Scientific Communication among Scientists of Kerala State Council for Science, Technology and Environment (KSCSTE), Thiruvananthapuram

Ashtamy L[1], Dr. B. Mini Devi[2]

[1]M.L.I.Sc. Student, Department of Library and Information Science, University of Kerala, Kerala, India, ashtamyl6381@gmail.com.

[2]Former Head and Assistant Professor, Department of Library and Information Science, University of Kerala, Kerala, India, drminidevi1968@gmail.com.

Abstract: ***Collaboration and communication are critical in science because they allow scientists to share knowledge, exchange ideas, and build on each other's findings. When scientists communicate, they benefit from each other's research and approaches, allowing them to improve their work. Collaboration also benefits scientists since it allows them to have a better knowledge of how various fields of science work. When scientists only collaborate with the people who work around them, their ideas may get stale. Scientists must continue to learn by engaging with individuals outside of their immediate circle to keep up to date on advances in their field and be inspired by new ideas or problem-solving strategies. Collaboration in research is vital because it allows scientists to share information and resources.***

Keywords: Science, Scientists, Scientific communication, Interdisciplinary Collaboration

1. Introduction

Science must be open, intelligible, and accessible to the general public. Everyone should be able to grasp Science when it is explained in an accessible language**.** To impact and influence ideas and discoveries, scientists must effectively communicate their research with others. As our world's technological complexity and connectivity expand, scientists must interact across disciplines more than ever. The study enables us to understand the various communication patterns and collaboration among scientists and how they promote excellence in S&T through Learning, Research, and Development with the participation of academia, industry, and research organizations. By analyzing the preferences of information sources, formal and informal communication channels, and the impact of information technology, the study seeks to understand how scientists effectively communicate and collaborate.

Instead of focusing on a specific scientific field scientists can concentrate on broad themes or social concerns that require insights from different fields and it enables specialists from various fields to collaborate on a common area of investigation. When scientists from different fields interact, bring distinct viewpoints, approaches, and paradigms. The various opinions and ideas collide to provide novel methods and, make them instantly applicable and significant. Active participation of scientistsfrom various fields encourages spontaneous cross-pollination of ideas, as individuals gain inspiration from contacts with specialists beyond their specific disciplines.Such a type of learning fosters a culture of inquiry, discovery, and cross-disciplinary interaction. The paradigm transcends the ordinary and drives into a domain where the fusion of ideas becomes a beacon of revolutionary change in an era where information is the currency of development. Researchers navigate the complicated weave of human knowledge magnifying collective wisdom and ushering in a future rich in collaborative invention.The next section of the chapter discusses the scientific communication among scientists in Kerala State Council for Science, Technology and Environment (KSCSTE).[1]

2. KSCSTE

The Kerala State Council for Science, Technology and Environment (KSCSTE) is an autonomous body under the Ministry of S&T, Kerala, constituted in November 2002 to be an agency for change and development through Science and Technology. The council promotes and implements programs to increase the pool of scientific knowledge, as well as develop programs that are important and will be beneficial to the future development of the world. The council creates a development strategy via scientific research and technological innovation. The council's aims include achieving excellence in basic research, fostering academia-industry relations, promoting indigenous initiatives, establishing strong infrastructure, and developing a high-quality scientific education system for the state. The following has been accomplished through a variety of projects and programs, as well as council-established R&D groups.

3. Objectives

- To understand the various ways in which scientists communicate with each other.
- To understand the challenges faced by scientists while communicating their research.
- To find out the strategies used by scientists to overcome the challenges while communicating their research.

4. Methodology

The study used the most flexible survey research approach, which allows to obtain answers to all sorts of questions using prior information and fundamental insights on the issue.The population consists of scientists in different institutions under KSCSTE. 137 scientists are working under the eight institutions of KSCSTE. The census method was used for collecting the data. Six institutions including Malabar Botanical Garden and Institute for Plant Sciences (MBGIPS), Centre for Water Resources Development and Management (CWRDM), Kerala School of Mathematics (KSoM), Jawaharlal Nehru Tropical Botanical Garden and Research Institute (JNTBGRI), National Transportation Planning and Research Centre (NATPAC), and Kerala Forest Research Institute (KFRI) were selected for the study and 122 scientists are working under these six institutions.

5. Case Study

5.1 Various ways in which Scientists communicate with each other

Various ways of communication are crucial among scientists due to the multidisciplinary nature of scientific research and the global scientific

community. Scientists often come from diverse backgrounds and specializations, making effective communication essential for successful collaboration, knowledge sharing, and problem-solving. Scientists employ various modes of scientific communication to ensure their research is disseminated, critically evaluated, and contributes to the advancement of knowledge within the scientific community and beyond. The various modes they employed include joint research projects, co-authoring papers, workshops and conferences, research networks, and online collaborative tools. These modes can promote teamwork and cooperation, ultimately fostering a richer scientific discourse. The diverse approaches can offer more credibility within the scientific community, hence increasingthe impact and visibility of scientific work. Comprehensive studies provide more robust results than individual results.

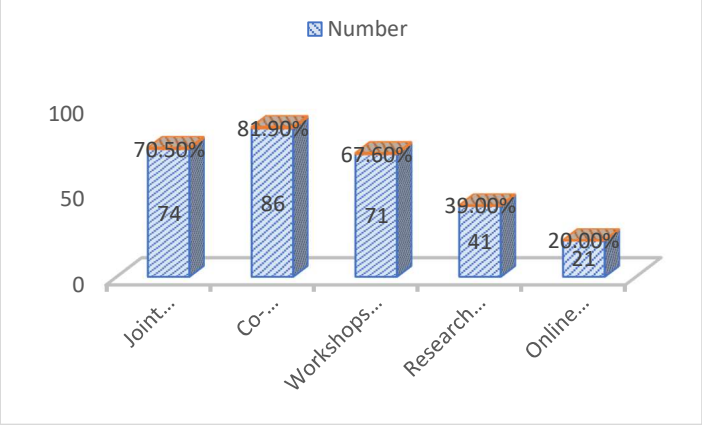

Figure 1: Different modes of communication

5.2 Challenges faced while communicating research

Scientists face various challenges when communicating their research. Navigating through the ever-evolving landscape of communication technologies and platforms it requires continuous adaptation and learning. Since scientists from various disciplines collaborate with each other they may face problems in vocabulary. Different scientific disciplines often have their specialized jargon. Many of them lack effective communication skills in engaging constructive communication, this may interfere with the ability to articulate their ideas and opinions eloquently. Also, scientists face time constraints, they have busy schedules since finding time to engage in fruitful communication is formidable. Another significant issue is the culture of competition. There is a large ground of competition around scientists for funding, credibility, and recognition, which impacts the openness and cooperation within the scientific community. Apart from these scientists also face technical impediments. Technical glitches during virtual meetings and problems in participating in online collaborative platforms hinder effective communication.[2]

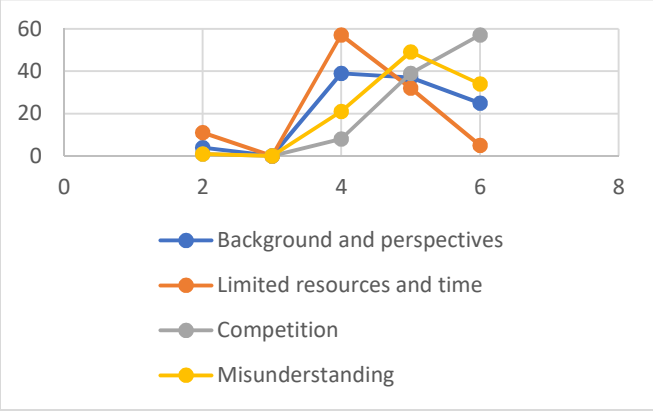

Figure 2: Challenges faced in communicating research.

5.3 Strategies to Overcome Communication Challenges

Effective communication is vital for successful interactions, whether it's in personal relationships or professional environments. However, communication challenges can arise due to various factors such as language barriers, cultural differences, technological limitations, or personal communication styles. Understanding and implementing effective strategies canovercome communication challenges and foster meaningful connections.

Identifyingcommon interests or goals can help to bridge disciplinary divides and foster collaboration among scientists. Understanding each other level of expertise and background will enhance better acceptance of ideas and opinions. Utilizing multiple channels of communication ensures accessibility and credibility. Scientists should keep an open mind and have a willingness to learn from others. Active listening to others strengthens interpersonal connections. Avoiding subject-specificjargon and using plain language can improve the efficiency of communication.[2]

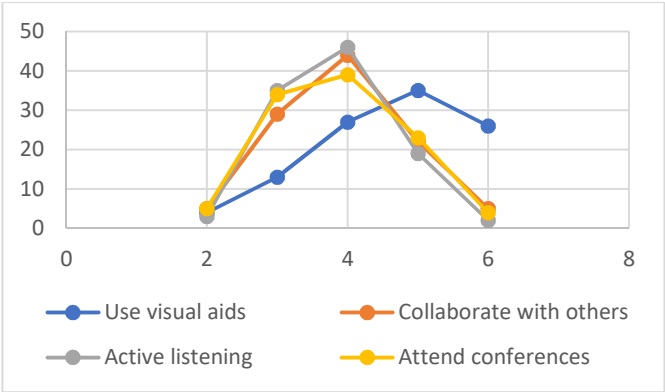

Figure 3 Strategies used to overcome communication challenges.

6. Results and Discussions

From the study, it is evident that the majority of the scientific community engages in co-authoring papers (81.9%), with 70.5% engaging in joint research projects, and 67.6% engaged with workshops and conferences, followed by 39 % in research networks and 20% engaged with online collaborative tools. Co-authoring papers is the most prevalent mode chosen by scientists for communicating among themselves, followed by joint research projects, indicating that researchers often collaborate closely on research projects and publish their findings together. Research networks and online collaborative tools are employed by a smaller but still notable percentage to expand their professional connections and engage in virtual collaborations.

The majority of the scientists encounter challenges related to limited resources and time constraints.A substantial portion faces the challenge regarding ‘backgrounds and perspective’. Some scientists facing competition as a challenge are relatively few. Scientists must address these challenges through effective communication strategies, adapting their approach to different audiences, and allocating resources efficiently to maximize the impact and accessibility of their research findings.

Scientists adopted various measures to tackle the issues they faced while communicating. Active listening and collaboration with others found more effective. Attending conferences and using visual aids also help them to overcome the problems.

7. The evolving landscape of Scientific communication

Science communication is concerned with the interactions between and within communities, cultures, and organizations. Science communicationpromotes an awareness of how knowledge is created, disseminated, verified, and examined. In its professional activity, scientific communication unavoidably encounters and intersects disciplines, and science communication education must examine them.

Some of the key aspects include:

Interdisciplinary collaboration:Science communication is seen as an interdisciplinary field, bringing perspectives from diverse subjects. However, it operates within structures bound by disciplines, competition for resources, and sectoral self-protection. Interdisciplinary collaboration is often difficult due to challenges such as evaluating interdisciplinary proposals and addressing epistemic cultures. Individual ideas get transformed in interdisciplinary teams, the ultimate goal is the generation and dissemination of new knowledge. Interdisciplinary participation among scientists results in the fusion and fission of various subjects and results in the formation of new disciplines that will tackle the perilous global challenges.[6]

Open Science Practices: The practice of open science in scientific communication findsways to minimize the barriers in effective communication.The ongoing sequence of clashes between established paradigms and the inevitability of new ideas exemplifies the conversation between these two entities.Reliable results gathered through open science foster the credibility and integrity of research findings. The evolving Scholar, OpenAIRE, and OSSI support the open science movement.[3]

Collaboration and Networking: Collaboration among scientists is crucial for the development of science communities, it involves fostering interdisciplinary approaches, forming collaborative research networks, and promoting international cooperation among scientists. Scientific cooperation fosters a culture of open communication and mutual support. The importance of collaboration in science can be overstated, it stimulates productivity and also bridges gaps between scientific disciplines. Networking can reduce the risks of research bias, enhance the ability of individuals to approach problems from multiple angles, and thus make a greater impact on pressing issues.[7]

Technological Advancements: Information on Science and Technology increases, and scientific communication through digital platforms is crucial between science and society. High-performance computing, machine learning, and big data analytics are transforming scientific research across several areas. Some of the recent platforms catering to the dissemination and evolving needs of scientific communication includeSciENcv, Protocols.io, Github, Zenodo, Code Ocean.[5]

Data Sharing and online repositories: Institutional repositories are a growing global phenomenon that provide services for managing and disseminating digital materials created by the institution or scholarly community. They also serve as platforms for scholarly electronic communication through open access initiatives, allowing authors to easily distribute and share information and scholarly works. The repositories are designed to manage and preserve digital content created by faculty and staff, serving as indicators of the scope and extent of institutions' research activities. They can increase the global visibility of faculty research, provide open access to institutional intellectual research output, improve the impact of research conducted by researchers, collect content as an added library resource, and provide researchers with a platform to publicize their work. Some of the online repositories include arXiv, bioRxiv, ChemRxiv, PubMed Central, Figshre, and Dryad.[10]

8. Conclusion

Scientific communication is widely accepted and interpreted in this modern era. When discussing scientific communication among scientists, explore different aspects of the communication system. For collaborating and exchanging information scientists use diverse ranges of platforms and channels. Engaging with each other enables the reliability and integrity of the information produced. Exploring initiatives enhances the transparency, reproducibility, and accessibility of science. In the era of technological advancements global scientific partnerships are essential for addressing complex issues.The study seeks to understand how scientists effectively communicate and collaborate. The findings of the study will provide insights into the challenges faced by scientists in their communication efforts and the strategies employed to overcome them.

References

[1] G. Abraham, “The Importance of Science Communication,” Metallogr. Microstruct. Anal., vol. 9, no. 1, pp. 3–4, Feb. 2020, doi: 10.1007/s13632-020-00613-w.

[2] M. Bucchi, “Facing the challenges of science communication 2.0: quality, credibility and expertise,” EFS2, vol. 17, no. Proceedings of the Third EFSA Scientific Conference: Science, Food and Society Guest Editors: Devos Y, Elliott KC and Hardy A, Jul. 2019, doi: 10.2903/j.efsa.2019.e170702.

[3] T. Dienlin et al., “An Agenda for Open Science in Communication,” Journal of Communication, vol. 71, no. 1, pp. 1–26, Feb. 2021, doi: 10.1093/joc/jqz052.

[4] B. Fähnrich, C. Wilkinson, E. Weitkamp, L. Heintz, A. Ridgway, and E. Milani, “RETHINKING Science Communication Education and Training: Towards a Competence Model for Science Communication,” Front. Commun., vol. 6, p. 795198, Dec. 2021, doi: 10.3389/fcomm.2021.795198.

[5] M. A. Kacena, L. I. Plotkin, and J. C. Fehrenbacher, “The Use of Artificial Intelligence in Writing Scientific Review Articles,” Curr Osteoporos Rep, Jan. 2024, doi: 10.1007/s11914-023-00852-0.

[6] J. Noviello, “Suggested Practices for Effective Interdisciplinary Science Communication,” Bulletin of the AAS, vol. 53, no. 3, 2021.

[7] A. Specht and K. Crowston, “Interdisciplinary collaboration from diverse science teams can produce significant outcomes,” PLoS ONE, vol. 17, no. 11, p. e0278043, Nov. 2022, doi: 10.1371/journal.pone.0278043.

[8] B. Trench, “Strengthening interdisciplinarity in science communication education: promise, pleasures and problems,” Journal of Science Communication, vol. 22, no. 06, Dec. 2023, doi: 10.22323/2.22060402.

[9] Universidade Federal de Lavras, Lavras et al., “Importance of open science and science communication practices from the perspective of stakeholders,” RDBCI, vol. 20, no. 2022, pp. 1–23, Jan. 2022, doi: 10.20396/rdbci.v20i00.8670366/29816.

[10] R. Vrana, “Digital repositories and scientific communication challenge,” presented at the INFuture2015: e-Institutions – Openness, Accessibility, and Preservation, 2015, pp. 357–366. doi: 10.17234/INFUTURE.2015.37.

.