNet | | Christina | Scott |