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Language, learning and engagement: Science communication skills among scientists in South Africa

Science communication in South Africa navigates the intersections of scientific knowledge and diverse social and economic landscapes. Science communication educators emphasise a multidisciplinary approach, integrating communication theories with practical skills for bridging the gap between science and society. Our understanding of science communication in South Africa has historically been constrained by a paucity of data describing language use amongst scientists as an essential part of the science system. This paper explores the characteristics of language diversity amongst scientists. We identify ways in which science communication can be applied to make science more accessible. Demographic characteristics of scientists reveal promising levels of multilingual diversity. Young black, female South Africans have a higher likelihood of being multilingual. On the basis of this analysis, we propose recommendations for enhanced resourcing of South African science communication skills development as well as capitalisation on existing linguistic and cultural awareness skills.

Significance:

This paper emphasises the transformative power of multilingual science communication in South Africa. While science communication plays a critical role in unlocking the potential of science, technology and innovation among linguistically marginalised communities, it can be constrained by limitations in linguistic access and scientific literacy. Scientists play a pivotal role in articulating the value of science to the public. This analysis shows a significant set of multilingual and bilingual scientists in South Africa. Our recommendations call for enhanced resourcing and training of scientists to utilise South Africa's rich linguistic heritage, thus creating stronger society–science relationships.

The significance of multilingual science engagement

Research has demonstrated that engaging with science in a home language benefits learners and citizens alike.[1-4] The presence of multilingual scientists in a science communication system presents opportunities for encouraging greater engagement in local languages.[5,6] However, we know relatively little about the motivations and barriers that influence South African scientists' science communication behaviour.[7] This paper explores language diversity and skills amongst a group of 300 South African scientists. Through our analysis of these data, we identify opportunities to make science more accessible. Our study is set within the science communication system of South Africa's linguistically diverse society, itself structured by intersecting inequalities. In the digital age, online science communication is critical for informing public decision-making, and for combating misinformation and disinformation.[5] Within the science communication system, scientists engage with distinct audiences in their unique social and linguistic contexts. Gaining a better understanding of scientists' multilingual capabilities has previously been constrained by a paucity of data. Our study therefore expands this empirical frontier, which informs new findings and recommendations.

South Africa's White Paper on Science, Technology and Innovation[8] and our national Science Engagement Strategy[9] position science communication as a foundation for building science literacy and promoting public trust in science. Effective science communication requires practitioners that are capable of engaging with diverse communities. Better understanding and supporting such capabilities presents a unique opportunity for public policy to strengthen science engagement in South Africa.

In the South African science, technology and innovation (STI) policy landscape, science is recognised for its transformative potential within marginalised communities[10], and scientific literacy is critical for unlocking this potential[11]. Science communication underpins science literacy and engagement, performing an essential function within South Africa's National System of Innovation. Scientists play an important social role, articulating the value of science, technology and knowledge, and the impact these have on different publics. This role is apparent in diverse contributions to the literature exploring the impact of multilingual science communication in various contexts, its impact on health, environmental changes, migration and inclusion, and English as the international language of science.[3,6,12,13]

South Africa is characterised by generally low public engagement with science.[14,15] The history of apartheid excluded a large proportion of the population from opportunities, education and employment, including in areas of science.[1,16,17] These unequal legacy effects persist, and the adoption of appropriate science communication language is therefore critical to expand the reach and relevance of science.

The language bias inherent in science communication media have an impact on how publics engage with scientific evidence, with digital media playing an increasingly important role.[6,18-20] This evolution is characterised by positive and negative effects, and the advent of a 'post-truth' era has created challenges for the communication of science. The importance of language diversity in ethically mediating access to and benefit from science has become

salient and has been shown to add value in multiple settings.[21] Science communication in South Africa is predominantly conducted in English[22], impacting the democratisation of the process of science[23].

Scientists, communication and language

Science and its communication occur in systemic contexts, and communicators can operate in a variety of professional roles. A 'scientist' in this study is defined as a trained professional working in the physical, natural or social sciences, who is engaged in the creation of knowledge, processes or methods to gain and share understanding of science and its benefit to society.[9,24] Scientists are increasingly required to communicate about their work, enabling the processes of information transmission, assimilation, critical reflection and public awareness.[25,26] Increasingly, communication forms an important part of contemporary scientific institutions, which have needs for visibility, public relevance and facilitating dialogue, and at times intersecting with digital media culture.[27,28]

Research into science communication has a rich and multidisciplinary history[29,30], centred on evidence and discourses from the Global North[31]. Broadly, the focus shifted from *scientific literacy* in the 1960s, to the *public understanding of science* paradigm in the 1980s – centred on improving public attitudes and scientific knowledge deficits.[29] Emerging from a critique of both of these paradigms, the *science in society* approach reconceptualised the public as knowledge participants, rather than as objects of a 'knowledge and attitude deficit'. This encouraged critical thinking, debate and public participation in science, with scientists playing a significant role in facilitating these dialogues.[31-33] Revised conceptions of language, public attitude and power relations between scientists and society provided greater insight into the social processes of science communication.[6,12,13,19,21,34] This theoretical shift championed the implementation of contextual models of science communication, and supported an increased focus on meaningful public participation and engagement.[30]

Meaningful public participation is mediated by language. English remains the international language of science[35], acting as a gatekeeper to participation in the scientific discourse for non-English-speaking publics[11,19]. This presents a challenge for broad science inclusion, particularly in the Global South. However, it also highlights an opportunity for multilingual science engagement practices. Many South African Indigenous language groups lack the technical terminology to articulate scientific concepts, and ongoing work remains important in achieving language equivalence across Indigenous language groups.[23] This work recognises the embedded cultural knowledge within Indigenous languages and has the potential to strengthen domestic science engagement. Multilingual science communication can enable scientists to design bidirectional engagements, reframe complex science and impart its relevance to diverse groups.[6] The incorporation of Indigenous languages in science communication can enhance public trust, challenge misinformation and increase research uptake.[36,37]

Teaching and learning science communication

Effective science communication relies extensively on the skills of its practitioners, particularly amongst scientists for whom such skills are highly dependent on the quality and efficacy of the training opportunities they have received.[38] The objectives of science communication training varies across contexts, but broadly include improving skills associated with the outcomes of scientific literacy, engagement, critical dialogue and public trust. Teaching this skill set empowers scientists to effectively engage with varied audiences, incorporating transdisciplinary approaches in science engagement efforts.[39] This learning can take place in both formal and informal settings, from universities, colleges and professional development programmes to informal settings that may include mentorship networks, online learning and citizen science activities.[40,41]

South Africa has benefitted from increased policy support for science communication and engagement over the last two decades.[8,9,14,42] The South African Research Chairs Initiative in Science Communication (SARCHI) and the Centre for Research on Evaluation, Science and Technology (CREST) have supported science communication in South Africa, acting as catalysts for knowledge creation, dialogue and recognition as a professional and academic discipline. CREST offers dedicated learning programmes, including postgraduate and PhD programmes, in areas related to science communication, as do the University of Limpopo and Rhodes University. It must, however, be noted that the majority of formal learning opportunities in science communication in South Africa are at the postgraduate level, and undergraduate learning opportunities, although growing, remain fewer.[8] Outside higher education, both formal and informal skills development opportunities are facilitated by private and non-profit organisations, whose objectives for science communication often are different from those of scientists, but contribute to science communication activities in multiple languages and digital media.[23,43]

In South Africa, the learning of science communication is undertaken almost entirely in English. The development of linguistically diverse science communication teaching and learning could contribute to overcoming this bias. Such enhanced teaching and learning would require support from government, as well as a wide range of social partners, along with an expanded Indigenous language lexicon.

Methodology

Data analysis draws on an existing survey data set produced for the report 'Assessment of the Science Communication Skills Needs of South African Scientists'.[44] A 'scientist' in this study was defined as a professional actively working in the physical, natural or social sciences and engaged in the creation and sharing of knowledge for the benefit to society.[9,24] This definition aligns with the Organisation for Economic Co-operation and Development's Frascati Manual definition, and with the definition used in the of South African White Paper on STI, which foregrounds the knowledge generation and engagement roles of scientists. The study focused on individuals who self-identified as a 'scientist', including a range of professional designations, from researchers, lecturers, professors, professionals and scholars in citizen science projects, providing an approximation for understanding the broader population of South African 'scientists'. Our sampling was inclusive of a number of public sector organisations in which scientists are employed, including national science institutions, departments of higher education, universities, science councils, research chairs, and other non-profit and non-governmental organisations.

The survey was conducted between April and June 2022. Data were collected in English using an online survey, which was accompanied by a digital popularisation and information campaign, in collaboration with 78 South African organisations in which scientists are most frequently employed. The popularisation campaign included weekly posts on all institutional digital channels, supported by participating partner organisations representing government, science councils and not-for-profit and higher education organisations. The campaign included a workshop with these organisations, in which a toolkit document was shared to assist in the internal dissemination of the survey materials to reach the scientists in their employ. The survey contained 64 items and took approximately 15 minutes to complete, with access granted via a shareable weblink.

The research was influenced by the work of Besley et al.[45,46] who examined scientists' views on communication training within the USA. Besley et al. developed 64 questionnaire items to understand scientists' areas of communication efficacy through self-reported experiences of technologies, social norms, behaviours, experiences and attitudes to science communication.[47,48] These items were complemented by an online informed consent and detailed information sheet, as well as anonymised demographic questions. Questionnaire items were grouped into four categories: (1) Internal Efficacy, containing 16 items about scientists' individual skills, behaviour and communications experience, (2) External Efficacy, containing 22 items about the environments supporting scientists' communication activities, (3) Social Norms, containing 10 items and (4) Technology Usage for science engagement, containing 9 items.

To better understand scientists' communication skill sets, our study had three objectives: (1) understanding scientists' current and future skills needs, (2) determining the enabling communication factors and challenges experienced by scientists and (3) gaining insight into the influence of technology, social norms and socio-economic factors influencing the science communication of scientists. The survey yielded

a total of 451 responses; after data cleaning activities that isolated responses from participants identifying as a scientist, the sample informing this analysis is consisted of 300 responses. The full population of South African scientists is not accurately known, thus producing an estimation of a response rate is not possible, although it is anticipated to be low as a proportion of the total population. The data, however, provide a basis for inferring broader patterns of communication practice among this group of scientists. Data analytics was performed in SPSS (n = 300) to explore the development of a demographic profile of scientists, their communication capabilities, experiences and audiences engaged.

Scientists' language use, audiences and multilingualism

Demographic profile of scientists

Within the context of this study, scientists who have been involved in public communication of science activities and events more often appear to be young, black, female, holding a postgraduate qualification, and based in the Gauteng or Western Cape provinces of South Africa. Among this group, 74.7% report being a researcher, lecturer, or being involved in medical or engineering research, while, as expected, relatively few scientists report being a professor (3.3%) or primarily involved in citizen science projects (1.0%). By population classification, more than half (53.7%) are black African, 24.3% are white, while Indians (9.0%) and coloured participants (7.7%) made up the smaller share. The main geographical locations of scientists in this research are Gauteng (39.3%), the Western Cape (26.7%) and KwaZulu-Natal (13.7%), as the three major provinces of South Africa and the remainder (20.3%) are distributed across the remaining six provinces. Approximately a third (32.4%) hold an undergraduate or honours degree, while more than half (67.4%) hold a master's or doctoral qualification. The survey response may have been influenced by its online modality attracting the attention of scientists already engaged in public science communication, STEM social media and online professional networks.

Experiences and capabilities of scientists

Scientists self-reported their level of science communication capabilities, with the largest proportion (34.0%) reporting an *intermediate* level of capability, while approximately 24% reported *advanced* science communication skills. Public interface forms a small but increasing part of the role of scientists; participants reported a range of experience in this area. Public safety protocols following the COVID-19 lockdowns limited the number of science events in the period preceding April 2022. Despite this, more than half (57.3%) of the respondents had attended a science engagement event, with 40.7% having publicly presented scientific work in the preceding 24 months. Scientists in this study reported a greater number of years of science communication experience, with the largest proportion reporting 1–5 years (32.7%), followed by 6–10 years (19.0%) or more than a decade (12.3%) of science communication experience. Although a small proportion had not presented scientific work to the public, most of the 300 respondents reported having done so over several years.

Scientists largely reported finding enjoyment in their public communication activities (67.3%). When asked to rate their confidence in public speaking on a scale of 1 to 5, the largest proportion (38.3%) indicated a rating of 4, while a further 23.3% reported the highest rating of 5. These findings can be seen as further positive indicators of the science system's capacity for building more confident science communication environments that offer meaningful experiences at the interface of scientists and the publics.

Audiences engaged

Scientists engaged a range of different audiences, requiring different skills, media, resource and engagement approaches. The Science Engagement Strategy[8] includes a framework for 11 audience types, which has been considered in the data analysis. Audiences most frequently engaged with include other scientists (16.9%), learners (16.1%), students (15.0%), educators (13.3%) and public audiences (10.8%). When asked which audiences they felt most comfortable presenting to, scientists most frequently reported students and learners (33.4%) and the general public (22.1%), followed by government departments (13.2%), community groups (11.1%) and policymakers (9.6%). While a large proportion of scientists reported not engaging with all 11 categories of the publics, there were nonetheless respondents engaging with the private sector, science interpreters, Indigenous communities as well as tourists and journalists within the course of their science engagement activities.

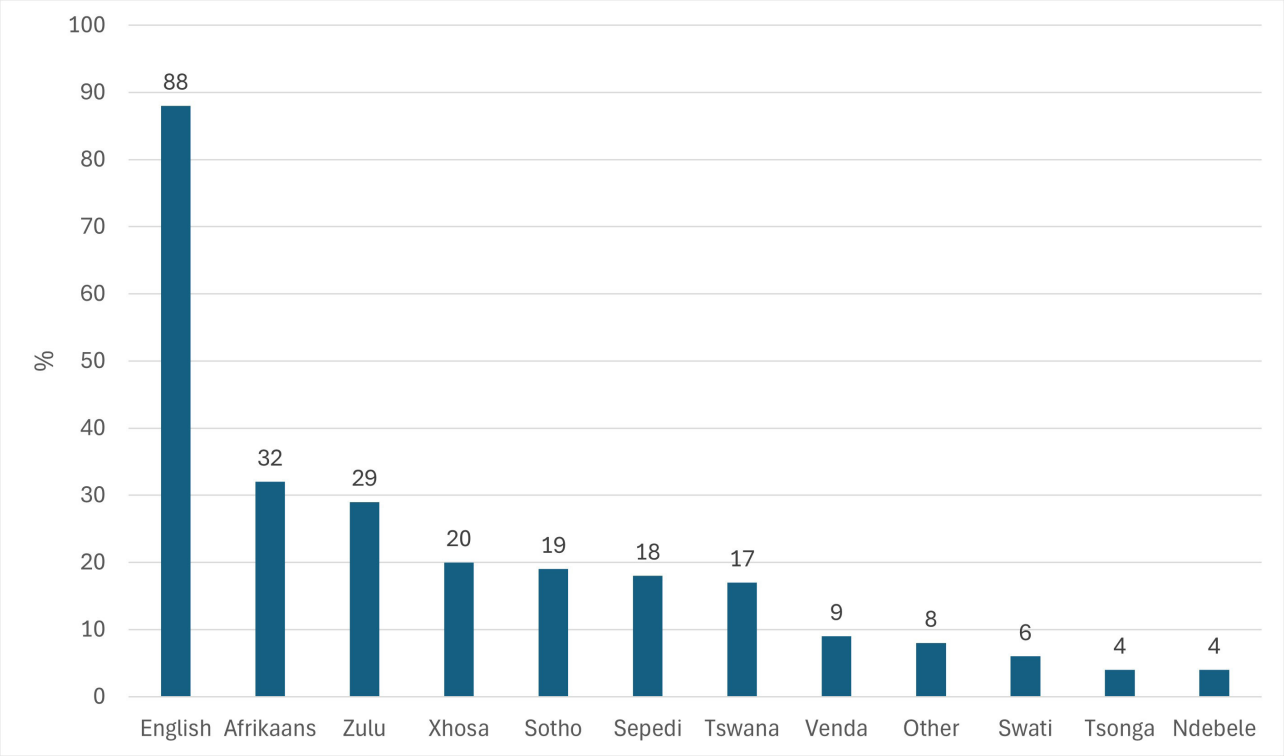

Figure 1: Languages spoken among a sample of scientists (%) (n = 300, multiselect item).

Scientists' language diversity

Language groups integrated in the questionnaire included all 11 South African official languages (in 2021) as well as an 'other' category. Respondents were asked to indicate the languages they speak in a multiselect item, with most reporting English (88.0%) among other languages, with sizeable proportions speaking Afrikaans (31.7%), Zulu (28.7%), Xhosa (20.3%), Sotho (19.0%), Sepedi (18.0%) and Tswana (16.7%) within their unique linguistic diversity (Figure 1).

A strength of South African scientists is an ability to communicate in more than one language, which enables greater reach, dialogue and contextual relevance, crucial to research uptake within the publics. Among scientists (Figure 2), 29.0% reported speaking only one language, while the remainder were bilingual (37.3%) or multilingual (33.6%). As a collective, 71% of scientists report speaking more than one language, signalling a number of opportunities for more effective communication by articulating science to wider audiences in the languages most relevant, while building understanding, participation and trust within the publics.

The Science Engagement Strategy[8] highlights language diversity as important for effective science communication and the importance of language and tailored communication strategies for South Africa's diverse publics. Multilingual communication has the potential to bridge cultures, increase accessibility and promote inclusivity in STI, while harnessing the benefit of diverse knowledges.[37] Scientists who report being bilingual or multilingual more often report engaging more varied audience types, enabling wider engagement opportunities for meaningful participation in the sciences (Figure 3).

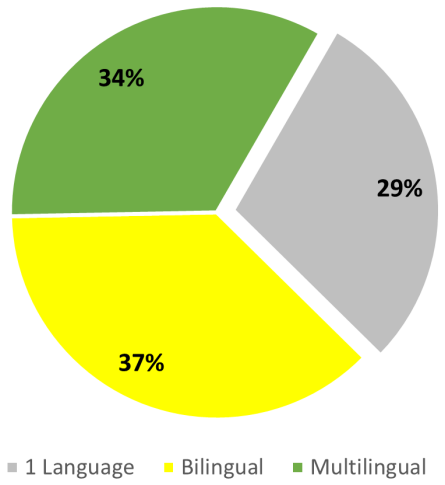

Figure 2: Multilingualism among a sample of scientists ($n = 300$).

A variable created by identifying all scientists who spoke more than one language revealed that *multilingualism* was highly correlated with several demographic variables. Respondent *age* ($r = 0.128$, $p = 0.027$) and *gender* ($r = 0.116$, $p = 0.045$) were found to be statistically significant at the 0.05 confidence level, demonstrated by more multilingual scientists being female and younger than 49 years old. The association between the *multilingualism* variable and those for *population group* ($r = 0.339$, $p =< 0.001$), *education* ($r = 0.183$, $p = 0.001$) and *provincial location* ($r = 0.209$, $p =< 0.001$) were significant at the 0.01 confidence level. Scientists identifying in the black African and white population groups reported higher educational qualifications, and those living in Gauteng or the Western Cape were likely to speak more than one language (Tables 1 and 2). The *population group, location* and *education* variables demonstrate an intertwined legacy impact of the apartheid past in South Africa, where linguistic exposure, home location and educational access are influenced by socio-political realities. Although these legacy impacts have been seen as contemporary challenges, they simultaneously present opportunities for harnessing the power of multilingualism within a cohort of young scientists to enhance the visibility, reach and relevance of STI information into hard-to-reach communities.

There is an apparent over-representation of white scientists within this sample, when compared to South Africa's overall population demographics. Multilingualism was highest among younger black African respondents (53.8%), with those between 20 and 39 years old making up the largest share of this response (68.3%), while white and coloured respondents more frequently reported being bilingual (Table 2). A mentionable group of scientists in this sample report foreign language skills, which could prove valuable in developing science diplomacy in regional or community communication contexts.

Respondents in more populated metropolitan areas demonstrated a higher rate of multilingualism. These associations speak to the consequences of population control measures pre-1994, as well as contemporary patterns of migration in South Africa's population. An example of this would be the concentration of Zulu speakers in KwaZulu-Natal and Xhosa speakers in the Western Cape, promoting bilingualism in these provinces, while Gauteng, Mpumalanga and Limpopo have a greater linguistic diversity within their populations due to mobility between these provinces.[49,50]

Scientists reported higher rates of English language usage than that of other languages in their science engagement efforts. English is used for a variety of reasons, including personal preference, historical influence, accessibility, and the availability of technical terminology. This holds true for many South African Indigenous languages, for which the lack of comprehensive scientific vocabularies and standardised terminology pose challenges to science engagement efforts.[20] There remains a gap in the languages in which scientists report competency versus those actively used in science engagement practice. After English, the next most frequently reported languages used in science communication are Afrikaans, Zulu and Xhosa. Although the levels of Indigenous language use in science communication remain below their overall spoken prevalence,

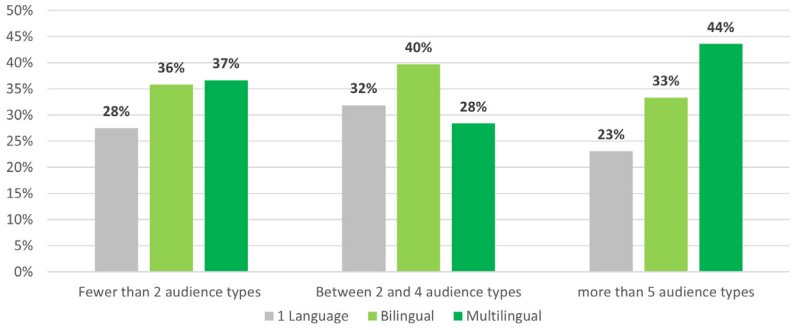

Figure 3: Audiences engaged and multilingualism of scientists ($n = 300$, multiselect).

Table 1: Bilingual and multilingual South African scientists by age and level of education ($n = 300$)

Profile of bilingual and multilingual scientists		Bilingual	Multilingual	Sample proportion
AGE	Younger than 20 years old	33.3%		**33.3%**
	20 to 29 years old	36.8%	38.9%	**75.8%**
	30 to 39 years old	32.1%	39.3%	**71.4%**
	40 to 49 years old	49.1%	20.8%	**69.8%**
	50 to 59 years old	50.0%	22.7%	**72.7%**
	60 + years old	21.4%	21.4%	**42.9%**
***n* = 300**	**Sample proportion**	**37.3%**	**33.7%**	**71.0%**
EDUCATION	Matric		100.0%	**100.0%**
	Diploma / certificate	29.4%	52.9%	**82.4%**
	Degree (including honours)	41.3%	38.8%	**80.0%**
	Postgraduate (master's or equivalent)	31.1%	35.3%	**66.4%**
	PhD	44.6%	21.7%	**66.3%**
***n* = 300**	**Sample proportion**	**37.3%**	**33.7%**	**71.0%**

Table 2: Population group and location profile of bilingual and multilingual scientists ($n = 300$)

Profile of bilingual and multilingual scientists		Bilingual	Multilingual	Sample proportion
RACE	Black African	26.1%	54.0%	**80.1%**
	White	57.5%	8.2%	**65.8%**
	Coloured	60.9%	4.3%	**65.2%**
	Indian/Asian	33.3%	3.7%	**37.0%**
	Other	25.0%	50.0%	**75.0%**
	Prefer not to answer	33.3%	33.3%	**66.7%**
***n* = 300**	**Sample proportion**	**37.3%**	**33.7%**	**71.0%**
LOCATION	Western Cape	50.0%	21.3%	**71.3%**
	Eastern Cape	39.1%	13.0%	**52.2%**
	Northern Cape	50.0%	25.0%	**75.0%**
	Free State	20.0%	20.0%	**40.0%**
	KwaZulu-Natal	36.6%	26.8%	**63.4%**
	North-West	30.0%	40.0%	**70.0%**
	Gauteng	33.1%	44.1%	**77.1%**
	Mpumalanga		66.7%	**66.7%**
	Limpopo	18.8%	62.5%	**81.3%**
***n* = 300**	**Sample proportion**	**37.3%**	**33.7%**	**71.0%**

their consistent use in science communication suggests that social and linguistic progress have the potential to open pathways to new audiences and more meaningful bidirectional engagements (Figure 4).

While 71% of scientists in this study reported being bilingual or multilingual ($n = 213$), fewer participants reported adopting these languages into their science engagement activities, with a lower use of additional languages in communication activities among bilingual respondents (29.4%) compared to multilingual respondents (47.5%). This may be for various reasons, as previously noted; however, despite this finding, Figures 5 and 6 show that, within this sample, multilingual scientists, particularly younger scientists, more often use a variety of languages within their science communication efforts. The analysis reveals a statistically significant association between the number of *languages spoken* by scientists and the *number of audiences* with which they have engaged ($r = 0.135$, $p = 0.027$); however, noting the low correlation coefficient value, it is likely that other factors play a role in the languages used by scientists in science communication activities. Incorporating local languages in science communication ensures the

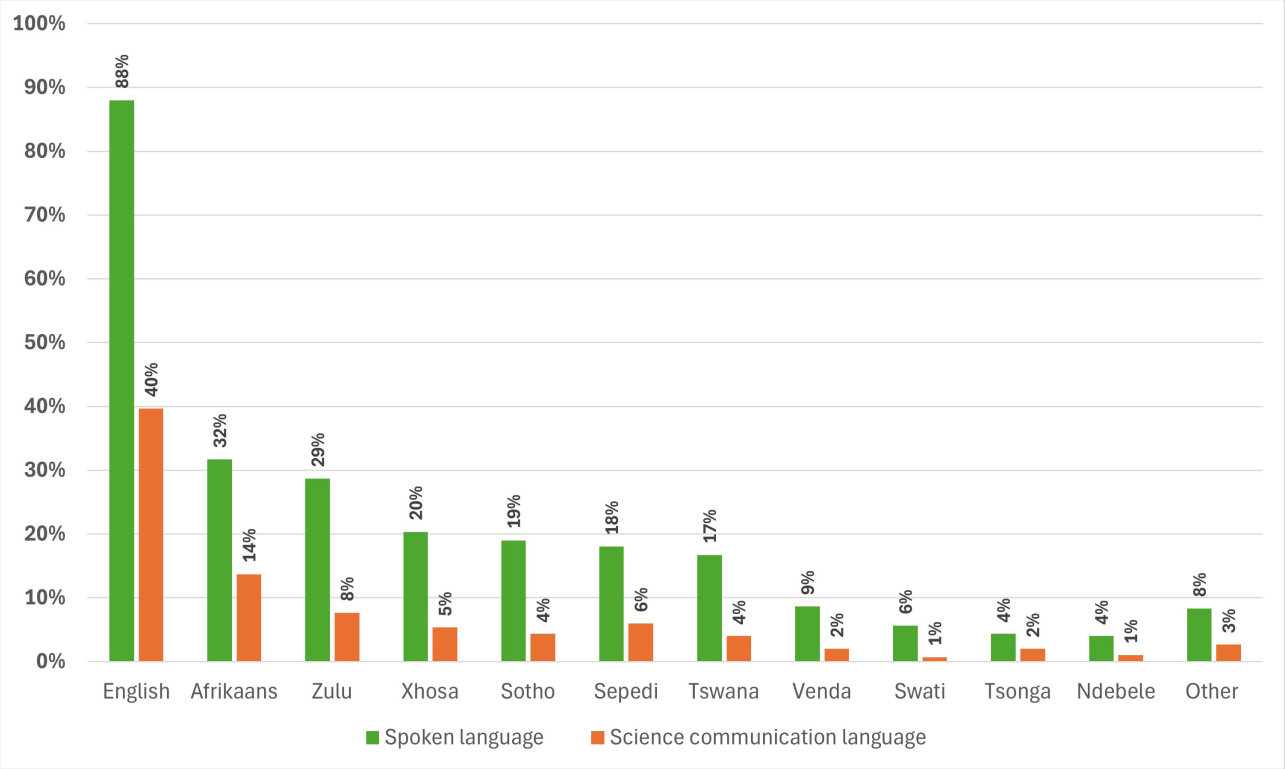

Figure 4: Spoken language versus language used in science communication ($n = 300$).

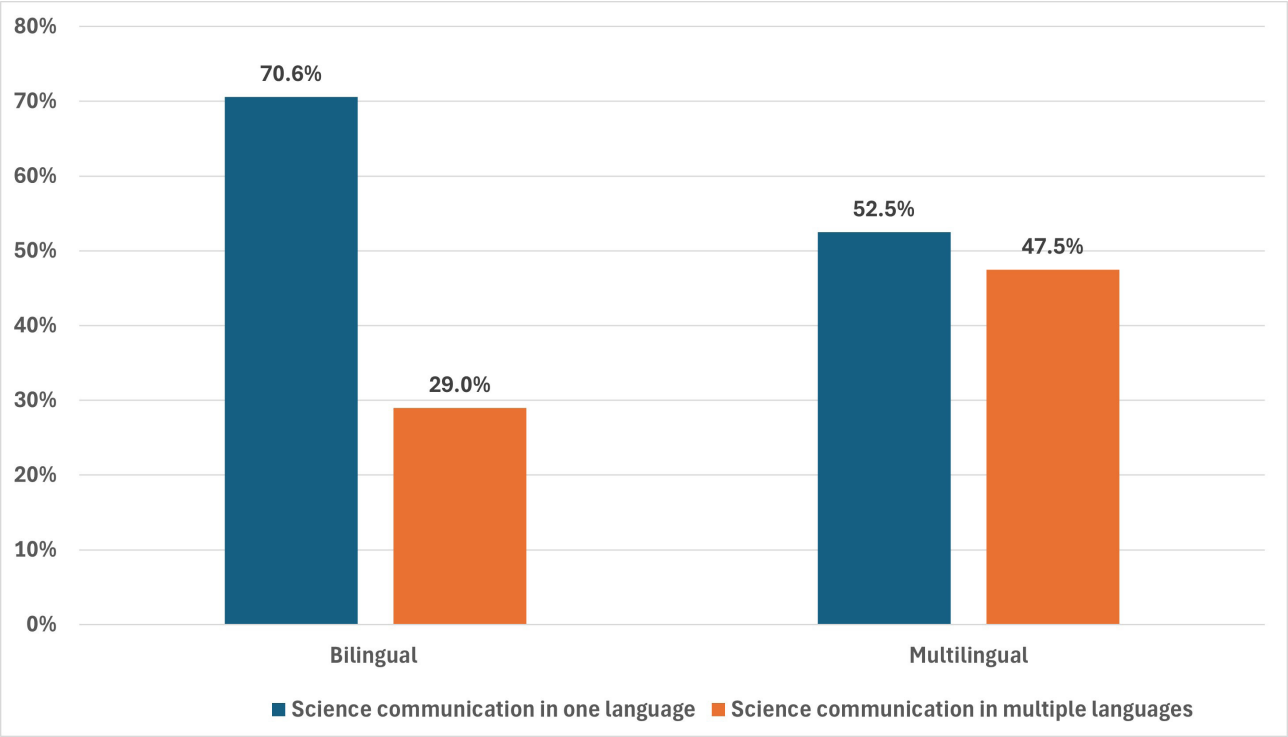

Figure 5: Bilingual and multilingual scientists using another language ($n = 213$).

information reach is broader, fosters deeper public connections and trust, and enriches the dialogue landscape.

Within South Africa's science system, women have historically been professionally under-represented. While changes have been welcomed since 1994, many gender gaps remain, particularly in leadership roles and certain disciplines of science. The purpose behind many of these changes has been to ensure female leadership, perspectives and role models remain visible and encourage greater participation in STI activities and careers.[51] A larger share of scientists identifying as female (23.3%) than as male (10.3%) reported multilingualism (Table 3), with further analysis revealing a significant association between the *gender* of scientists and the *number of languages* spoken ($r = 0.116$, $p = 0.45$).

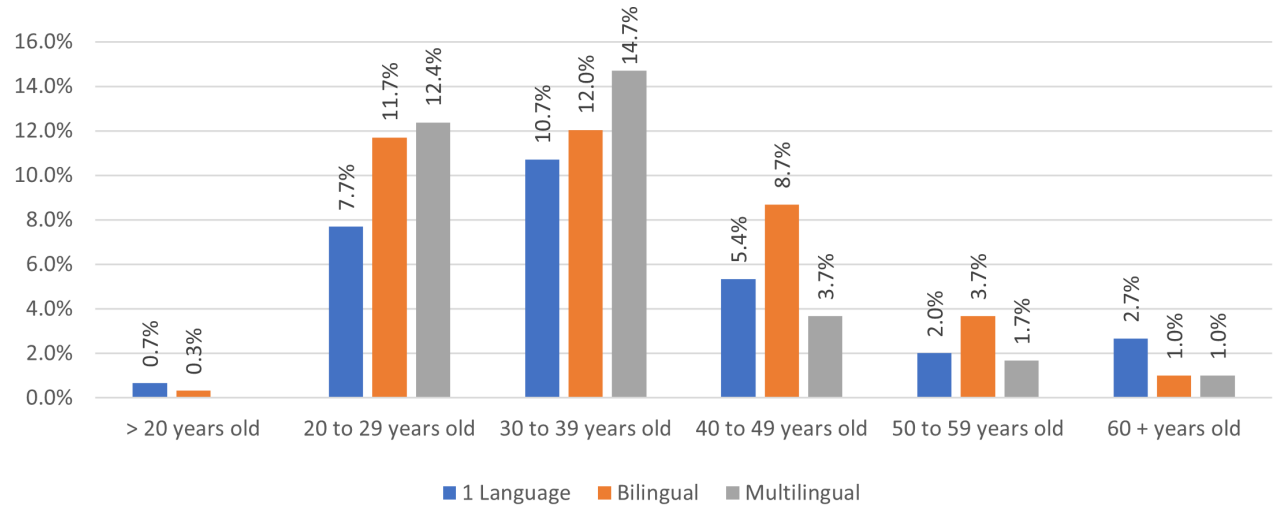

Figure 6: Multilingualism and the age of scientists ($n = 300$).

Table 3: Gender profile of bilingual and multilingual scientists ($n = 213$)

Profile of bilingual and multilingual scientists		Bilingual	Multilingual	Sample proportion
GENDER	Female	22.3%	23.3%	**45.7%**
	Male	13.7%	10.3%	**24.0%**
	Other	1.3%	0.0%	**1.3%**
	TOTALS	37.3%	33.7%	**71.0%**

Table 4: Employment profile of bilingual and multilingual scientists ($n = 213$)

Profile of bilingual and multilingual scientists	Bilingual	Multilingual	Sample proportion
Professors	100%	0%	4
Scientists / researchers	53%	47%	109
Lecturers	64%	36%	25
Professionals (medical, engineering, etc.)	61%	39%	31
Scientists employed within citizen science projects	50%	50%	2
Other scientists	33%	67%	42
TOTALS	**112**	**101**	**213**
	37.3%	**33.7%**	**71.0%**

Many scientists – including professors, researchers, academics, professional services (e.g. medical or engineering) and those involved in citizen science projects – engaged in vocational activities that require science engagement activities as part of their professional responsibilities.

Among these categories, 213 scientists reported being bilingual or multilingual. Researchers, lecturers and scientists involved in professional services account for 77.5% of multilingual scientists in Table 4, having implications for an evolving translational science communication practice, particularly within the South African context. Bilingual and multilingual scientists have the opportunity to collaboratively refine and define the most appropriate scientific terminology with Indigenous communities. This scenario has the potential to aid in the adoption and diffusion of scientific terminology across South African lexicons, enhancing scientific literacy, access and public engagement with the sciences.

Key findings and recommendations

It is an asset to South Africa that most of our scientists speak more than one language, and a third speak more than two languages. A typical South African scientist involved in science communication is a black women under 40 years old, who has a postgraduate degree and is multilingual, but more often communicates in English. Indeed, the use of English in science communication remains a common practice[2,13,52], and the language diversity present among South African scientists has not yet been fully leveraged to advance South Africa's well-defined science communication objectives.

The study data reveal significant insights about the skills associated with multilingualism. Within the study sample, 71% (213) of scientists reported being bilingual (37.3%) or multilingual (33.6%). South African science policymakers need to reflect on ways in which such existing science communication capacity may be adopted to develop enhanced resources to better share science in languages that resonate with our diverse population.[53]

The development of scientific lexicons among South Africa's official languages is another opportunity to unlock further potential to effectively communicate in cross-cultural and multilinguistic settings.[54] This requires a shared understanding of terminology and lexicon, underpinned by iterative processes of co-development and strategic collaboration with Indigenous communities and scientists.[55] Bilingual and multilingual scientists could open new pathways to adopt the richness of our national languages and play a role in the development, diffusion and adoption of scientific terminology across linguistic groups.[55,56] Developing scientific glossaries in Indigenous languages, training on cross-cultural communication, and

providing multilingual digital resources to effectively convey scientific messages, may all prove to be valuable supporting processes.

At an institutional level, support modalities could include linguistically nuanced communication outputs, socio-cultural awareness and digital proficiency training consistent with institutional language policies.[57] Within the science communication skills development system, the establishment of more undergraduate courses may provide new opportunities for skills development and, in turn, support learning within multilingual science communication.[58] The establishment of mentorship networks for scientists to share skills, experience and opportunities may open up informal learning opportunities.[59] Such opportunities may include access to peer groups, digital skills proficiency and socio-cultural awareness of the communication context.[60]

However, there remains a gap between scientists' spoken language proficiency and the language they use in science communication. English continues to dominate science engagement, with the use of Indigenous languages remaining well below their spoken prevalence. Incentivising the use of other languages could expand the dynamic social and cultural space that is South African science. Expanding access to science and using the existing skills of scientists would help to address the historical marginalisation of Indigenous languages in science, and thereby have a positive effect on public participation and future scientific careers.

Conclusion: Unlocking the 71%

Our analysis reveals an underutilised asset in the 71% of South African scientists who are either multilingual or bilingual. Drawing on this finding, we have reflected on the ways in which scientists' existing communication skills may be leveraged to develop enhanced resources to better share science in languages that resonate with our diverse South African population. Our findings may find application in public policy to support science communication teaching and learning in South Africa. The aim of developing a critically engaged knowledge society is fraught with challenges, including deep disparities in education, literacy and economic privilege. Leveraging the richness of our national languages may provide new ways to address some of these challenges.

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Data availability

The data supporting the results of this study are available upon request to the corresponding author.

Declarations

We have no competing interests to declare. We have no AI or LLM use to declare. Ethical clearance was obtained from the Human Sciences Research Council (protocol no. REC 6/23/02/22).

Authors' contributions

S.P.: Conceptualisation, methodology, investigation, sample analysis, formal analysis, writing – original draft, project administration, project leadership. M.G.: Formal analysis, validation, writing – review and editing, project quality assurance, supervision. Both authors read and approved the final manuscript.

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