

Prioritising SciCom at NUST

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Introduction

This study is the first of its kind in Zimbabwe—no research on public science communication has been done in the country before. As a matter of fact, few studies on science communication as a field in its own right have been carried out globally and, while done on a small scale (198 survey participants and 35 interviewees), to a greater or lesser degree, the results and conclusions mirror what has been found in studies conducted in the United States of America, the United Kingdom, Norway and Japan, among others.

The National University of Science and Technology (NUST) was established in Bulawayo, Zimbabwe, in 1991. In its 2011/2012 yearbook, the university states that it strives to contribute positively towards the advancement of humanity through the provision of knowledge-based solutions to scientific, technological, economic and social challenges. NUST is strategically placed to excel in the area of research and has a potentially extensive niche market that can benefit from its unique combination of applied sciences, technology and commerce.

Seven faculties operate within the university: Medicine, Commerce, Industrial Technology, Applied Sciences, Built Environment, Science and Technology Education, and Communication and Information Science. All seven faculties are represented in this study. Academic staff members at all levels were approached to participate in the survey, but not everyone did. Participants were approached from the ranks of Professors, Associate Professors, Senior Lecturers, Lecturers, Research Fellows, Staff Development Fellows and Teaching Assistants.¹

The study

The study was done in two stages—a survey of academic staff members at NUST, followed by 35 semi-structured interviews representing all academic ranks in the university. The purpose of the survey was to determine the current state of affairs with regard to the opinions and attitudes of academics towards science communication (SciCom) at NUST. We then conducted interviews for the purpose of getting a detailed understanding of how individual academics perceive the process of SciCom, their motivations and ultimately how this process feeds into their academic work.

The survey intended to answer the following broad questions:

- What are the main strategies of public SciCom practices by academics at NUST?
- How are academics participating in public SciCom activities?
- What are the views of academics on support mechanisms provided by NUST to encourage academics to communicate their findings?
- What are the perceptions of academics on interactions with the media?
- Are there any training programmes to equip academics (researchers) in public SciCom skills at NUST?
- What challenges affect public SciCom at NUST?

Limitations

While this study is a first for Zimbabwe, it was conducted on a small scale at a single university that employs only 413 academic staff members. From the literature review we learned that most studies in public science communication—specifically on the communication of science to the public—are national surveys that have been conducted in the developed world such as the United States of America, Norway, Australia, Japan, China, Spain, United Kingdom, France, Belgium and New Zealand, among others. These include studies on scientists' public outreach in France², dissemination practices in Spain³, popular science writing by

¹ The terms 'scientists', 'academics', and 'researchers' are used interchangeably in this study.

² Jensen, 2011

³ Torres-Albero et al, 2011

academics across 13 countries, including Australia⁴, 40 European research institutions⁵, and popularisation activities and motivation of 1 198 scientists in Argentina⁶. In the discussion of the research findings, there was limited comparison of our findings with those from other national studies because of the large scope of these surveys. The study therefore made reference to such surveys mainly in terms of similar issues that were also applicable to the findings of the present study.

As a single-institution study, this work was designed to establish:

- Whether participating academic staff were aware of the concept of SciCom in general;
- Whether they believed that they had a responsibility to communicate with the public and further participate in public SciCom;
- Whether they were aware of SciCom strategies and interacted with the media in SciCom; and
- Whether they were offered any support by the university in public SciCom, taking into account the challenges that had to face in the process.

Of the 198 respondents, 32% were female and 68% were male.

The state of public science communication at NUST

Public science communication is a relatively new phenomenon for universities in Zimbabwe. This concept was introduced in the country in 2012 through NUST's participation in the Development Research Uptake in Sub-Saharan Africa (DRUSSA) programme, including the training workshops offered under the initiative.

It quickly became clear that the state of public science communication at NUST is in disarray. The communication of research findings is done sporadically by academics, with no defined channels of communication, and without proper coordination with the Research and Innovation Office. In general, academics are not compelled by their universities to engage in public science communication. They are only too satisfied with publishing in accredited journals, which means they share their science with other scientists who have access to such journals. In this scenario—where important research results are locked up in journals, with access by only a few—research findings that may be relevant to society and policymakers are unlikely to reach the public.

Our findings bear this out—NUST academics communicate research findings mainly to fellow academics at conferences and through publishing in peer-reviewed journals, with very few reaching out to public and policymaker audiences. Most respondents indicated that they found it difficult to explain scientific facts to the public in a way that they could understand. However, the academics did agree that they had a responsibility to communicate with the public, not only because it is important for society to know about science, but also because they have a right to that knowledge.

One of the major challenges is the fact that compared with other academic duties, public science communication is low on academics' list of priorities. There is no budget for public science communication and as it is, funding for research is inadequate. And with teaching loads already heavy, academics don't have enough time to engage in public science communication. However, arguably the biggest barrier to academics' communicating their research is the absence of an institutional science communication policy. With academics increasingly coming under pressure to communicate their findings, and in the absence of clear guidelines and parameters, confusion bedevils what few communication efforts are made.

The university should:

- draft a policy to guide science communication to non-academic audiences,
- provide adequate support for public science communication through rewards and incentives, and

⁴ Bentley & Kyvik, 2011

⁵ Neresini & Bucchi, 2011

⁶ Kreimer et al, 2011

- introduce training programmes on public science communication for academics designed by a professional science communicator.

Over the last two decades the level of encouragement for scientists to open up their disciplines and communicate with the public has been unprecedented⁷.

What is science communication?

Science communication (SciCom) is a relatively new yet dynamic and multidisciplinary field of scholarship and practice. It includes fields such as public understanding of science (PUS) and public engagement with science (PES)⁸. Public understanding of science is learning about and dealing with science, while PES is about the public having a say in science⁹.

The discipline of SciCom covers:

- **Science promotion:** To strengthen the ideas and awareness of science and technology;
- **Science education:** To learn about the principles, potential and dangers of science and technology; and
- **Prevention of knowledge deprivation:** To protect someone from harm caused by a lack of knowledge, for example antibiotics do not protect one from viral infections¹⁰.

The concept of public communication of science and technology (PCST) goes by many names, including public understanding of science activity¹¹, knowledge transfer activities¹², public engagement of science¹³, and science dissemination¹⁴. Activities range from doing interviews with journalists to giving public lectures, among many others¹⁵.

SciCom makes information about science relevant and understandable to people so that they can use it and even respond to it.

Science information is crucial—it is a social necessity that no democracy can afford to toss aside. Effective communication is an essential part of science and in the interests of scientists for at least two reasons:

- First, if nobody hears about your work, you might as well never have done it.
- Second, if you do not communicate your work effectively yourself, many people will be only too happy to do it for you, and when they do, you run the risk of it being skewed to support whatever agenda or misconceptions they have¹⁶.

The fundamental goal of science is to develop a shared, public understanding of our observations¹⁷, and SciCom is the key to helping determine the ultimate impact of science on society. Communication should be a two-way street. As much as the ideas, attitudes and views of the public are fed back to science, ideas and solutions offered by science should be fed back to the public.¹⁸ But the value of SciCom goes beyond benefiting society—some experts say better public understanding of science can play an important role in promoting countries' wealth, while it also raises the quality of public and private decision-making and enriches people's lives. "Improving public understanding of science is an investment in the future, say

⁷ Miller, 2001

⁸ Joubert, 2014

⁹ Van der Sanden & Meijman, 2008

¹⁰ Van der Sanden & Meijman, 2002 cited in Van der Sanden & Meijman, 2008

¹¹ Pearson, Pringle & Thomas, 1997

¹² Jacobson, Butterill, & Goering, 2004

¹³ Bauer & Jensen, 2011

¹⁴ Torres Alberio et al, 2011

¹⁵ Dudo, 2013:479

¹⁶ Olson, 2009 cited in Grant et al., 2015:2

¹⁷ Grant et al, 2015:2

¹⁸ Fisher, Lee and Cribb, 2013

Stocklmayer and Bryant.”¹⁹ Hostility, or even indifference to science and technology, whether by shopfloor workers, middle or senior industrial management or investors, weakens a nation’s industry²⁰.

Interpretation of the concept of science communication

Science communication²¹ can be further defined as a term that encompasses communication between:

- groups within the scientific community, including those in academia and industry;
- the scientific community and the media;
- the scientific community and the public;
- the scientific community and government, or others in positions of power and/or authority
- the scientific community and government, or others who influence policy, industry and the public;
- the media, museums and science centres and the public;
- the government and the public.
- wellcome.ac.uk/stellent/groups/corporatesite/@msh_peda/documents/web_document/wtd003419.pdf

We initially asked respondents whether they were aware of the concept of ‘SciCom’. Half of the survey respondents indicated they were aware of the concept, while the other half either did not know about it, or were unsure of their understanding of it. The respondents who managed to define the term came up with a range of explanations for it. Two themes emerged: A so-called ‘traditional interpretation’ that says SciCom encompasses the sharing of scientific findings with scientific audiences. The second included ‘broader audiences’, including people outside the scientific community. Those who used the traditional interpretation described it as “sharing one’s findings at a conference”, “communicating to peers in the field”, and “getting my research published”. Those who included the broader audiences described the term as, “reaching out” or “speaking out about my findings” to society.

The definition above is from ‘Science and the public: A review of science communication and public attitudes to science in Britain’, published in 2000 by the Office of Science and Technology and the Wellcome Trust. It encompasses communication between the scientific community (academics) and non-scientific or non-academic audiences such as the public, media, industry and policymakers. We brought this definition to the attention of the respondents who could not define the term.

¹⁹ Stocklmayer & Bryant, 2012:82 (citing the Bodmer Report of The Royal Society, 1985)

²⁰ The Royal Society, 1985

²¹ 2000 report by the Office of Science and Technology and the Wellcome (2000) cited in Burns, O’Connor, and Stocklmayer, (2003:190—191) on ‘Science and the public: A review of science communication and public attitudes to science in Britain’

The vowel analogy: Know your A, E, I, O, Us²²

Science Communication (SciCom) can also be described as the use of appropriate skills, media, activities, and dialogue to produce one or more of the following personal responses to science:

- **A**wareness, including familiarity with new aspects of science;
- **E**njoyment, for example appreciating science as entertainment or art;
- **I**nterest, as evidenced by voluntary involvement with science or its communication;
- **O**pinions, the forming, reforming, or confirming of science-related attitudes;
- **U**nderstanding of science, its content, processes and social factors

SciCom may involve science practitioners, mediators and other members of the general public, either peer-to-peer or between groups.

Support mechanisms to encourage SciCom

Institutional support is crucial in motivating academics to engage in public SciCom. If academics at NUST are to get involved, they need to know that it is an activity that is recognised by the university and that there are rewards attached. Ideally, the university should incentivise engagement—some European and American universities have incorporated public engagement into promotional criteria for academics²³. If communication with the public is not formally part of their job description, duty statement or project requirement, scientists are unlikely to communicate²⁴, and in the absence of support structures, academics are unlikely to prioritise this activity. The few who do practise public SciCom, generally do so in an uncoordinated manner, outside the control and guidance of the university research office. Without stable science policy structures and reward processes, science dissemination carried out by universities is characterised by amateurism. Researchers engage in these activities of their own accord, with institutional support that is likely to be short-term and sporadic²⁵, if there at all.

However, over the past two decades, scientists have become increasingly aware of the need to popularise their work more widely. It has become an activity they cannot escape, especially if they work on topics that create social debates²⁶. That is easier said than done, not least because of the well-known chasm that exists between academics and the media (see *The Big Divide: Scientists vs Journalists* below).

Views of academics

We set out to establish the level of institutional support academics could expect if they were to communicate their findings. Of the survey participants, 70% believed that the university offered some support, while 30% were either unsure or didn't know. The *NUST Research Policy of 2013: Revised (section 4.1.2:14)* stipulates that “the university encourages research that is relevant to the needs of communities locally, regionally and internationally”, and that such research needs to be communicated to the relevant stakeholders. A 2006 Royal Society study found that leadership support was important for academics to engage, and such support should also encourage junior scientists to participate. Scientists commonly believe there is a lack of external support for public communication of science and technology (PCST) and blame the absence of resources

²² Burns et al, 2003:183—202

²³ Kyvik, 2005

²⁴ Searle, 2011)

²⁵ Torres Alberio et al, 2011

²⁶ Maillé et al, 2010

and managerial support for their lacklustre participation^{27,28,29,30}. It seems likely that scientists who hold this view might be less inclined to communicate their research.

During the survey, 65% of respondents were either not sure whether the university had a SciCom policy or believed there was no policy, while 35% believed a policy was in place. Speaking to the research office, we discovered that NUST, in fact, had no dedicated SciCom policy, although the Research Policy of 2013 was revised in 2014 to address some issues around research uptake and utilisation. The revised policy, *NUST Research Policy of 2013—Revised*, has yet to be ratified and cascaded down to academic staff.

Most academics at NUST have never communicated their findings to public, media and policymaker audiences. One of the reasons for this poor showing is no doubt the fact that the university does not have a policy stipulating SciCom as part of academics' job descriptions, simultaneously offering guidelines and support structures to reach out to non-scientific audiences. Other studies have also found that if communication with the public were part of their jobs, scientists would be more likely to communicate. Two-thirds of the time, however, this is not the case³¹.

Without a SciCom policy it is difficult for the university to reward academics for their communication efforts. Nearly 70% were not sure or didn't know whether the university rewarded public communication. This corresponds to findings of a study of 40 European research institutions,³² which have also failed to recognise public communication as an integral part of the research profession, constituting an organisational responsibility. SciCom is an organisational activity and it should be understood as such³³. When scientists talk about science in public, they do more than purely communicate scientific knowledge to non-scientists—they represent the world of science and all that goes with it³⁴.

Communicating scientific work is enjoyable and scientists typically experience self-growth when engaging with the non-science world. Research bears this out, suggesting that positive attitudes are linked with public communication activities^{35,36}. During our interviews it became clear that academics expected rewards such as financial benefits for engaging in SciCom. Several studies support this, finding that academic staff do not engage in popularising research because they are not rewarded financially, socially or by way of career promotion³⁷. In France, public dissemination had only a weak and generally insignificant impact on promotion³⁸. However, other research suggests that scientists can derive numerous positive benefits from engaging in PCST³⁹, such as gaining support for research funding, increasing discipline visibility, recruiting future scientists and enhancing personal reputations among peers, the public and acquaintances. So scientists who believe that external rewards are to be gained from communicating with the public are more likely to engage in doing so⁴⁰.

So, is it even allowed by the university to communicate publicly? Without a SciCom policy at NUST academics were uncertain about this, with 82% of the survey respondents not knowing whether they had to get approval, or thinking there was no need to get approval. Most academics interviewed held the view that the university did not compel them to communicate their findings, and they believed that the university research office was concerned mainly with publication output for promotion criteria purposes. It appears that scientists with greater autonomy to communicate with non-scientific audiences engage in more PCST activity⁴¹. This poses questions for best practice when it comes to scientific institutions' internal policies about PCST, suggesting that the trade-offs between providing a supportive internal framework for organisational

²⁷ Dudo, 2013

²⁸ Kreimer et al, 2011

²⁹ Martin-Sempere et al, 2008

³⁰ The Royal Society, 2006

³¹ Searle, 2011

³² Casini and Neresini, 2012

³³ Horst, 2013

³⁴ Horst, 2013

³⁵ Martin-Sempere et al, 2008

³⁶ Poliakoff & Webb, 2007

³⁷ Bentley and Kyvik, 2011

³⁸ Jensen et al, 2008

³⁹ Dudo, 2013

⁴⁰ Dudo, 2013

⁴¹ Dudo, 2013

PCST (for example, a network of trained public information officers) on the one hand, and providing experts with freedom to engage in creative public engagement activities on the other, need to be carefully considered and researched⁴².

Interaction with the media

The big divide: Scientists vs journalists

The reasons given for the gap between scientists and journalists are legion, among them scientists' belief that journalists often get the facts wrong, negative stereotyping of one group by the other, power struggles, language use, differing conceptions of what is newsworthy, and the tendency toward sensationalism by some media^{43,44,45,46}. Some scholars believe that inaccuracies in the media can be attributed to a lack of scientific training among journalists. They say training would help journalists understand science in general, discern what constitutes a story of interest to the public, or identify which scientific results are valid. In the end, it is the poorly-informed public that pays the price of strained relations between scientists and journalists⁴⁷.

Prejudice against journalists remains high among scientists, and while it is their job to bring science knowledge to the public, this in no way exonerates scientists of their own obligation to communicate with public audiences. It is true that the public turns to mainstream news media for science news, but one must consider whether that is at least partly because of a lack of alternatives⁴⁸.

During the interview phase of the study, one lecturer said it was "difficult to communicate research findings via the media, since journalists have a tendency to twist or misrepresent facts and findings for commercial purposes. It is also not easy to engage and make appointments with the media, since they are biased towards writing stories on political issues."

Other comments from academics were that the media were interested mostly in articles that lead to more sales of their publications and that stories about science did not sell. One professor went as far as saying that journalists did not understand science, were completely clueless, could not be transmitters of information that they did not understand themselves, and that they could not pass information on to others in an intelligent manner.

Scientists should be urged to reassess their attitude to the media. They should also undergo courses in public communication and develop long-term relationships with journalists. This is easily done by regularly providing background advice and graphics, and providing plain-English versions of their findings for publication, possibly, on discipline-based websites.

To improve their science reporting, journalists, on the other hand, should be prepared to ask more questions of scientists, accept the integrity of the peer review system, write good science stories the way they would detective stories, and when they access the Internet for information, they should do so in a critical frame of mind⁴⁹.

⁴² Dudo, 2013

⁴³ Reed, 2001

⁴⁴ Myers, 1979

⁴⁵ Goldstein, 1986

⁴⁶ Peters, 1995, cited in Maillé et al, 2010

⁴⁷ Maillé et al, 2010

⁴⁸ Suleski & Ibaraki, 2010

⁴⁹ Reed, 2001

Time and power: The villains in the scientist/journalist story⁵⁰

Two factors play a role in the conflict between scientists and journalists—time and power relations.

- **Time:** Journalism and science operate at very different paces. Daily news, for example, is immediate, operating against short deadlines, while accumulating scientific knowledge takes place at a much slower pace.
- **Power:** Each of the two groups (journalists and scientists) sees the other as powerful and fears this strength. For instance, scientists fear the potential power of journalists to destroy their reputations.

It is crucial for scientists and journalists to bridge the gap that separates them and find a way to reach the public with important scientific stories that have an impact on people's well-being.

Views of academics

Even though academics at NUST have research to communicate—and most of the participants reported having been involved in research in the previous five years—82% said they had not used the media to communicate research to the public and policymakers. A paltry 18% of participants indicated that they had engaged with the media. As more and more science news and information become available to the public through the mass media and other, less mediated sources, interaction among scientists, the media and the public is becoming commonplace⁵¹. In stark contrast, a 2008 international survey of biomedical researchers found that 70% of respondents had interacted with the media in the previous three years⁵².

Although the NUST academics had not adopted a culture of engaging the media in their research activities, most (76%) believed that they should partner with journalists. As complex as the scientist-journalist relationship is, it is becoming more and more crucial in modern society⁵³. Whether because of public opinion regarding funding for universities, or the donation of private money to universities, higher education is increasingly dependent on positive media coverage. What is more, media exposure can provide science with better opportunities to benefit society in a myriad of ways, from affecting public policy to the quicker rollout of new drugs and therapies.

The somewhat tumultuous relationship between scientists and the media has been well documented⁵⁴. This study laid bare some negative attitudes academics at NUST hold about working with journalists. Some academics believed that the journalists' failure to interpret scientific stories correctly was the reason for them not sharing their findings in the media, while others believed that only controversial stories received coverage. Yet others believed that journalists had negative attitudes towards covering science stories and that they were generally unavailable when needed to cover scientific research. Journalists, on the other hand, contend that scientists lack a basic understanding of the journalistic process and the communication skills needed to relay information to the public^{55,56,57}.

During interviews, we explored avenues other than the mainstream media that could be used for public science communication. Some academics had used channels such as the science fairs hosted by the Ministry of Science and Technology Development in Zimbabwe from time to time. Still, most of the

⁵⁰ Reed, 2001

⁵¹ Besley & Tanner, 2011

⁵² Peters et al, 2008

⁵³ Tsfati et al, 2011:158

⁵⁴ Besley & Tanner, 2011

⁵⁵ Nelkin, 1996

⁵⁶ Tanner, 2004

⁵⁷ Willems, 2003, cited in Besley & Tanner, 2011

respondents who had never approached journalists said they preferred presenting their scientific findings at academic conferences and publishing in peer-reviewed journals.

Deviating from this notion, some recent studies have challenged the perceived conflict between scientists and the media. Evidence suggests that most scientists consider visibility in the media as important and that responding to journalists is a professional duty—an attitude that is reinforced by university leadership and other science organisations⁵⁸. Some researchers have found that the relationship between scientists and journalists is becoming increasingly positive, as scientists learn to interact efficiently with the media⁵⁹. A 2008 survey of scientists in top research and development countries found that interactions between scientists and the media were more frequent and more positive than previously thought⁶⁰.

Research productivity of academics at NUST

Employment contracts for all academics at NUST bind them to undertake research, be innovative, and generate new knowledge. To establish the state of SciCom at NUST, it was necessary to establish academics' research productivity. In other words, was there sufficient research output to be communicated? At the time of conducting this study, nearly three-quarters of the academics surveyed were engaged in postgraduate studies or other research projects, while 28% were not involved in any research at all.

Almost all of them (93%) had been involved in research activities in the previous five years (2009—2014). However, research productivity measured by publication output was disappointing, with 34% indicating that they had never been published at all, 38% having been published between one and four times, and only 19% between five and ten times.

The university encourages academics to conduct research that is relevant to the needs of communities, nationally, regionally and internationally, and to conduct research that provides solutions to contemporary problems experienced by society. This means that as solutions to community challenges are addressed through research, the research findings should not only be published in journals and left there, but further communicated to the communities concerned and to all relevant stakeholders. NUST's revised research policy incorporates a broad spectrum of science communication activities that are expected from academics, including reaching out to the public and policymakers. The policy⁶¹ states that the university encourages and is committed to supporting the communication of research findings by means of local and international journals, monographs, books, policy briefs, and presentations at conferences, seminars and workshops, among many other channels, including the Internet.

Strategies for public science communication

Public engagement includes a wide range of activities such as lecturing in public or at schools, giving interviews to journalists for newspapers, magazines, radio or television, writing popular science books, writing articles for newspapers and magazines (in print and online), taking part in public debates, volunteering as experts for conferences or *cafés scientifique*, collaborating with non-governmental organisations (NGOs) and associations as advisors or activists, and more⁶². Such forms of popularising science has received little attention in the field of science studies⁶³, and only a handful of single-country studies have tried to establish the extent of these activities in the academic community^{64,65}.

We found that in the five years up to December 2014, only 31% of the academics in our survey had presented guest lectures in public, only 16% had been interviewed by journalists and a paltry 1% had been

⁵⁸ Peters, 2013

⁵⁹ Dunwoody et al, 2009

⁶⁰ Peters et al, 2008

⁶¹ NUST Research Policy 2013—Revised, 2014

⁶² Bauer and Jensen, 2011

⁶³ Felt, 2003

⁶⁴ Kyvik, 1994, 2005

⁶⁵ Jensen et al, 2008

guests on television or radio to share their work with the public. Very few NUST academics have participated in activities meant to reach out through non-scientific channels as compared with similar studies such as a 2006 survey by The Royal Society in the United Kingdom. The British study focused on factors affecting SciCom by scientists and engineers, and found that nearly three-quarters (74%) reported taking part in at least one SciCom or public engagement activity during the previous year⁶⁶.

The 2009 Project for Excellence in Journalism⁶⁷ found that the public experiences science through news and entertainment media, and through interaction with science communicators⁶⁸. Most commonly, science is channelled to the public through newspapers, magazines, television and the Internet. NUST academics prefer to communicate their findings to peers. Almost three-quarters (73%) indicated that they preferred to attend conferences and most opted for seminars that resulted in the publication in journals of papers presented at events. Very few, only 18%, used newspapers and social media.

Right now, science is almost entirely a monologue delivered to a very specific, small audience. As scientists, we pride ourselves on doing meaningful, cutting-edge research and publishing it in top-tier journals. But the problem is, these publications communicate science only to other scientists. Articles are locked behind pay walls, and many of those that are published in open-access journals still lurk behind jargon walls—barriers that keep the scientifically uninformed from understanding what we do because they don't grasp of the terminology.

Of the academics who were aware of the concept of SciCom, only 27% said they had communicated their findings to the public, 21% had communicated to policymakers, and only 11% had communicated to the media. A Norwegian study on popular science publishing and contributions to the public discourse by university faculty staff identified similar results⁶⁹. It found that most faculty academics did not prioritise the dissemination of research. People cannot be interested in something they haven't heard about. Efforts to let the public know about research activities and outcomes should be increased to stimulate people's interest in science. Scientists may be doing excellent work and discovering fascinating things, but most people will not know about it unless the work is discussed in places other than peer-reviewed literature and professional conferences⁷⁰.

The low level of communication with the public, media and policymakers is not confined to any particular discipline or group of disciplines; it is prevalent across all faculties at NUST—in the social as well as the applied sciences. This contradicts research elsewhere that has found that, in most instances, academics from the social sciences and humanities are more likely to communicate science to public audiences. Faculties in the humanities and social sciences seem to be more active in their roles as popularisers and public intellectuals than their colleagues in the natural and medical sciences⁷¹.

Two factors may account for this: First, faculties in the humanities and social sciences have the general public as an important and legitimate audience to a larger extent than other researchers, and second, the 'hard' sciences apply a more codified language of communication than the 'soft' fields of learning. Jargon renders academic language difficult and meaningless to the unscientific world and it may be hard for faculty members to translate their research into language that is easy to understand. The Changing Nature of the Academic Profession (CAP) project—an international survey of academics conducted in 2007/2008 by the University of Kassel—also found that academics in the natural sciences and technology published, on average, the fewest popular articles⁷².

⁶⁶ Besley and Tanner, 2011

⁶⁷ The 2009 Project for Excellence in Journalism (2009 cited in Besley & Tanner, 2011)

⁶⁸ Nelkin, 1996

⁶⁹ Kyvik, 2005

⁷⁰ Shipman, 2014

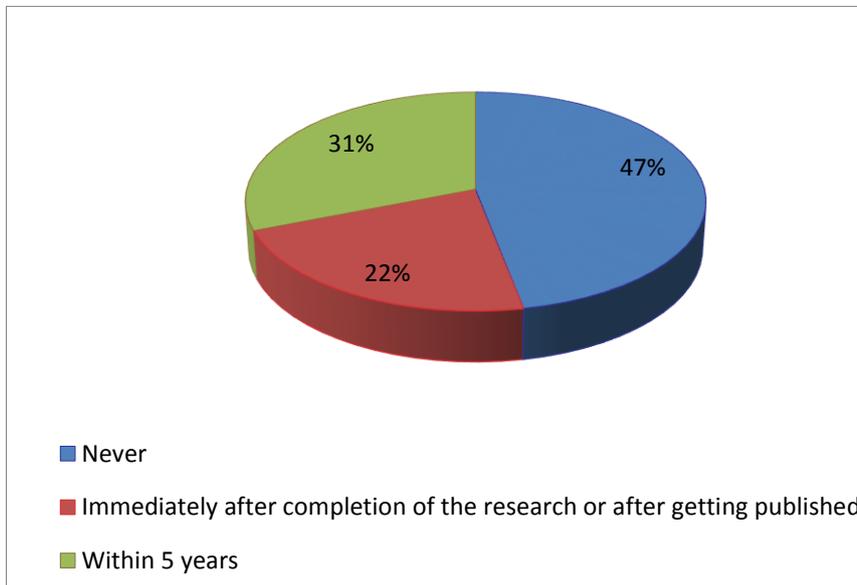
⁷¹ Kyvik, 2005

⁷² The Changing Nature of the Academic Profession (CAP) project, an international survey of academics conducted in 2007/08 by the University of Kassel in 2008 cited in Bentley & Kyvik, 2011

Participation of academics in SciCom activities

Almost half (46%) the academics had never communicated their findings to public and policymaker audiences, while only 22% had communicated their research as soon as it was completed or the findings published. Thirty-two percent had communicated their findings within five years of completion.

Figure 1: Frequency of communication to public and policy audiences (N=198)



The 2000 Wellcome Trust survey⁷³ of British scientists found that only 13% had published a popular science or newspaper article in the previous year, and only 26% had done so at least once during their career. The Royal Society's 2006⁷⁴ survey—which included a broader definition of publishing for the non-specialist public (including for the media, articles and books)—found that 25% of scientists had written popular articles in the previous 12 months⁷⁵. The findings of these two studies—despite the fact that they were national studies—validate our findings at NUST, as they indicate that very few scientists communicate the findings of their research within a year of conducting the research, while most academics rarely communicate throughout their careers.

Why the resistance to communicate?

The 2006 survey of academic scientists and engineers in the United Kingdom puts forward this suggestion as to why scientists did not communicate with the general public:

“The biggest constraint on [public engagement] activity is that it is not seen as part of the research job—let alone an important part of the job. To a large degree this perception is fuelled by institutions' (and the research community's) preoccupation with research and publication rather than education.”

More than half of the respondents (53%) said it was difficult for them to explain scientific facts to journalists in a way they would understand, with only 19% believing it to be easy to translate scientific facts into language easily understandable by the unscientific world. This was the case across all faculties. These findings are in line with those of another study⁷⁶, which found that communicating science to the lay public demands yet

⁷³ Wellcome Trust, 2000

⁷⁴ Royal Society, 2006

⁷⁵ Bentley and Kyvik, 2011

⁷⁶ Baram-Tsabari, 2013

more learning, in this instance, the skill to use nontechnical language when discussing science beyond the scientific community.

Scientists are called upon not only to be clearer speakers, but also to engage in dialogue with the public, as public sentiment is an important factor in science-related policy issues⁷⁷. And they have to do so effectively, conveying meaningful scientific ideas in language that is stripped of scientific jargon. Plain language makes for clear communication⁷⁸. Some people believe that ‘clear language’ means using simple words or ‘dumbing things down’. That is a mistake: what it really refers to is communications that engage and are compelling to the audience⁷⁹. The transition from technical to ordinary speech can be considered code switching to achieve clear communication. Even though more than half of the survey respondents (53%) indicated that it was difficult for them to explain scientific facts to journalists in a way they would understand, they agreed during the interview phase that it was their responsibility to communicate with the public—not only because of the importance of scientific knowledge for society, but also because of society’s right to have that knowledge.

Challenges for SciCom

Scientists elsewhere have similar attitudes toward SciCom. One study found that while about half of the scientists surveyed agreed that they had a duty to communicate their research and its implications to the public, most had complaints about their experience of SciCom⁸⁰. To promote more effective and frequent SciCom activities, we need to find out what scientists think the obstacles are and what would motivate them to become more involved⁸¹.

One of the barriers mentioned by 75% of the academics we interviewed was people’s lack of understanding of scientific process. Researchers often choose not to talk about their work with family, friends and others not part of the research community, because they feel those people are not interested in science or are hostile to it⁸². A 2009 Pew Research Center survey found that most scientists considered the public’s lack of scientific knowledge a major problem. And several scholars have described the deficit model of one-way communication that is prevalent among scientists^{83,84,85}. Deficit-model thinking assumes the belief that public scepticism toward modern science is caused by a lack of adequate knowledge about science. Furthermore, it holds that this scepticism—or ‘knowledge deficit’—can be overcome by providing the public with sufficient information. While it is clearly true that the public has relatively low levels of scientific knowledge, SciCom scholars often complain that literacy is not particularly predictive of views about most scientific topics⁸⁶.

An alternative to deficit-model thinking would be an approach that makes space for non-experts in science discussions⁸⁷.

⁷⁷ Leshner, 2009, cited in Baram-Tsabari, 2013

⁷⁸ Stableford and Mettger, 2007, cited in Baram-Tsabari, 2013

⁷⁹ Sharon & Baram-Tsabari, 2014:3

⁸⁰ Mizumachi et al, 2011

⁸¹ Mizumachi et al, 2011

⁸² Woolley, 2000, cited in Searle, 2011

⁸³ Horst, 2013:760

⁸⁴ Casini & Neresini, 2012

⁸⁵ Davies, 2008

⁸⁶ Besley 2011

⁸⁷ Besley (2011)

Definition: Deficit model of science communication

“In the deficit model, science is typically transmitted in a one-way, top-down fashion from the scientists (who are the experts) to people or public audiences (who are regarded as ignorant), with the expectation that the people will support and appreciate science. It assumes that members of the public have empty heads, just waiting to be filled with scientific information.

“This model is criticised mainly because it does not take into account that people have diverse views, concerns and beliefs that will influence how they respond to scientific information.

“The deficit model remains implicit in much science communication, probably because many scientists are still convinced that the public will share their enthusiasm and support for science if only they understood it better. But, as the public-understanding-of-science movement of the 1980s discovered, to know science is not necessarily to love science. It is not true that people will appreciate and support science when given more information. On the contrary, more information may often lead to more questions and concerns, and a polarisation of views.”

Marina Joubert, 2016

Nearly two-thirds (65%) of the NUST academics saw SciCom as an optional activity and not part and parcel of their work. This corresponds with an Australian study⁸⁸, which found that Australian scientists also regarded public communication as an optional activity and not a basic part of their work. Academics are often accused of being reluctant to engage in communicating with the public because they are first and foremost interested in pursuing their research interests and furthering their careers⁸⁹.

Another problem—identified by 25% of the interview subjects—is the occasional sensitive nature of research content. Sometimes research is politically sensitive and, as such, findings may be censored or not communicated to the public at all. The censorship of commercially and/or politically sensitive science is described as the ‘code of silence’ that many scientists find themselves operating under on threat of losing their funding or jobs, or both⁹⁰. Secrecy in science sees more and more academics having to kow-tow to corporate and political interests, neither of which values the production of knowledge for the public good all too highly⁹¹.

Eighty percent of the academics blamed a lack of time and heavy teaching loads for poor levels of public engagement. Another study found that one in five of all comments described the lack of time as a hindrance to communicating with the general public⁹². In other words, communication with the public is not considered part of the scientist’s job, nor is it otherwise recognised or rewarded. Scientists are already overburdened and they tend to see non-research tasks as beyond the scope of their work. All over the world, time pressure is frequently used as an excuse for not engaging with the public⁹³.

Academics have competing commitments and they allocate time according to the value a given activity may have for their careers⁹⁴. When asked how important it was to find time for public engagement compared with other work activities, most British scientists in the Royal Society study saw public engagement as less important than other activities⁹⁵. It may also be that scientists believe public engagement to be more time-consuming than it really is. And some academics might even genuinely want to spend more time on public

⁸⁸ Gascoigne and Metcalfe, 1997

⁸⁹ Checkoway, 2001 cited in Bentley & Kyvik, 2011

⁹⁰ Edmeades, 2009, cited in Searle, 2011

⁹¹ Searle, 2011

⁹² Searle, 2011

⁹³ Mizumachi et al, 2011

⁹⁴ Gascoigne and Metcalfe, 1997

⁹⁵ The Royal Society, 2006

engagement, but the existing demands of teaching, research and administration may leave little time for additional activities⁹⁶. If academics believe that public engagement is a secondary activity, it is unlikely that they will spend more on it unless they get to spend less time on other activities⁹⁷.

NUST offers no rewards or incentives in the form of career progression for public engagement, and without a good reward system, academics are not likely to change their behaviour. Other studies have also found that most researchers do not prioritise dissemination of research; in the first place, they say it is not possible or meaningful to popularise every kind of scientific work and, in the second place, they didn't want to waste their time because this kind of activity is not rewarded⁹⁸.

As of January 2015, NUST further reduced its funding for research and indicated that conference attendance (including attendance to present papers) would no longer be funded by the university, citing financial problems as the main concern.

Developing Academics' SciCom Skills

"With the exception of a few people ... we don't know how to communicate with the public. We don't understand our audience well enough; we have not taken the time to put ourselves in the shoes of a neighbour, the brother-in-law, the person who handles our investments, to understand why it's difficult for them to hear us speak. We don't know the language and we haven't practised it enough"⁹⁹.

Scientists themselves have to take some of the blame for problems with SciCom, as the quotation above rightly suggests. They are not involved in outreach because they do not know *how* to become involved¹⁰⁰. To overcome some of the barriers, an appropriate training programme is necessary. While 26% of academics agreed that they had some formal training in SciCom, nearly three-quarters (74%) indicated that they had never received any training. When interviewed, the academics, especially the lecturers (60%), said they did not possess the skills to engage in SciCom activities.

SciCom training for scientists in academic institutions is important in guiding them to engage with the public¹⁰¹. It could be offered in the form of courses, workshops and/or seminars designed to prepare scientists to interact with the media and to teach them to speak more often and more clearly to the public and policymakers¹⁰². Such training will also go a long way towards improving science–media–public relationships.

Most of the academics surveyed (83%) were willing to attend training events. Seventeen percent were either not willing to undergo training or not sure that they wanted the training. This corresponds to findings of another study, which found that scientists participating in SciCom workshops found the training beneficial, indicating that the sessions had provided them with useful skills that would help them discuss science with the general public¹⁰³.

Various personal skills are needed to communicate with the public, media and policymakers effectively. Skills may directly relate to communicating science at an interpersonal or public level, or more indirectly to designing, organising or facilitating science activities. These days, several SciCom courses are offered at

⁹⁶ Bentley & Kyvik, 2011

⁹⁷ Bentley & Kyvik, 2011

⁹⁸ Kyvik, 2005

⁹⁹ Treise & Weigold, 2002:313

¹⁰⁰ Woolley, 2000, cited in Searle, 2011

¹⁰¹ Besley & Tanner, 2011

¹⁰² Peters et al, 2008

¹⁰³ Miller, Fahy, & Team, 2009, cited in Besley and Tanner, 2011

various centres around the world. Some focus purely on science journalism, while others teach a broader range of skills to enable science workers to communicate more effectively with one another and with the general public¹⁰⁴.

Most of the NUST academics (80%) agreed that training in SciCom directed at non-academic audiences would be useful to their research work and to the university, so there is a need for training programmes. Among training available in Africa are the courses offered through the DRUSSA initiative. Between 2012 and 2015, several researchers and research managers at selected universities across sub-Saharan Africa attended training courses presented by Marina Joubert and offered through the Centre for Research on Evaluation, Science and Technology (CREST) attached to the University of Stellenbosch in South Africa. These short courses have been held in Southern Africa (Stellenbosch), East Africa (Nairobi) and West Africa (Accra).

Internationally, institutions such as the American Association for the Advancement of Science, The Royal Society and the Center for the Public Awareness of Science at the Australian National University (ANU) offer SciCom training, while the European Network of Science Communication Teachers (ENSCOT) have produced modules designed to be used and adapted by science communication teachers and students across the European Union. These training programmes cover strategies to convey key messages to the public or the media in a clear manner. Scientists get to learn how to translate complex science into easily understandable formats. The programmes also emphasise presentation skills, for example giving public lectures and holding press conferences¹⁰⁵.

When interviewed, it became clear why 20% of survey respondents had mixed feelings about SciCom training. They were concerned about how such training would be offered and by whom. Another concern was the divergences in academic disciplines; in other words, if a professional science communicator were engaged, they would have to understand all scholarly disciplines and their needs. This also meant that a professional science communicator would have to be employed to offer appropriate training programmes across all academic disciplines.

To make science more meaningful to people—whether through translating complex concepts or by creating dialogue—a science communicator can play an important role and enhance the work done by academics. The type of science communicated can be specialised or diversified, across any scientific field, be it physics, forestry, robotics, biology, astronomy, pathology or geography¹⁰⁶.

Conclusions

From our review of literature we learned that few studies on SciCom have specifically examined the ideas and assumptions of scientists about public communication and engagement, despite the fact that such studies would certainly affect the ways in which they engaged the public¹⁰⁷. We tried to address the status and strategies of public SciCom by academics at NUST. We presented academics' views on their engagement with public, media and policymaker audiences, the strategies they used for SciCom, the frequency with which they engaged in public SciCom, and the perceptions about interactions between academics and the media. We also looked at the barriers scientists faced as they engaged in public SciCom.

We found that very few academics at NUST (see *Figure 2*) have participated in public engagement activities such as giving guest lectures, being interviewed by journalists, appearing on radio or television, writing newspaper articles or engaging the public through social media. Academics were concerned mainly with communicating their findings to scientific audiences at seminars and conferences, and publishing in peer-reviewed journals. The reason for this is primarily the fact that the contracts of academics at NUST do not stipulate SciCom as a requirement for promotion. Therefore, scientists still prioritise scientific publishing,

¹⁰⁴ Burns et al, 2003

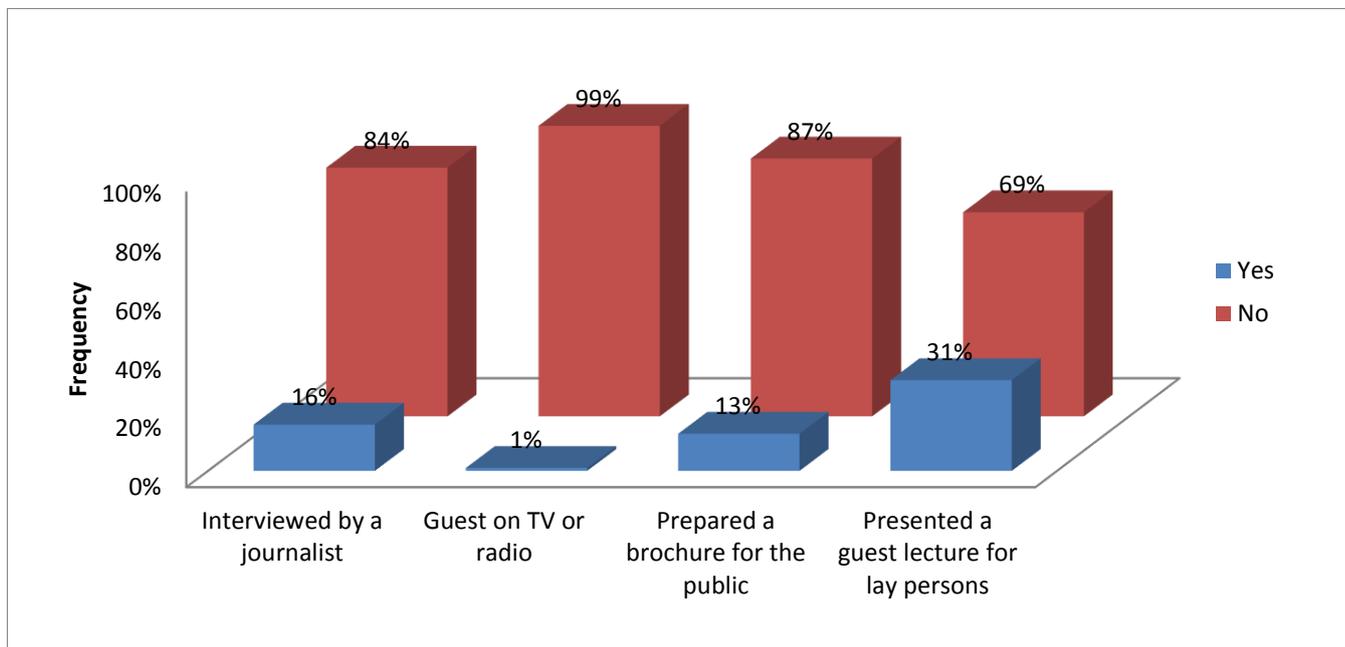
¹⁰⁵ Mizumachi et al, 2011

¹⁰⁶ Mullan, 2004

¹⁰⁷ Davies, 2008

peer recognition and teaching over public SciCom to get promoted¹⁰⁸. Across all academic faculties at NUST, very little communication is directed towards public, media and policymaker audiences.

Figure 2: Participation in public science communication activities (N=198)



Of the 198 survey respondents, only 31% had presented a guest lecture for lay persons, while only 1% have been guests on television or radio.

A significant finding of this study was that most participating academics at NUST (66%) had never communicated their research to public, media and policymaker audiences. One of the reasons for this could be that they were not recognised and rewarded by the university for public SciCom. Academics therefore felt strongly that public SciCom was not an integral part of their jobs and, as such, it wasn't seen as a priority among their other duties. Academics generally believed that it was difficult for them to explain scientific facts to journalists in a way that non-scientists could understand. This was likely a contributing factor that led academics at NUST to shy away from reaching out to public and policymaker audiences through the media. Put differently, the academics lack the confidence to communicate their research in a manner that eliminates jargon and makes their research understandable.

Organisational culture and leadership strategies on public communication are important, since they either encourage or discourage individual scientists to popularise their research. NUST has no SciCom policy to guide academics and compel them to reach out. Organisational priorities spelled out in the contracts of academic staff members have always stipulated teaching, research and community service. The concept of community service is not well defined in terms of what it entails and has been replaced by the newer and narrower concept of the 'civic scientist', which is all about the relationship between scientists and the public¹⁰⁹.

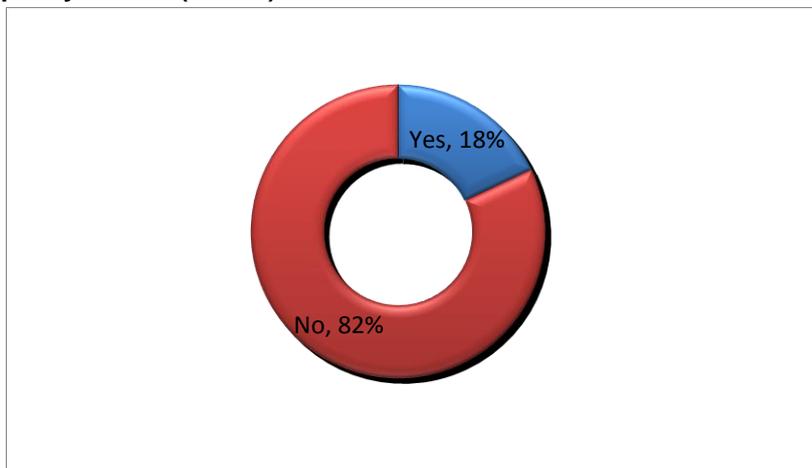
Even if academics were encouraged to engage in SciCom activities, the university does not emphasise engaging public, media and policymaker audiences. Also, it is not clear whether academics need approval from the university to engage in public SciCom. After 24 years in existence, the university research policy (NUST Research Policy of 2013—Revised) was updated only recently to include aspects of research uptake and SciCom. The lack of a clear position by the university on mandating academics to engage in SciCom has meant that what little engagement has taken place has been done as an optional activity.

¹⁰⁸ Kyvik, 2011. Jensen et al, 2008

¹⁰⁹ Kyvik, 2005

We also found that academics overall did not use the media for public SciCom (see Figure 3), but they believed and saw value in engaging with journalists to reach out to the public and policy audiences.

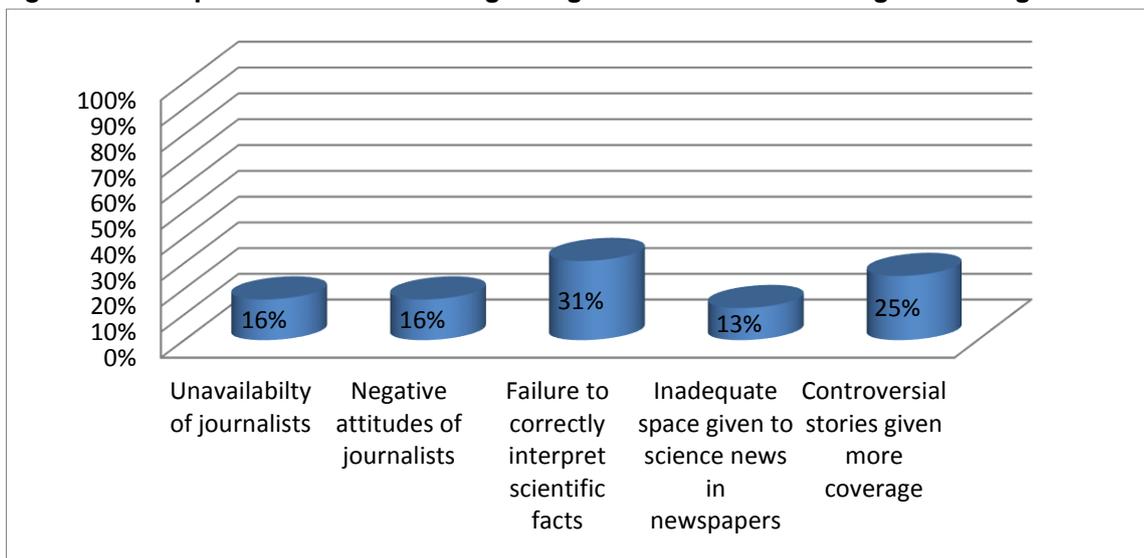
Figure 3: Academics who use the media to communicate research (science) to the public and policymakers (N=198)



Of the survey respondents, 82% did not use the media to communicate science

Most academics have several negative attitudes and perceptions about working with journalists, including the belief that journalists failed to interpret their findings accurately. As a result, they would not share their findings with journalists. They say controversial stories are given more coverage in the media, journalists have negative attitudes towards covering science stories and are generally unavailable when needed (see Figure 4).

Figure 4: Perceptions of academics regarding the barriers to reaching out through the media (N=120)



Academics have several negative beliefs about journalists

Academics who had never approached journalists preferred using other avenues for public SciCom, such as science expos and trade fairs. Further afield, in contrast with our findings at NUST, a review of the literature has shown that the relationship between journalists and academics is positive.

We identified various reasons why academics were reluctant to engage in public SciCom activities. One of the main obstacles was academics' perception that the non-scientific world had no interest in their research. This attitude would also explain why academics at NUST rarely reach out to the public and policymaker audiences.

Another barrier is the censorship of politically sensitive findings. Participating academic staff felt that it was difficult, if not impossible, to communicate such research, since the extreme penalty for such an action in Zimbabwe could be a charge of treason. A lack of time and heavy teaching loads were further blamed for academics' failure to engage. NUST is a teaching university and the existing demands of teaching, research and administration may leave little time for additional duties. Furthermore, the university funds research activities poorly because NUST is financially unstable and, as of 2015, research funding for conference attendance was cut from the Research Board budget. The fact that funds for research at NUST are limited ripples out to have an impact on funding for public SciCom activities—this may be one of the reasons why the university does not reward them. It therefore remains an optional activity for academic staff.

To make it easier for academics to engage in public SciCom activities, a suitable training programme is necessary. Academics expressed concern that they were not properly trained in public SciCom and said they'd welcome training programmes to equip them with the skills to discuss science with outside audiences. They said there was a need for a dedicated office to equip them with these skills.

Our findings suggest that the university should engage a professional science communicator to organise workshops, seminars and courses for academic staff, so that they can become effective science communicators with the desire to make science more meaningful for outsiders. Academic staff agreed that science communication training would be useful to their own research and to the university.

Recommendations

If a university understands the importance of communicating its science and improving its communications with key audiences better, this can create partnerships, improve reputation and attract funding.

“In the 21st century, scientific institutions will be judged not only on what they've discovered, but also on how effectively they shared it and how valuable to humanity it proved to be¹¹⁰.”

Five recommendations for the university	
Recommendation 1	<ul style="list-style-type: none"> The university should draft a SciCom policy to direct academic staff on the procedures to be followed in engaging non-academic audiences such as public, media and policymaker audiences in SciCom activities. The SciCom policy should be operationalised alongside the university's promotional requirements, and SciCom expectations spelled out in the contracts of academic staff members. Existing contracts need to be amended to mandate academics to engage in public SciCom. This may also be made a requirement for staff members who want to be tenured.
Recommendation 2	<ul style="list-style-type: none"> The university should redirect its focus on improving funding for research and set aside a budget for public SciCom with rewards and incentives to motivate academics. Academics should be encouraged to engage in public SciCom activities where costs are minimal, such as media interviews, social media and public talks, among others. Researchers should also be encouraged to attract further research funding from external sources. This may even improve the quality of research at NUST.

¹¹⁰ Cribb 2001:12 cited in Mullan, 2004

Recommendation 3	<ul style="list-style-type: none"> • The university should introduce training programmes for public SciCom. Continued educational efforts to convince scientists that they have a professional obligation to disseminate their work beyond the scientific community may increase media motivation and SciCom practices. • Training will increase comfort and confidence, while also raising awareness of the importance of SciCom. • If the university launches information campaigns and embarks on faculty training in effective mass communications, we may hope that the ties between scientists and journalists will become stronger, improving also the public's level of scientific knowledge and understanding¹¹¹.
Recommendation 4	<ul style="list-style-type: none"> • NUST should employ a professional science communicator. From comments by most academics it is evident that they require the help of a professional to ease the burden of packaging research into forms that can be widely communicated. • Science communicators can be of help when a scientist—be it because of a lack of skill, time, or any other reason—chooses to focus on the science rather than the communication of science¹¹². • Besides engaging the outside world, a science communicator can coach scientists to become more effective communicators themselves. This will enable science to transcend from laboratories and research papers into a wider forum for debate, discussion or acknowledgement.
Recommendation 5	<ul style="list-style-type: none"> • As a university of science and technology, NUST strives to contribute positively to the advancement of humanity by providing knowledge-based solutions to scientific, technological, economic and social challenges. It is important to do research that addresses society's problems and that the university communicates these research findings to relevant communities. • Because of economic challenges, academics currently face heavy teaching loads. This leaves inadequate time to engage in research and to communicate it. The university should realign the duties of academics, prioritising both the research component and public science communication.

Four recommendations for academics

The 1985 Bodmer Report¹¹³ states that scientists in general must recognise that they have a serious responsibility to speak to the non-scientific world. Scientists are also democratically accountable to those who support scientific training and research through public taxation.

If the public is not told about the scientific research it supports, it is unlikely to worry when the level of support is reduced.

Academic staff at NUST need to change their mindset in terms of the following:

Recommendation 1	<ul style="list-style-type: none"> • Currently, public SciCom is viewed as a low-priority activity, mainly because it is not rewarded financially or by way of career advancement. Rewards for SciCom should not always be associated with external rewards; even intrinsic rewards will make a difference.
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¹¹¹ Tsfati et al., 2011

¹¹² Mullay (2004)

¹¹³ Bodmer Report, 1985

	<ul style="list-style-type: none"> To address the obstacle of diminished research funding, instead of expecting funding from the university, academics should source research funds from external sources. They should look for research grants outside the university, especially grants that make financial allowances for communication and engagement. They should consider applying specifically for SciCom money.
Recommendation 2	<ul style="list-style-type: none"> The scientific culture of publishing in peer-reviewed journals—associated with academics’ professional advancement opportunities—should be combined with the practice of public SciCom. Communication planning is ideally included from the very beginning of a research project . Academics should incorporate communication plans in their research proposals, and such plans should set out the popular communication of the right messages, to the right people, at the right time. This applies equally to communication with policymakers¹¹⁴. The SciCom plan should define communication objectives, the groups or individuals the communication is targeting, communication activities and timeframes. This practice will eventually bring about a culture of public SciCom for academic staff in all their research endeavours.
Recommendation 3	<ul style="list-style-type: none"> Academics should embrace public SciCom as a core duty. Academics should see effective communication as returning a debt created by public support—this can create favourable attitudes toward science and science funding among policymakers and the broader public by making clear the benefits that scientific activity offers society.
Recommendation 4	<ul style="list-style-type: none"> Academics’ attitude toward public SciCom has to move away from deficit-model thinking towards interactive participation, where engagement with the public is a two-way process, with feedback and participation from both ends. By moving away from the deficit model to a more dynamic, non-directive transactionable vision, the goal of SciCom also changes. In the dynamic vision, sender and target group or receiver negotiate about meanings and facts¹¹⁵.

Three SciCom research recommendations

This study focused on a single university (NUST) and on the views of its academic staff members. We recommend that further research studies be conducted in Zimbabwe on a national scale, as follows:

Research Recommendation 1	<ul style="list-style-type: none"> A national survey of scientists focusing on public communication of science and technology in Zimbabwe—the study should involve all the public universities in the country, as well as all the relevant public-sector research organisations;
Research Recommendation 2	<ul style="list-style-type: none"> An investigation into how the Zimbabwean public and scientists view science and society issues, similar to the study conducted by the Pew Research Center in collaboration with the American Association for the Advancement of Science (2015), but adapted to local conditions; and

¹¹⁴ Von Grebmer, 2005

¹¹⁵ Dierkens and Von Grote, 2003

**Research
Recommendation 3**

- A survey of Zimbabwean scientists' incentives and impediments to communicating through the media.

Conducting such studies in Zimbabwe will make a significant contribution to the developing field of SciCom. The experiences and case studies gathered will encourage and improve public science communication in Zimbabwe. This should be very valuable to African as well as global research on public SciCom.

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