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### **What knowledge and skills define a professional science communicator?**

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#### Abstract

Science communicators are required to do an increasing number of tasks, such as constructing a website, planning an exhibition, writing a media release and engaging with different groups of stakeholders such as industry, policy makers and NGOs. Those involved in research or evaluation of exhibits, programmes and activities, encounter methodologically increasing complex approaches which require social science research skills.

How much science do science communicators need in order to perform such tasks properly and how multidisciplinary should this background be?, Can we talk about basic concepts and paradigms, an understanding about the processes, how science works and its role in society?, What other fields of knowledge and skills do science communicators need?,

There are no definite formulas for designing courses and programmes with the purpose of preparing future professional science communicators. The social and cultural context, human and technical resources of the institution offering the programmes and the desired profiles of the graduates are determining factors. However the answer to questions such as the ones mentioned above are essential as a starting point.

Panelists from different backgrounds who have contributed to the development of the field over the years, be it as practitioners or as advisors and creators for science communication programmes, will share their points of view.

## Introduction:

There is a large range of profiles for science communicators such as full time professionals in the field, teachers and scientists who engage in science communication tasks as a social responsibility; science writers, journalists and free lancers. Science communicators work in wide variety of places: universities, research institutes, science museums, government agencies, NGOs, industries, publishing companies, television or radio networks; and some even have their own science communication business. They use a variety of media such as television, radio, internet and social networks; books, journals, magazines and newspapers; museums, exhibitions, plays, workshops and massive events such as science fairs. There is also an ample set of reasons to communicate science such as making science part of culture, as a complement to formal education or life-long learning programmes; as a tool to enforce public policies and as a social commitment with the purpose of forming a society of individuals who are capable of making informed decisions concerning science related issues.

For some information, concepts and ideas are the core of science communication. For others it is much more important to make an emotional impact with the purpose of stimulating awareness about certain issues such as climate change, a change in attitudes and habits and perhaps a new outlook on life towards a sustainable and equitable future. Science communication is also used to attract young people to scientific or technical careers or simply to promote a better acceptance of science and scientific institutions. Today science communication is an important ingredient of national and local programmes for the development of science, technology and innovation.

As the field of science communication becomes more and more complex and diverse the need for professionals is increasing. Research and evaluation have become important tools for developing projects with a decrease in improvisation. Science communication is growing as a professional field with abundant literature, journals, associations, networks and conferences.

The need for specialized training:

This diversity and complexity obliges science communicators to specialize for instance in the topics they communicate, the media they use, the audiences they communicate with, the relationship they wish to establish with their audiences, and the issues they address. Science communicators also find that they require certain knowledge and skills in order to work successfully as part of multidisciplinary

teams. Related activities such as research, evaluation and public relations are very much in demand.

Professional training is becoming more and more compulsory and the offer of training programmes is growing worldwide. The discussion of what skills and knowledge are required is the starting point in defining the curriculum of such programmes. A diversity of science communicators are needed to develop projects for different contexts. A brief glance at the offer of such programmes proves that there are no definite formulas.

No two programmes are alike. We find a large range and diversity in terms of the length of these programmes, courses and workshops: introductory brief courses, specialized courses; training programmes to perform certain tasks such as museum guides; courses for journalists, students or scientist, and full PhD programmes. Each programme has different entrance requirements, contents, structure, duration, objectives, activities and degrees or diploma they offer. Some of the formulas are (Reynoso, 2015):

- Emphasis on the scientific contents. Some are specialized in certain areas of science for example health, energy or environment.
- Emphasis in a certain media: writing, audiovisuals, museums, massive communication media, web, etc.
- Emphasis on theory for science communication involving disciplines such as history, philosophy, sociology, education, literature and social sciences.
- Emphasis on practice: such as writing or video production.
- Emphasis in administrative or management skills and knowledge.

Most programmes include a combination of these approaches. The formula depends on the context, the institution offering the programme, the professional needs of the future science communicator as well as the particular approach about science communication and the image of science.

Different points of view:

Based on the UNAM experience in planning and designing for programmes to train professional science communicators, Elaine Reynoso proposes the following core ingredients:

1. Fundamental concepts and paradigms of science.

2. An understanding of the tools scientists use and how they know what they know. For example and understanding of statistics, probability, graphs, models and scenarios.
3. Scientific issues and the strategies to communicate them. For example: climate change, nanotechnology, risk situations, genetic engineering, etc.
4. The internal and external contexts of science: epistemology and the relationship of science with its political, cultural and economic context.
5. Writing and narrative skills.
6. The scope and limitations of different media.
7. Project development including evaluation.
8. Practice

Toss Gascoigne, from the Australian National University, began this discussion with questions such as: Why would someone enroll in such courses?, What are their expectations? Do they expect to have better jobs opportunities? Toss considers that the emphasis of such courses should be in strengthening certain abilities. The top five abilities on his list are:

1. The ability to write
2. To understand audiences, to learn how to ask questions and listen
3. To think strategically and understand the context in which they work
4. The ability to construct and use networks
5. To understand risk and uncertainty and to be able to explain them.

His next five suggested abilities are:

1. To appreciate strengths and weaknesses of different media, and the various avenues to publish stories
2. The ability to present a topic.
3. To appreciate what actions are likely to move audiences to act, to change
4. The ability to learn constantly.
5. To Evaluate

As optional abilities which are highly useful, Toss proposes:

1. Proficiency at electronic stuff (web, new media)
2. Events management

3. To edit
4. To teach
5. A sense of development of science communication and how the theoretical basis is changing
6. A sense of design
7. To manage projects and budgets

Ana Claudia Nepote, from the RedPOP and the Escuela Nacional de Estudios Superiores, in Morelia, Mexico shared her reflections based on her experience as practitioner and recently as a scholar in the field. She mentioned a wide variety of professionals such as researchers who have good communication skills, non-scientists communicators, and professional science communicators. Ana Claudia's proposal follows:

It is essential that science communicators have a deep knowledge of science in practice and theory. He/she must have previous experience in science labs, universities and must understand how science is done. Also, ideally they should have a wide cultural background for instance in literature, music, art, and the cultural heritage of the local/regional context and international context.

As basic skills she mentioned: curiosity, honesty, empathy, respect for the audience and precision to communicate ideas. These so called "soft" skills are the most difficult to teach and to develop in a formal educational context. Since science is a human activity, the professional communicator can draw from history, culture, traditions, social topics and science facts all based on a critical discourse.

Considering that humans have, by nature, a strong tendency towards imagination and magical thinking, she considers that imagination is an important ingredient in science and that it should be used by professional science communicators as a way to engage and seduce publics. Science communication is full of contrasts between real events and imagination therefore an adequate balance is required in order to tell a science story successfully.

Finally, Ana Claudia quoted the advice of an outstanding Mexican scientist and science communicator Ruy Pérez Tamayo who considers that in order to be successful in science communication, a person must know:

How science is done, how scientists work, the common aspects of different disciplines, and a personal experience in scientific work. Professional science communicators must learn about science through real life experiences, by doing research and by reading. The professional science communicator must have a full

understanding about the limitations, mistakes, risks, uncertainties and development of science.

Luisa Massarani from the Brazilian Institute of the PCST considered that there are no definite formulas for designing courses and programmes with the purpose of preparing future professional science communicators. She presented three different examples of science communication programmes developed within and with the Oswaldo Cruz Foundation in Rio de Janeiro, Brazil.

The first one was carried out from 2009 to 2012, with support of CYTED - Programa Ibero-Americano de Ciência e Tecnologia para o Desenvolvimento (Ibero-America Programme for Science and Technology for Development). The result of this first programme was the Network for Research and Training in science journalism for Ibero-America. Thirteen organizations from 11 countries in the region created this network which held nine different face to face training workshops for scientists and journalists in nine different Latin American countries, particularly in Central America, that do not have access to such opportunities. In these 2 to 3 day workshops the main topics covered were: how to make local science visible, how to strengthen local journalism, how to foster synergy between scientists and journalists and techniques for better communication. The network was awarded with the Mercosur Award for Science and Technology in 2013.

Another short term training course designed within the scope of Oswaldo Cruz Foundation, the main health research institution in Latin America, is an online science communication course for masters and PhD students of the institution. It is currently in a pilot stage during the second semester of 2018. This course will be offered for free to Portuguese speaking researchers and it consists of two modules. In the first module, general issues of public engagement in science and technology are addressed. For example, why should scientists engage with the public and public perception of science and technology. In the second module, ten practical guides/lessons are offered. Some of the topics covered are: how to write science texts, how to prepare videos on science, how to communicate science to children, how to do face to face street events, how to communicate of journalists and how to evaluate your science communication project.

In 2016, the Oswaldo Cruz Foundation launched a master in communication of science, technology and health – the second one in Brazil specifically designed for science communication. The aim of this master is to engage different stakeholders (scientists, journalists, museum professionals, artists, designers, etc.) and introduce them into research in the field. Many students are practitioners, who want to improve their work through scientific evidence and research. The contents of this programme are: general discussions on science communication, introduction of

Science, Technology and Society issues, history of science communication in the world and Brazil, public perception, gender and scientific methodology. Specific discussions on important science communication topics are also addressed, such as science museums, mass media and science, audiences, Internet & social media and science.

Finally, Alex Gerber, from the Rhine-Waal University, Germany, has been mapping the global science communication landscape not only to show the amount and site of each programme but also with the intention of analysing the different contents. He has classified these programmes by different focus areas and sub-categories: miscellaneous, legacy media, institutional communication, STS and Philosophy, Science, practical skills, business and interactive media. He also analyzed the different degrees offered: bachelors, masters, specialization, graduate programmes, postgraduate and others. He considers that this diversity is the result of the inter-and multidisciplinary character of the field, however it could also be the result of a continuing identity crisis. This diversity is a sign of vitality as well as vulnerability of our field. An historical development of these courses and programmes is also a reflection of how the content have evolved in order to meet the changing job requirements and working conditions which require different skills and qualifications.

The points of view and experiences presented in this panel confirmed that although there are no formulas for becoming a professional science communicator, the field is definitely becoming much more complex, challenging and demanding.

#### Bibliography:

Elaine Reynoso, Carina Monterrosa y Patricia Macías (2015) "La formación de comunicadores de la ciencia en América Latina". **RedPOP: 25 años de popularización de la ciencia en América Latina.**

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