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# From Lab Coats to Public Forums: Crafting a Science Communication Curriculum for Nigerian Medical Researchers

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**Title:** From Lab Coats to Public Forums: Crafting a Science Communication Curriculum for Nigerian Medical Researchers

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**Abstract**

**Background:** Effective science communication is critical for bridging the gap between biomedical research and its application in clinical practice and policy. In Nigeria, science communication remains underdeveloped, with researchers often lacking the skills and incentives to disseminate their findings to non-specialist audiences. To address this gap, a structured science communication curriculum tailored for biomedical researchers, was developed and pilot tested.

**Objective:** To co-design a comprehensive science communication curriculum and pilot its implementation among a cohort of Nigerian biomedical researchers.

**Methods:** A three-phase mixed-methods study was conducted. For phase 1, an electronic survey assessed participants' existing competencies and needs in science communication. In Phase 2, the curriculum was developed through collaborative virtual meetings and iterative feedback. And in Phase 3, the curriculum was piloted at a 3-day in-person workshop in Enugu, Nigeria. Quantitative data were collected using pre- and post-training surveys to assess four competency domains. Guided by the Kirkpatrick Model of Training Evaluation, participants' experiences were explored through focus group discussions, and the qualitative data obtained were analyzed using thematic content analysis in NVivo.

**Results:** Eighteen faculty members participated in the in-person training and subsequent survey data were analyzed. Post-workshop evaluations showed improvements in all four assessed competencies: understanding visualization techniques (mean difference [MD] = 1.50, p = 0.003), clear understanding of effective communication (MD = 1.66, p = 0.003), writing for publication proficiency (MD = , p = 0.011), and applying science communication concepts (MD = , p = 0.285). Participants expressed increased motivation, enhanced understanding of science communication, and plans for practical application, including curriculum integration and use of visual tools**.**

**Conclusion:** The science communication curriculum appears to have enhanced knowledge and confidence among participating researchers, particularly in visualization and public-facing communication. While

promising, future interventions should examine long-term impacts, broader participant inclusion, and integration of practical assessments.

**Keywords:** Science Communication, Biomedical Researchers, Curriculum Development, Research Translation, Public Engagement, Capacity Building

**Background**: The impact of research partly depends on how it is communicated.[1] Strong communication skills, including formative understanding of audience abilities and interests, are essential for fostering scientific literacy and ensuring that research findings are understood and applied by a broad audience.[2] Science communication refers to "organized, explicit, and intended actions that aim to communicate scientific knowledge, methodology, processes, or practices". [3] Communicating science to the public is often considered a key responsibility of researchers; however, this duty is frequently overlooked, seen as a waste of time or largely ignored as many researchers lack formal training in effectively conveying scientific concepts to lay audiences.[4–6] In Nigeria, science communication practices can best be described as fragmentary and rudimentary[7] as many Nigerian healthcare researchers struggle to clearly and effectively communicate their research findings to both medical and non-medical audiences. Lack of effective communication of medical research findings has contributed to poor translation of proven strategies into clinical practice and policy, thus depriving patients of the benefits of improved clinical outcomes.[8] Researchers often emphasize communication within their peer community while giving less attention to engaging with the public, policymakers, and popular media.[9] Insights into researchers' views regarding the lack of dissemination of study findings to the public and policymakers reveal reasons such as difficulty in making their findings more appealing for public consumption, lack of incentives to share their work with the public and policy audiences, low priority attached to public communication, focus on publishing in academic journals (the *publish or perish syndrome*) and lack of time to engage with the general public.[9] Recent studies have identified logistical and methodological issues such as the lack of effective and efficient communication methods, and a lack of tools and training for disseminating findings as barriers to effective communication.[10,11]

Science communication may take the form of visual (e.g. images), verbal (e.g. public speaking and podcasts) or written communication (e.g. policy briefs) and occur through interpersonal communication channels as well as specialty and mass media. Science communication also includes the ability to read and critically analyze scientific data and scientific literature.[2,12–14] Traditionally, healthcare researchers have not been trained to communicate their research findings to non-scientific or lay audiences.[15–17] However, improving capacity for scientific communication through translational training can help to close this research-practice gap.

Communicating science in a way that is accessible to the general public serves multiple crucial purposes. It helps raise public awareness and encourages active engagement with scientific issues.[18] Clear communication also fosters trust in research, shapes public attitudes and behaviors, enhances both scientific and health literacy, supports the recruitment of participants for clinical trials, and contributes to gaining political backing and financial investment in research initiatives.[19] Additionally, if policymakers do not fully understand or misinterpret the research findings, they may make decisions that are not evidence-based. This can lead to the implementation of policies that are ineffective or even harmful to public health, funding may be directed towards interventions or programs that are not supported by the scientific evidence or there may be delays in implementing interventions that could improve health outcomes. Also, if members of the public perceive a disconnect between scientific research and policy-making, trust in both the scientific community and policymakers may erode.[17] This can lead to skepticism about public health recommendations and interventions, misinformation and reliance on 'alternative facts'.[19] Inadequate communication may result in policymakers overlooking critical health issues or failing to prioritize interventions that could address pressing public health challenges; additionally, if communication is lacking, there may be missed opportunities for collaboration that could enhance the translation of research findings into actionable policies.

Despite increasing emphasis on science communication globally, there is a lack of evidence-based curricula designed to build science communication capacity among researchers in Sub-Saharan Africa, highlighting the need to develop and pilot a contextually relevant training program. There is evidence to suggest that undergraduates can develop scientific process skills and scientific reasoning simply by reading primary scientific literature.[13] Additionally, meta-cognitive processing, cognition and information retention have been shown to improve when students create images of didactic content of their lectures through drawing.[14,20] Using a combination of science communication methods in a scientific communications curriculum has been shown to increase engagement and learning by making content of such curricula easy to learn and relevant to trainees.[21] Accordingly, the Center for Translation and Implementation Research (CTAIR), affiliated to the University of Nigeria, developed two objectives: (1) to train researchers in technical skills including scientific writing and grantsmanship (2) to train researchers in soft skills such as science communication, time management and team leadership. We have observed as in several published studies that while researchers

may be ready to present at national and international conferences, they are often reluctant to go to the communities from where they extracted their data, to interact with study participants and to communicate research findings with participants.[10,22] To close the science communication skills gap, we sought to co-design a comprehensive curriculum to train biomedical researchers in science communication and to pilot and evaluate the developed curriculum among a cohort of CTAIR Scholars. The CTAIR Scholar Program is a 12-month structured mentorship and training program that teaches early-career researchers and other participants, how to design, fund, and lead impactful research in the area of Implementation Science.

**Methods**: This study employed a three-phase approach to co-design and implement a science communication curriculum for healthcare researchers. The study, funded by Michigan State University, was conducted at CTAIR, one of five centers at the IVAN Research Institute, Nigeria which is affiliated with the College of Medicine, University of Nigeria. The participants included 18 healthcare researchers selected by convenience sampling from a pool of researchers at the University of Nigeria's College of Medicine and from participants enrolled into the CTAIR Scholar Program who had either previously submitted a grant application or were actively implementing funded research. This study combined quantitative data from the pre- and post-training surveys with qualitative data from the FGDs thus collectively capturing the magnitude of changes in the participants' skills and the underlying reasons for these changes, including how the skills were understood and applied. The study which received ethics approval, was conducted in accordance with ethical principles outlined in the Declaration of Helsinki and all relevant national and institutional guidelines for research involving human participants. Written informed consent was obtained from all participants and participation in the study was voluntary.

*Phase 1 (Needs Assessment)*: Participants completed an online survey assessing their science communication needs. Survey results provided insights into existing competencies and knowledge gaps, informing the subsequent curriculum design.

*Phase 2 (Curriculum Development)*: A series of virtual meetings were held with the study's Principal Investigators (PIs), co-investigators and a few faculty members from the University who were not part of the final list of participants selected for the training, to discuss survey findings and develop a structured science

communication training program. The initial curriculum draft developed by the investigators was iteratively refined based on feedback from survey participants and additional faculty input, resulting in a finalized curriculum.

*Phase 3 (Curriculum Implementation*): The finalized curriculum was piloted through a three-day Science Communication Training Workshop held November 7–9, 2024, in Enugu, Nigeria. The workshop was attended in person by 18 faculty members of varied medical specialties and from different regions of Nigeria (**Table 1**).

**Table 1.** Characteristics of Study Participants

| **Variable** | **Pre-Test Count** | **Percentage** |
|---|---|---|
| **Number of Responses** | 18 | 100 |
| **Sex** | | |
| *Male* | 3 | 16.7 |
| *Female* | 15 | 83.3 |
| | | |
| **Age Group (years)** | | |
| *35 – 44* | 9 | 50 |
| *45 – 54* | 7 | 38.9 |
| *55 – 64* | 2 | 11.1 |
| | | |
| **Discipline** | | |
| *Dental Surgery* | 1 | 5.56 |
| *Chemical Pathology* | 1 | 5.56 |
| *Medical Laboratory Science* | 2 | 11.1 |
| *Microbiology* | 1 | 5.56 |
| *Medical Sociology* | 2 | 11.1 |
| *Obstetrics and Gynaecology* | 6 | 33 |
| *Pharmacy* | 1 | 5.56 |

| | | |
|---|---|---|
| *Physiotherapy* | 2 | 11.1 |
| *Plant Molecular Genetics* | 1 | 5.56 |
| *Public Health* | 1 | 5.56 |
| | | |
| **Previously engaged in science communication activities** | | |
| *Yes* | | 88.9 |
| *No* | | 11.1 |

An additional six participants joined virtually but were not included in the survey analysis. The workshop aimed to (1) Strengthen participants' understanding of effective science communication principles; (2) Build capacity for developing grant proposals incorporating science communication; (3) Equip researchers with tools and strategies for engaging diverse audiences; and (4) Foster interdisciplinary collaboration among researchers, grant writers, and science communicators. The workshop featured a mix of lectures, interactive sessions, and role-playing exercises designed to enhance participants' practical skills. Participants engaged in case studies, hands-on writing exercises, and group discussions that provided real-world applications of science communication strategies. Topics included how to simplify complex scientific concepts for policymakers and the public, use storytelling techniques to make research findings more engaging, employ strategies for increasing research visibility through digital and multi-media engagement and best practices for effective research dissemination.

A mixed methods approach was used to assess training outcomes. Pre- and post-training evaluations measured change in knowledge, while focus group discussions provided insights into participants' motivations for attending the training, the knowledge gained, the science communication skills and strategies acquired, and the potential practical applications of these skills. The Kirkpatrick Model of Training Evaluation[23,24] guided the exploration of participants' experiences. This model, developed by Donald Kirkpatrick, provides a structured framework for evaluating the effectiveness of training programs across four interconnected levels. The first level, reaction, examines participants' perceptions and satisfaction with the training experience. The second level, learning, evaluates the knowledge and skills gained as a result of the training. The third level,

behavior, assesses how effectively participants apply what they have learned in their professional practice. Finally, the fourth level, results, measures the broader impact of these behavioral changes on organizational outcomes and overall performance. Focus group discussions were transcribed verbatim and analysed using NVivo (version 15, QSR International). A conventional content analysis was used to identify key patterns in the data. The coding process followed an inductive-deductive strategy, where initial themes were informed by the study objectives, but emergent themes were also incorporated. Two researchers conducted the initial coding. Discrepancies were resolved through discussion to ensure consistency. NVivo facilitated the organization, retrieval, and categorization of data, allowing for a systematic comparison of themes across different focus groups. Themes were refined iteratively until data saturation was achieved. Representative quotes later in this article are included to illustrate key themes and subthemes. Quantitative data from the pre- and post-training survey items were analyzed with descriptive statistics based on responses to Likert-scale items evaluating knowledge and confidence in science communication. Due to the small sample size (n = 18) and non-parametric data distribution, changes in pretest to post-test scores were analyzed using the Wilcoxon signed-rank test. Effect sizes were reported as rank-biserial correlations (r), interpreted as small (≈0.1–0.3), medium (≈0.3–0.5), and large (>0.5) following established guidelines.[25]

**Results:** All 18 participants completed the training. Analysis of the quantitative data revealed that the Science Communication Training Workshop led to measurable improvements in participants' competencies across multiple domains of science communication. We found overall improvement across all assessed competencies. The mean pretest and post-test scores, along with the change in scores, are summarized in **Table 2**.

**Table 2:** Comparison of Pretest and Post-test Mean Scores

| **Domain** | **Pretest Mean** | **Post-test Mean** | **Mean difference** | **p-value** | **Effect Size (r)** |
|---|---|---|---|---|---|
| Applying science communication concepts | 4.17 | 4.5 | 0.33 | 0.285 | 0.25 |
| Writing for publication proficiency | 3.67 | 4.33 | 0.66 | 0.011 | 0.60 |
| Understanding visualization techniques | 3.42 | 4.92 | 1.50 | 0.003 | 0.70 |

| | | | | | |
|---|---|---|---|---|---|
| Clear understanding of effective communication | 2.92 | 4.58 | 1.66 | 0.003 | 0.70 |

Wilcoxon signed-rank tests revealed significant post-workshop improvements with large effect sizes (rank-biserial r) in three domains: writing for publication proficiency ($p = 0.011$, $r = 0.60$), understanding visualization techniques ($p = 0.003$, $r = 0.70$), and clear understanding of effective communication ($p = 0.003$, $r = 0.70$). No significant improvement was detected in applying science communication concepts ($p = 0.285$, $r = 0.25$) (all $n = 18$).

Qualitative data were useful for contextualizing and interpreting the quantitative results. Participants who were largely female, demonstrated strong positive reactions to the science communication workshop, reflecting high levels of satisfaction and engagement, as captured through the FGD. Motivations for attending which were diverse included curiosity, personal interest as well as the important role science communication plays in the public health domain.

*Motivation for joining science communication training*: Study participants joined the workshop for various reasons, ranging from curiosity to professional necessity.

Participants noted,

> *My motivation for this science communication workshop is because I engage in scientific research and there is a need for me to communicate the findings of the research to communities, to stakeholders, to be able to inform policy and practice.*[1]

"*… to help me to be able to discern a need by scientific findings, communicate it in a way that it brings about change in behavior, in attitude, in practice and including public health*"[2]

"*I like to do something that is always outside of myself. So, I really don't know what science communication is all about, but I'm just inquisitive to get to know what it's all about*"[3]

Participants' joining the science communication training reflects the strategic recognition of the critical role it plays.

[1] *FGD; Female participant*

[2] *FGD; Female participant*

[3] *FGD; Male participant*

*Understanding of science communication*: Following the training, participants demonstrated a deeper understanding of science communication.

> *I didn't know it had to go beyond just those within the scientific aspect, that even those that are in the non – scientific area, that the woman in the market needs to know what you are doing. You need to communicate your findings to them, so that they would use it to change their behaviour. So, the training really thought me a lot, that going forward, I shouldn't just think about my audience being just those within my sub-specialty*[4]

A good number of participants agreed that Science communication helps in translating research findings into practical implementation.

*"I observed that one very important thing that science communication does is that, it makes our research not just to end as research, I find that many times, scientists find things that could actually influence practice*."[5]

"*I find that communicating science, helps to translate what we find in the lab, you know, to actual practice, like implementing our findings*"[6]

"… S*cience communication is important because disseminating the findings from the data you collected from stakeholders and community members helps to build trust*."[7]

Participants recognized science communication as essential for translating research into practice, engaging non-specialist audience and encouraging trust with stakeholders and communities.

[4] *FGD; Female participant*

[5] *FGD; Male participant*

[6] *FGD; Male participant*

[7] *FGD; Female participant*

*Science communication skills and strategies acquired during the training*: Participants demonstrated the science communication skills and strategies acquired during the training. One key learning point expressed by participants was the importance of blending logic with emotion to engage audiences effectively.

> *I learnt that I have to use a combination of these two, to be able to get people's interest in what I want them to know about, and be able to still logically present what I want them to know in a way that it captures their interests. So, a mix of the emotion, the fun and the logical rational content of my findings*[8]

Audience analysis and audience segmentation were practical skills learned by the training participants.

*"… One that I love most, that's the audience analysis, I love that because most times you'll be picked or called upon to talk to certain group of people and if you don't segment them, the message is of no use."*[9]

Similarly, the participants expressed that understanding one's target audience helps in adopting the right communication skills that help to drive the research message home.

> *I have to find out who are these people that I want to speak to, to be able to know how to get to them, of course, whatever I am talking should be to their level, so that I will be able to pass the information across, so having to learn my audience, that's the major thing*[10]

Additionally, respondents noted that the choice of tools and social media platforms to deploy in communicating science is influenced by proper audience analysis and segmentation.

> *You need to do an audience analysis, and audience segmentation, because that's what will now tell you which type of social media tool you need to use, you need to address needs to address the problem you intend to address in the community.*

> *So, I think for me, social media stood out for me, because it has a lot to do with telling or implementing whatever you have or your product, letting the people know what you intend to do, or the health interventions you intend to implement, or even communicating whatever you've implemented to the community member*[11]

Participants believed that the skills and strategies they learned would go a long way in enhancing their capacity to deliver impactful messages as well as increase the practical reach of their research.

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[8] *FGD; Female participant*

[9] *FGD; Female participant*

[10] *FGD; Female participant*

[11] *FGD; Male participant*

<u>*Potential practical applications of new science communication skills and strategies acquired*</u>: Participants shared potential practical applications of their new skills, particularly in teaching and research dissemination.

> *… Henceforth, my lectures will not be slides that are worded, I want it to be more of visuals, pictures. So I am believing God it will henceforth be better slides that would be captivating and make these people to want to learn whatever that I am presenting*[12]

Similarly, participants were willing to teach their students how to prepare visual abstracts which is part of the skills learned during the workshop training.

> *I said that my students will write visual abstract even for their project, everybody will have to present a visual abstract. So, from there, other colleagues will know, other students will know, oh, you can do this, this is a new way of doing things*[13]

Participants advocated for science communication to be enshrined in undergraduate's course curriculum to enable scientists and researchers learn about science communication early on in their career.

"*But I think it is something that needs to enter into our curriculum, it's not something that we should just be learning only when we have gotten Ph.D. Teaching us about science communication at this level, is rather late*"[14]

Furthermore, participants emphasized their interest in transferring the knowledge from the workshop to their students, and appeared eager to establish a Science Communication Network across their institutions to sustain the knowledge gained from the workshop.

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[12] *FGD; Female participant*

[13] *FGD; Female participant*

[14] *FGD; Female participant*

**Discussion**: The phased research approach employed in this study was an evidence-based, participatory development and piloting of a science communication curriculum to ensure its relevance and applicability to a group of healthcare researchers in Nigeria. Study findings show significant improvements with large effect sizes in three key competency domains: writing for publication proficiency, understanding visualization techniques and clear understanding of effective communication, with no significant change observed in applying science communication concepts. However, the overall trend showed modest positive shifts across all domains. Qualitative findings from FGDs complemented these results, revealing increased participant motivation, deeper understanding of science communication's role in translating research to diverse audiences (including policymakers and the public), and strong intentions to apply skills such as visual tools, storytelling, and community engagement in their future work. These findings are comparable to findings from previous research which demonstrate that targeted science communication interventions lead to measurable improvements in researchers' ability to communicate their work to non-expert audiences.[26–29]

**Level 1: Reaction. Participants' Satisfaction and Motivations for Engaging in Science Communication Training**: The workshop received strong positive feedback from predominantly female participants, who expressed high satisfaction and engagement in focus group discussions, driven by diverse motivations including curiosity, personal interest, and recognition of science communication's vital role in public health. These findings align with findings from previous studies, which often characterize the typical science communication trainee as female and driven by both career goals and personal interest.[30] The recognition of the need for science communication to bridge the gap between research and real-world impact was illustrated by a participant who stated: "*My motivation for this science communication workshop is because I engage in scientific research and there is a need for me to communicate the findings of the research to communities, to stakeholders, to be able to inform policy and practice.*" This study also had participants expressing how the structured science communication training significantly deepened their understanding of how to effectively convey scientific information beyond traditional academic audiences and acknowledging the professional value of the training, findings that mirror results from a study by Greer et al.[31] Furthermore, the quotes from some of the study participants emphasized the need for trust-building and community engagement, which are goals deeply tied to healthcare research in the Global South, and which resonates with a study by Altman et al.[32] This latter study suggests that communicating research findings back to the community helps strengthen trust and accountability. Our study likewise captured a shift in participants' understanding, that science communication must go beyond academia to reach everyday people, such as "the woman selling her wares in the market." These opinions are in stark contrast with participants' opinions of professional visibility and communication effectiveness in the Greer et al. study,[31] the latter reflecting a Western academic setting where the focus is often on career enhancement and interdisciplinary collaboration. In other words, findings from these studies referenced above demonstrate that a one-size-fits-all approach is inadequate and that adapting training to specific contexts greatly improves training effectiveness and value. Thus, the authors conclude that science communication curricula should be designed with local needs in mind, balancing technical skills with societal relevance.

Overall, participants expressed enthusiasm for the interactive format (lectures, role-playing, case studies, and group discussions) which they perceived as engaging and relevant. These positive reactions align with

Kirkpatrick Level 1 criteria, indicating that the workshop was well-received and fostered immediate buy-in. Such positive perceptions as expressed by participants in this study, often lay the groundwork for deeper learning and meaningful application, echoing findings from previous training evaluations which show that motivation and participant satisfaction are key drivers of sustained engagement.[33–35]

**Level 2: Learning. Acquisition of Knowledge and Skills in Science Communication**: Our finding of significant improvements in three of four core competency domains provide robust evidence of knowledge and skill acquisition among workshop participants (Kirkpatrick Level 2). Participants expressed surprise that science communication extended beyond academic audiences to include the general lay public and policymakers. This impression is consistent with the strong quantitative findings in the domain of understanding effective communication, showing that the curriculum helped participants recognize the importance of simplifying complex concepts for lay audiences and policymakers. Also, this study further revealed that participants appreciated the need for the use of visual tools in making research more relatable and memorable.

Participants also highlighted the practical use of audience analysis, segmentation and blending emotional with logical appeal strategies, learned during the workshop. Participants' expression of intentions to integrate science communication into undergraduate curricula suggest that the workshop successfully triggered motivation for behavioral change (Kirkpatrick Level 3). These strategies highlighted by training participants (audience analysis, segmentation, and blending emotional with logical appeals), are well-supported by existing literature.[36–38] The strategies are recognized as effective methods for enhancing the reach and impact of science communication efforts. A recurring theme in this study was the recognition by participants of the need to combine logical reasoning with emotional appeal to effectively engage audiences. One participant noted the importance of using "a mix of the emotion, the fun and the logical rational content" to capture audience interest and communicate research findings persuasively. This finding supports impressions from recent studies that good science communication is not just about sharing facts, but also about making an emotional connection with the audience. Taddicken and Reif[39] point out that it is a mistake to separate emotion and reason in communication. Instead, combining both can make science messages more effective. They highlight how

emotional storytelling and entertaining formats, especially through digital media, have become more common and can help engage people without losing accuracy. This reflects what our training participants discovered, which is that using both logic and emotion is a practical and proven way to connect with their audience. Participants were enthusiastic to learn practical strategies for engaging audiences, particularly the importance of blending logical content with emotional appeal

**Level 3: Behaviour. Intended Application and Transfer of Science Communication Skills to Practice**: Although we found a non-significant improvement in participants' self-reported ability to apply science communication concepts, the qualitative findings provide compelling evidence of strong behavioural intentions which with further training, could improve participants' self-reported ability to apply science communication. Participants gave clear plans on how to transfer newly acquired skills into their professional practice, particularly in teaching and research dissemination. For example, several expressed commitments to redesigning their lectures by replacing text-heavy slides with engaging visuals: signalling an intent to institutionalize visual communication practices early in training. Agrawal and Ulrich[40] emphasize the importance of graphical and visual abstracts and recommend training students in visual design to improve understanding and engagement. Integrating visuals not only aids understanding but also increases the appeal of scientific content for diverse audiences.[36]

Effective data visualization is crucial for conveying complex scientific information in a simple manner that can aid understanding of lay persons and the general public. It ranges from the traditional forms (graphs, infographics) to emerging forms (visual abstracts, or video summaries) to futuristic forms (data physicalization, role-play and simulation, stand-up comedy and theatre performances, physical installations and virtual reality).[41–45] Visualization ensures that the communication is not a one-way traffic of highfalutin scientific jargon from scientists to uninformed general public.[41] Studies have shown that graphical representations, such as charts and graphs, can significantly enhance comprehension and retention of scientific data. For instance, a 2020 study concluded that graphical representations significantly enhance understanding and retention compared to text alone, particularly when designed to align with cognitive processing principles.[46] Other visual communication tools such as graphical abstracts and infographics are gaining ground

in this era of digital social media in knowledge enhancement and engagement of the public with scientific outputs, by presenting text in a compelling visual output.[47] Presently, websites like Canva® (https://www.canva.com/), Venngage® (https://venngage.com/) and BioRender® (https://www.biorender.com/) offer user-friendly tools that enable scientists to transform their research findings into engaging diagrams, visual abstracts, and infographics.

The authors believe that the workshop's interactive elements such as role-playing may also have boosted visualization skills of participants. These experiential approaches likely enabled participants to translate abstract concepts into real-world contexts. The implications of this finding are significant, as improved visualization and communication skills may help address Nigeria-specific challenges such as low public trust in government sources, misinformation, and limited engagement between researchers and the public.[48–50] By equipping participants with tools to communicate scientific evidence more clearly, accessibly, and empathetically, the training has the potential to increase public understanding of research and foster greater confidence in scientific outputs. In a comparable study,[51] participants showed a marked increase in engagement with non-expert audiences following the course (77% post-training vs. 51% pre-training; $P < 0.0001$), alongside a substantial gain in self-reported confidence in science communication (median score increase from 5 to 8, Taken together, these results suggest that a structured science communication curricula may do more than build technical skills, such as visualization and writing. It also suggests that such a course may also enhance researchers' self-efficacy and intent to engage with public audiences. However, the non-significant quantitative results obtained in this domain suggest that participants need ongoing support such as follow-up mentoring, hands-on assignments, or longer-term guidance, to help turn intentions into sustained practice.

**Level 4: Results. Broader Implications for Research Translation, Public Engagement, and Institutional Change in Nigeria**: Although this pilot study did not set out to measure organizational or societal outcomes (Kirkpatrick Level 4), the integration of both quantitative and qualitative findings show promising broader impacts. Participants strongly believed that science communication should be introduced early, ideally during undergraduate training, rather than later in a scientist's career. This view is supported by studies showing that

embedding communication skills in science degree programs improves both learning and confidence. For example, at an Australian university, almost all students who received formal training in communicating science to the public reported improved skills and confidence, while lecturers observed a stronger understanding of core scientific concepts and supported making science communication a routine part of the curriculum. Participants also expressed intentions to apply newly acquired skills such as incorporation of visual tools in teaching, production of visual abstracts by students, and advocating for science communication training in undergraduate curricula, all of which suggest potential for institutional change within Nigerian universities. Academic institutions can introduce science communication courses for both undergraduate and graduate students, encourage science communication as a specialty within Mass Communication units and offer support services that help researchers effectively share their work with the public and policymakers[6] These shifts could foster a cultural normalization of public-facing communication, countering the longstanding "publish or perish" syndrome while encouraging early-career researchers to prioritize research translation and community engagement. The realization by workshop participants that effective science communication builds trust with communities ("disseminating the findings…helps to build trust") and translates laboratory discoveries into practical health improvements, also helped them understand its potential in addressing critical gaps in policy uptake and public health literacy in Nigeria. By equipping researchers to convey findings to diverse audiences which include policymakers and "the woman in the market," the curriculum has the potential to reduce misinformation, enhance evidence-based policy-making, and narrow the research-practice divide that currently deprives patients of improved clinical outcomes. However, realizing these Level 4 results will require sustained support beyond the three-day workshop.

**Study Limitations**: While this study demonstrated promising results in improving science communication competencies among healthcare researchers, some limitations are acknowledged. The study involved a relatively small group of participants, mostly in healthcare. This limited sample size and selection bias may limit the generalizability of the findings to a broader population of healthcare researchers in Nigeria or similar low-resource settings. The training duration of three days followed in quick succession by assessments hinders the understanding of whether the improvements observed in knowledge and confidence translate into sustained behavioral change or practical application in real-world settings. The absence of a control or comparison group

restricts our ability to attribute observed improvements solely to the training intervention. Ours was just a pilot. Without a control group, it is difficult to rule out the influence of external factors or participant maturation over time. For example, participants might have naturally become more confident or knowledgeable as time passed, even if they had not attended the workshop. Participants who attended the workshop virtually were excluded from the analysis. This omission prevents a comparative evaluation of the effectiveness of virtual versus in-person training modalities, an important consideration for scalability in diverse and geographically dispersed settings. In hindsight, this curriculum could have taken a hybrid format incorporating an online component such as the Communication Learning in Practice for Scientists (CLIPS) (open-access science communication interactive website),[52] with researchers opting for one or more formats. Despite these limitations, our creation of a curriculum for short-term engagement successfully enhanced participants' core competencies in science communication, increased their confidence in engaging diverse audiences, and laid the groundwork for sustained integration of communication practices in their research and teaching activities.

**Conclusion**: This science communication training workshop significantly improved participants' knowledge and confidence, particularly in writing for publication, using visualization techniques, and conveying research findings effectively. Integrating quantitative and qualitative evidence, the findings show that the workshop strengthened both technical skills and conceptual understanding, equipping researchers with the tools and perspectives needed to communicate science in accessible and impactful ways. To reduce misinformation and build public trust in science, research findings should be shared in clear, simple language that the public can understand. Doing so can help individuals make better decisions and improves overall well-being. Further training may be required to translate these conceptual improvements into practical application in real-world science communication efforts. Future evaluations should incorporate longitudinal designs, larger and more diverse cohorts, long-term follow-up, practical output metrics (e.g., policy briefs produced, media engagements), and institutional indicators (e.g., curriculum revisions, establishment of science communication networks) to rigorously assess whether enhanced researcher competencies translate into measurable improvements in public engagement, trust in science, and health policy in Nigeria.

## Abbreviations

CLIPS: Communication Learning in Practice for Scientists

CTAIR: Center for Translation and Implementation Research

FGD: Focus Group Discussion

PIs: Principal Investigators

## Declarations

### Ethics approval and consent to participate

This study conformed to the ethical guidelines of the Declaration of Helsinki, and written informed consent was obtained from all participating researchers. The study was deemed to pose minimal risks to participants, and was given National Health Research Ethics Committee of Nigeria (NHREC) expedited approval. Health Research Committee assigned number: NHREC/01/01/2007.

### Consent for publication

Not applicable.

### Availability of data and materials

The datasets generated and/or analyzed during the current study are are available from the corresponding author on reasonable request.

### Competing interests

The authors declare no competing interests.

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## Authors' contributions

*Conceptualization*: TO. *Study design*: TO, JD, BA. *Data analysis*: KU, BA, II. *Interpretation of data*: TO, JD, KU, II, JO, BO, EE, NA. *Drafting and revising the manuscript*: TO, JD, BA, KU, II, JO, BO, NA, EE,

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