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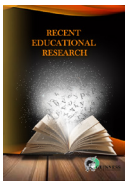

Analyzing Science Communication Discourses in a Global Society: A Case Study of a Graduate School Classroom

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Abstract

This study anchored on constructivist grounded theory aimed to unveil discourses on science communication in a glocal society in a Philippine graduate school classroom. Virtual interviews were done with the participants. In vivo coding technique and narrative discourse analysis were used for data analysis. Results revealed seven emerging discourses on science communication in a graduate school classroom. These are 1) popularizing research- and evidenced-based knowledge, 2) focusing on truth and authenticity, 3) synergy of thinking skills, 4) social media engagement, 5) science communication in policymaking, 6) emancipation and empowerment through education, and peace and global understanding. The emerging discourses of Filipino graduate students reflect how they perceive science communication when positioned globally and applied locally. Science communication is a conduit for making science relevant and impactful to all social contexts through sound and accurate knowledge sharing and engagement of scientific and technical information. Integrating it into allied disciplines to maximize its practical application may emphasize science communication in an academic setting. Future researchers may replicate this study by exploring other methodologies and collaborating with international partner educational institutions to look into intercultural and cross-cultural constructs along this research interest.

Keywords: Discourses, classroom, graduate school, global society.

Introduction

Science communication refers to a variety of techniques that make scientific concepts, procedures, know-how, and research useful or approachable to non-specialist audiences. Audiences for scientific communication shouldn't be expected to have a background in STEM fields or a prior interest in such fields. It is a young, interdisciplinary area that may draw from a range of communication disciplines and modes. Research, criticisms, and discussions on the paradigms of scientific communication used by science communicators are included in this (Newcastle University, 2019). Science communication refers to a variety of techniques used to convey scientific concepts, procedures, information, and findings to audiences that are not experts in the field in a clear, intelligible, or beneficial manner (University of Newcastle, 2014). Science communication is the process of fostering an appreciation for, understanding of, and application of science and the scientific method in a way that promotes participation by a variety of stakeholders, according to Dr. Ma. Theresa H. Velasco, retired dean of the College of Development Communication at the University of the Philippines in Los Baos. This was stated in 2005. According to Velasco, understanding the scientific method stresses understanding the what, the how, and the way of communicating about science and technology. Understanding science and the scientific method is essential to understanding and appreciating science and technology, in addition to know-

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ing about the most recent scientific findings and discoveries. It is crucial to understand scientific communication as a process that takes participation and interaction into account. The importance of public engagement in science has increased. To combat a constant stream of false information coming from many sources, including business lobbies and fundamentalists, scientists and scientific organizations must educate the public about potentially harmful beliefs. Lack of trust, peer pressure, perception, communication ambiguity, the function of journalists, and social media are all contributing factors to the communication gap between scientists and the general public. Similar to their peers in underdeveloped nations, scientists and scientific communicators in the Philippines think that local attempts at science communication are poorly done. However, certain difficulties are made worse by the environment of development. For instance, the Philippines has significantly lower numbers and wages for scientific communicators than the rest of the globe. Local scientific communication efforts must also contend with the nation's distinctive culture, which includes its diversity of languages and opposing views on science (Navarro and McKinnon, 2020). As researchers and their institutions get more involved in contact with the "end-user," they are given new and increased responsibilities. However, they are only sometimes equipped to handle these engagement dynamics and associated hazards. In general, we may observe important scientific issues in social research as well as chances to reconsider some of the major concepts in this field (Bucchi, 2019, pp. 1-7). Navarro and McKinnon (2020) investigated the issues of scientific communication faced by scientists and science communicators in Manila, Philippines. Other worldwide research have repeated the revealed difficulties. However, accessibility issues and local attitudes about science were exacerbated in the Philippine environment. These findings highlight the prevalence of distinct obstacles in scientific communication, as well as the necessity for country-specific science communication frameworks. More investigation into the mentioned difficulties is required, both locally and worldwide. Navarro and McKinnon's (2020) study, according to Bugnosen (2022), mentioned numerous obstacles experienced by Filipino scientists when distributing knowledge to the public: 1. Science news is rarely covered in the mainstream media. Science news is frequently overshadowed by political, entertainment, or sports news, and only makes headlines in the aftermath of catastrophes such as natural disasters. Science reporting in the media was determined to be deficient. 2. Scientists require more time to convey their findings. They are focused with their research, teaching, or administrative obligations and believe that interpreting their results should be left to someone else. 3. More training in scientific communication is required. As previously said, scientists have few opportunities to develop as communicators, which are often provided through brief seminars or fellowships. 4. Language can be an impediment to communication. The Philippines' many dialects have ramifications for science communication. It is critical to communicate with stakeholders in their native language to ensure that they grasp the message accurately, or risk alienating a big portion of the Philippine population. 5. Science is frequently seen as dull or unimportant in everyday life. As a result, bored audiences wonder how the scientific information offered to them can help them make more money or feed their families. Furthermore, it was shown that science is frequently presented to individuals who are already engaged in science. 6. Scientists should be asked to talk to the public more frequently. They are eager to discuss the findings of their investigations, but they also want assistance in organizing public briefings and consultations. Scientists are more attentive to outreach programs that are well planned and well-coordinated by others. More people should work in scientific communication and science journalism. The shortage of science communicators is clear, since the same group meets and works for years or even decades to practice and promote science communication. This shows that information is being passed down slowly among younger communicators. In a graduate school classroom, students have attempted to exhaust discourses on science communication which becomes underrated yet relevant in a glocal society in the age of overwhelming technological needs and advancements.

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This study aimed to unveil discourses on science communication in a glocal society in a graduate school classroom.

Methodology

Research Design

The study used transcendental phenomenology to examine the discourse on science communication in a graduate school classroom.

Duration and Location of the Study

This study was conducted from August to October 2022 in one of the campuses in a Philippine state university.

Participants of the Study

The study's participants were purposively selected 10 Master of Arts in Education major in English students of a state university duly enrolled in the first semester of the school year 2022-2023. The interview is conducted from the experts of science communication out of the students. They were taken in a complete enumeration. Focusing on English-speaking students in science communication research offers advantages such as reaching a broad audience, building a foundation for future scientists, testing layperson understanding, and generating long-term impact. Engaging students provides diverse perspectives, feedback, and potential for collaboration, but it's important to also include scientists for effective communication across various audiences. Conducting interviews with only 10 students for qualitative science communication research is justified due to its focus on obtaining in-depth insights, thorough analysis, resource constraints, achieving data saturation, and prioritizing quality over quantity. However, researchers must acknowledge potential limitations in terms of generalizability and strive to justify their sampling approach and address any constraints. Ten semi-structured interviews were conducted as part of this qualitative research focused on science communication. The participants were purposefully selected to ensure diversity in backgrounds, experiences, and perspectives related to science communication. The interviews were conducted in a one-on-one format to create a comfortable and open environment for participants to share their thoughts and experiences.

Interview Structure

The interviews followed a semi-structured format, allowing for a balance between predefined questions and spontaneous discussions. This approach enabled the researchers to explore specific topics while also allowing participants to introduce unanticipated insights. The interview guide consisted of open-ended questions designed to uncover participants' attitudes, understanding, and engagement with science communication. Probing questions were used to encourage participants to elaborate on their responses and share personal anecdotes.

Data Analysis:

The collected data were analyzed using a combined approach involving in vivo coding and narrative discourse analysis.

In Vivo Coding Technique: Transcripts of the interviews were reviewed meticulously to identify significant phrases, terms, or expressions used by participants. These were transformed into codes representing specific themes, concepts, or patterns. Multiple researchers were involved in this phase to ensure reliability and consensus in the coding process.

Narrative Discourse Analysis: In parallel, the transcripts were subjected to narrative discourse analysis. Researchers examined the structure, content, and emotional nuances of participants' narratives. This analysis focused on identifying the underlying narratives that shaped participants' perceptions of science communication.

Cross-Verification and Consensus

Throughout the analysis, regular meetings were held among the researchers to cross-verify codes, interpretations, and emerging themes. This collaborative approach minimized biases and ensured a holistic understanding of the data.

Documentation

Comprehensive documentation of the entire research process was maintained. This documentation included detailed records of interview scheduling, consent forms, interview guides, audio recordings, and transcriptions. The coding process and the development of themes were recorded, and field notes were

compiled to provide context to the findings.

Ethical Considerations

The research adhered to ethical guidelines, ensuring informed consent, confidentiality, and the right to withdraw for participants. Institutional review board approval was obtained prior to data collection.

Data Gathering Procedure

The researcher sought permission from the dean's office before the data gathering. The participants signed an informed consent form to ensure ethical standards were followed and the data generated would be used for academic exercise. The interviews were done both in a virtual and limited face-to-face manner in adherence to the learning continuity guidelines implemented by the university. Audio recordings of the interviews were made, with participants' consent, to ensure accurate representation and documentation of their responses. Additionally, field notes were taken during and after each interview to capture non-verbal cues, contextual observations, and initial reflections.

Data Analysis

Gathered data were analyzed using in vivo coding technique and narrative discourse analysis.

Results and Discussion

Science Communication Discourses in a Graduate School Classroom

Figure 1 shows the discourses on science communication in a graduate school classroom. These are 1) popularizing research- and evidenced-based knowledge; 2) focusing on truth and authenticity; 3) synergy of thinking skills; 4) social media engagement; 5) science communication in policymaking; 6) emancipation and empowerment through education; and peace and global understanding.

Popularizing research- and evidence-based knowledge

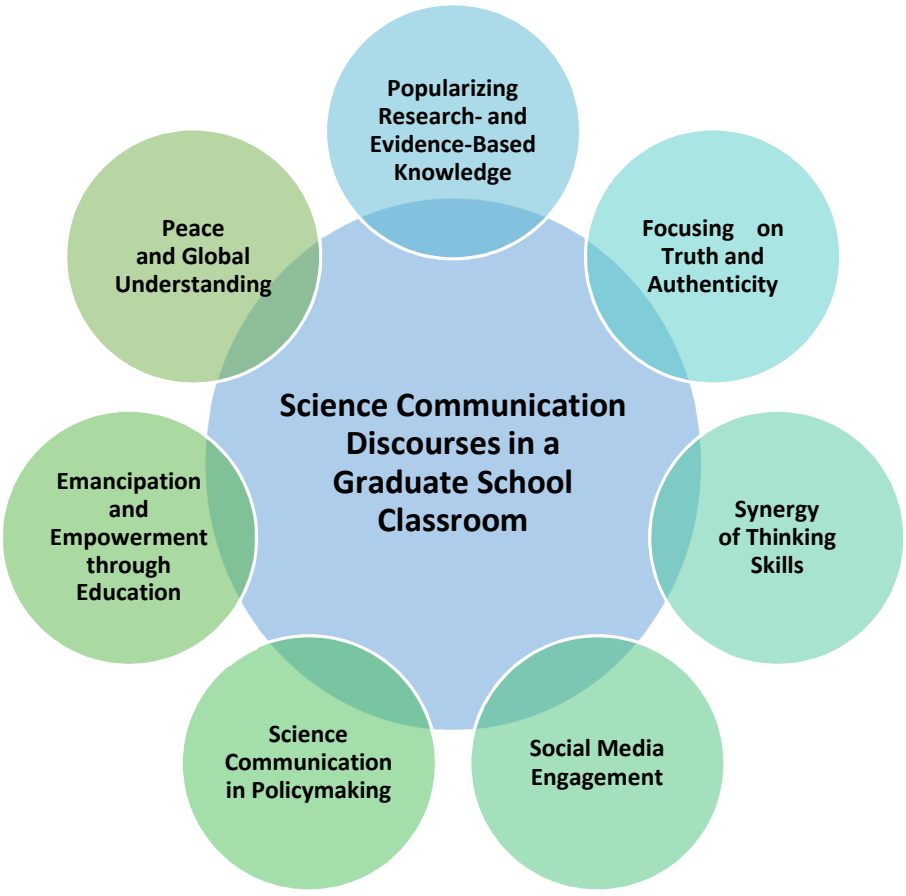

Figure 1. Science Communication Discourses in a Graduate School Classroom

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Discourse	Sub-Theme	Transcript
Popularizing Research- and evidence-based knowledge	*Bringing science closer to people*	Science communication brings science closer to people. I remembered that the Department of Science and Technology had been steadfastly promoting how people would be able to appreciate the work of science.-*GS 8*
	Promotion of evidence-based information on all platforms	Communicating scientific and technical information is crucial in accurately positioning society's understanding of any information. We need to promote evidence-based knowledge.-*GS 2*

Table 1. Discourse 1 – Popularizing research- and evidence-based knowledge.

Table 1 shows the discourse on popularizing research- and evidence-based knowledge. Scientific and technical information should be more understandable to people so that it will be appreciated and understood. The results of Menezes et al. (2022) highlight the complexity of systemic obstacles to inclusive scientific communication, the necessity of resource sharing and network development, and the significance of assessment frameworks. We are close to catching up with the notable developments in everyday communication from previous decades in terms of science communication. If everyone participates, science communication will reach a new level in the coming decade, ready for many generations to come and the next wave of scientific leaders (Jansze, 2016).

Science will only be sound if communicated. Understanding how science could be promoted by all means and far-reaching to diverse audiences is essential. (Jensen & Gerber, 2020). Science communication is at a pivotal stage in its development due to the development of digital communication platforms has brought up new opportunities as well as obstacles. Scientists, researchers, curators, journalists, and other content creators may need new sorts of preparation and assistance in this situation to interact with various audiences across various media (Fähnrich et al., 2021).

Focusing on truth and authenticity

Discourse on focusing on truth and authenticity is revealed in Table 2. In a generation where information is readily available, problems with discerning authenticity occur. People should not fall victim to misinformation, disinformation, and malinformation. With a few keystrokes, the internet enables billions of people to easily access information. However, technology also makes it simple for false information to propagate, which may have terrible repercussions on people and society. It is crucial to fact-check information sources because of this. Checking the facts is important since false information might influence your thinking. Your behaviors can then be influenced by your viewpoint. If you base your selections on erroneous information, it's simple to make the wrong choices Graduate students have realized how crucial agenda-setting is regarding information gatekeeping. When it comes to sharing research, three components of agenda-building are particularly relevant. First, there are fewer news holes (i.e., spaces available for material in media outlets), particularly for scientific concerns. Furthermore, the utilization of full-time science journalists by major news organizations is declining (Scheufele, 2013; Dudo et al., 2011), which further reduces the possibility that scientific topics will be covered by the media. Second, according to studies, science is rarely reported for its own sake (Scheufele, 2014). The third feature of

Discourse	Sub-Theme	Transcript
Focusing on Truth and Authenticity	*Fact-checking*	Science communication has taught us to take fact-checking very seriously. In a world where information overload is just fingertips away, people could become overwhelmed in discerning the truth. We should not be victims of misinformation, disinformation, and malinformation.-*GS 5*
	Agenda setting	In Development Journalism class, we have learned that mass media can influence the importance given to various topics to what the public thinks. How we gatekeep information may affect the decision of the people. We need to learn how issues are framed and how it is being shaped and reshaped. Right now, there is the emergence of citizen journalism. Additionally, vloggers with no formal training in journalism tend to contest the credibility of news and information from legitimate journalists.-*GS 1*

Table 2. Discourse 2 – Focusing on truth and authenticity.

agenda setting that is especially pertinent to science is that more lay people are turning to online sources for knowledge about scientific subjects (Brossard, 2013; Brossard & Scheufele, 2013).

Synergy of thinking skills

Table 3 presents the discourse on synergy of thinking skills. Critical thinking is needed in making judgments, especially when identifying problems. Creative thinking is what advances problem solu tion whereas critical thinking examines information and identifies the real nature and dimen-

Discourse	Sub-Theme	Transcript
Synergy of thinking skills	*Critical thinking*	We live in a global village anchored on a specific local setting. As world citizens, critical thinking guides us to think of problems. It is in identifying fundamental issues that we can provide real solutions. Science communication will allow us to reflect. It will enable us to think.-*GS 9*
	Creative thinking	Innovative problem-solving will foster the creation of feasible and plausible solutions to problems. It will help bridge the misunderstanding gap between nations or even in any social strata of society.-*GS 3*

Table 3. Discourse 3 – Synergy of thinking skills.

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sions of issues. The best creative thinkers come up with original solutions to challenges that don't rely on previous or existing ones (Baker, 2014). Creative thinking delves into solving problems, in offering solutions.

Social Media Engagement

The discourse on social media engagement is disclosed in Table 4. Social media has a crucial role in a glocal society. The extent of awareness of global issues has expanded. This prompted it to become locally relevant as it may have some effect on the ground level. The distinctive feature of global problems is the need for a central authority for coordination and enforcement (The World Bank, 2003). Social media platforms can be a good and bad place for debates about global challenges. This highlights the potential for social media to empower individuals, both in their position as regular citizens and as customers or activists that question corporate conduct. Inclusivity and equality are tremendous, and this is unprecedented compared to offline venues that are constrained by time and geography. On the other side, a significant problem with using social media to discuss global concerns is the glaring absence of continuing, reciprocal information sharing or discourse. The silence indicates that we should use caution while utilizing social media to address international issues. However, the usage of social media to debate global issues is quickly expanding. Therefore, we

Discourse	Sub-Theme	Transcript
Social Media Engagement	*Taking global issues to become locally relevant*	Social media has a crucial role in a glocal society. The extent of awareness of global issues has expanded. This prompted it to become locally relevant as it may affect the ground level.-*GS 10*
	Effective communication of science over social media	Scientific knowledge or results are communicated effectively if social media is used well. If social media is used correctly, conflicts over beliefs and values will be minimized, if not entirely avoided. It is still a long way, but it will work.-*GS 6*
	Understanding competing messages and sources of information	It is not an issue which social media platform is better for understanding messages or information. It is a matter of addressing the problem of making competing messages and sources of information better understood and understood.-*GS 4*

Table 4. Discourse 4 – Social media engagement.

Discourse	Sub-Theme	Transcript
Science Communication in Policymaking	*Scientific and technical information in formal policy processes*	Science communication gives policymakers adequate and necessary scientific and technical information to substantiate formal policy processes. This is vital in making the policies proactive to serve their very purpose.-*GS 7*

Table 5. Discourse 5 – Science communication in policymaking.

must acknowledge the significance of social media, but we may reconsider how they fit into international debates (The Business of Society, 2021).

The Internet and social media platforms have produced new opportunities for open science, such as improved communication and data sharing. Our study indicates that the majority of academics are aware of the value and significance of more open science communication and data sharing, according to evidence from interviews and a survey of academics in the United Kingdom. However, many people were worried about the possible consequences. A select few people "super users" regularly shared updates on their continuing studies. Clearly, there are greater chances for open science and public participation, but there are also difficulties (Zhu & Purdam, 2017).

Science communication in policymaking

Table 5 shows the discourse on science communication in policymaking. Science communication allows policymakers to be guided when making decisions.

Scientific and technical information is a term that is increasingly employed in National Research Council reports, and its use is linked to a number of report-specific traits, elements of the public policy climate, committee-specific traits, and the request's origin. However, scientific and technological data are not included in National Research Council reports more likely to be used by Congress (Youtie et al., 2017, p. 108).

Emancipation and empowerment through education

The discourse on emancipation and empowerment through education is reflected in Table 6. Sound decisions are based on science-based evidence. This evidence will allow people to have options or alternatives. Digital divides, in particular, are a significant structural barri-

Discourse	Sub-Theme	Transcript
Emancipation and Empowerment through Education	*Science communication in making informed choices and decisions*	Science-based information must provide informed choices and decisions to people. This is the core of science communication, allowing people to figure it out themselves. We want people to be empowered. They will be emancipated.-*GS 2*
	Role of academic institutions in propelling science communication	Educational institutions, including ours, has a role in making science communication felt. The academe can propel science communication as a catalyst for positive change.-*GS 7*

Table 6. Discourse 6 – Emancipation and empowerment through education.

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er, and community Possibilities for literacy, science literacy development, and science communication exist. (Howell & Brossard, 2021). Science communication is getting more professionalized as a result of the diversification of the industry. No longer is science communication the exclusive domain of a select few "visible scientists." It is a field that is populated by a variety of full-time communicators (along with many enthusiastic volunteers), whether they are scientists who have made a full-time transition to communication, communication experts from other fields (like PR), or an increasing cadre of individuals especially (Davies & Horst, 2016). Many palaeoscientists expressed a strong commitment to scientific communication, but they were also aware of time restrictions and potential conflicts with other academic obligations. In order to regard science communication as a worthwhile and professionally recognized activity within the study of knowledge sharing, palaeoscientists and their institutions would profit (Barbolini, 2022). This would also help other parts of a successful academic career.

Peace and global understanding

Table 7 presents the discourse on peace and global understanding. When the scientists are good and effective communicator, they can do lot more. This aids public in comprehending science as the core rudiment of their everyday lives; seeing the science as the decision-making sources, delivering the wide education to the people related to the threats planet is facing and shaping the direction of political and social policy. The present numerous advances in science and technology have a huge influence on society today and affect humanity's and the Earth's future. Science and society seek and require one another. Scientists have an ethical commitment to the public to provide truthful, understandable, and timely information, as well as to account for their use of public monies to support their work. Communications are appropriate if they provide individuals with the information they want in an understandable style (Jucan & Jucan, 2014). The world is evolving, and so must our teaching methods. Our moral mission is to provide this generation with the knowledge and skills they will need to flourish in an uncertain future. This may be the most important educational assignment we have. We should prioritize education that acknowledges and comprehends global con-

Discourse	Sub-Theme	Transcript
Peace and global understanding	*Impact for a better world*	For me, science communication changes our knowledge, attitude, and practice in any aspect of society – political, economic, and all others that directly impact our lives. We need it for a better world. World peace is said to be impossibly attained. However, when we try to embrace cultural diversity and understanding, we develop a sense of sensitivity toward others. Peace will prevail.-*GS 5*
	Preparing learners for future-proofing	Learners must be prepared in these times of uncertainty. Science communication will help us realize the need for future-proofing. We have to anticipate the future. We plan and re-plan to be successful in the future, even if the situation changes.-*GS 8*

Table 7. Discourse 7 – Peace and global understanding.

cerns in their social, political, cultural, economic, and environmental dimensions. As a result, a learner's knowledge and abilities should be enhanced in order to ensure a more fair, peaceful, tolerant, inclusive, secure, and sustainable world.

Being future-proof implies being able to withstand shifting environments and difficulties. When university policies are structured to resist and accommodate future changes in the educational landscape, they are most successful. These policies are based on agreed-upon concepts.

(Naidu & Roberts, 2018)

Conclusions

The emerging discourses of Filipino graduate students reflect how they perceive science communication when positioned globally and applied locally. Science communication is a conduit for making science relevant and impactful to all social contexts through sound and accurate knowledge sharing and engagement of scientific and technical information.

Recommendations

Science communication may be emphasized in an academic setting by integrating it into allied disciplines to maximize its practical application.

This study may be replicated by exploring other methodologies and collaborating with international partner educational institutions to look into intercultural and cross-cultural constructs along this research interest.

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