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TRANS-DISCIPLINARY COMMUNICATION AND PERSUASION IN CONVERGENCE RESEARCH APPROACH

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Abstract: This paper investigates the role of persuasion in research, specifically focusing on Trans-Disciplinary Communication (TDC). It distinguishes between convincing and obtaining consent, commitment, or consensus within TDC. It explores whether academic presenters should advocate for their positions or contribute to the disciplinary body of knowledge. The analysis employs a Systematic Literature Review and a Bibliometric Network visualization to examine state-of-the-art TDC research. Persuasion is contextualized within the public debate, and its relevance to the search for objective truth and paradigm shifts in research is discussed. The paper explores Trans-Disciplinary, Inter-Disciplinary, and Multi-Disciplinary Communication in collaborative research, highlighting the counterproductivity of contentious debates in TDC and convergence research. The role of persuasion is examined through theoretical frameworks such as Game Theory, Critical Theory, and the Theory of Interactive Team Cognition. This comprehensive exploration emphasizes the need for a Trans-Disciplinary approach to clarify terms and taxonomies and enhance understanding among researchers worldwide. It sheds light on communication and language functions, theoretical frameworks, and the debates surrounding TDC and convergence research. The paper suggests future directions for TDR and TDC, aiming to foster effective communication practices in the global research community.

Keywords: Persuasion, Systematic Literature Review, Ethos, Pathos, and Logos, Trans-Disciplinary Communication (TDC), Convergence Research Approach (CRA), Aristotle (384-322 B.C.).

INTRODUCTION

Trans-Disciplinary Communication (TDC) involves people from different fields working together to solve complex issues and promote innovation. The Convergence Research Approach (CRA) combines different areas and technologies to create new problem-solving methods. CRA is a type of Trans-Disciplinarity that relies on TDC to blend additional knowledge and technology areas for research and development breakthroughs. This approach can lead to innovative solutions beyond the reach of a single discipline, allowing for more comprehensive and transformative research outcomes. Effective communication is vital for the success of both TDC and CRA. Persuasion is crucial in communication, influencing diverse contexts, including scientific research. In the context of this paper, persuasion refers to compelling others through arguments to adopt specific beliefs, positions, or courses of action, known as the rhetorical triangle.

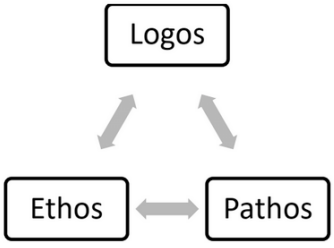

Figure 1.- Rhetorical triangle

Persuasion's role in research is essential. It significantly affects how scientists present their ideas, interact with others, spark interest, and gain stakeholder support. The article delves into various forms of persuasion, including logical, emotional, and credibility-based appeals, while acknowledging the influence of language framing on audience perception. The authors' primary focus centers on exploring the intricate relationship between persuasion and academic research, emphasizing effective communication across

disciplinary boundaries and understanding audience needs.

This article critically examines the importance of TDC and its link with persuasion in research. It investigates aspects like types of communication, language functions, the relationship between persuasion and theories like Game Theory (GT), Critical Theory (CT), and the Theory of Interactive Team Cognition (TITC), and the debates surrounding TDC and CRA. Before embarking on the literature review, the work thoroughly examines foundational concepts and pertinent research. Notably, the article provides an in-depth analysis of the Aristotelian Trinity, which serves as a cornerstone for subsequent investigations into Persuasion and TDC. The literature review includes a thorough report of its findings. The article then outlines the methodology used, presents the results from the analysis, and follows up with discussions and recommendations. This section also delves into exploring best practices for fostering effective TDC.

Finally, the article outlines a route for active engagement in TDC. To ensure genuine participation in the persuasion and TDC discourse, the authors cordially invite all interested individuals to partake in a virtual conference scheduled for January 2024, envisioning this conference as an initial step toward achieving consensus on an effective method for engaging in TDC.

THEORETICAL FRAMEWORK

In TDC, one of the most significant challenges is for the sender to connect with and captivate the recipient. The issue becomes even more critical since the sense of belonging to a pre-existing group often does not provide an initial introduction or benefit of the doubt. In collaborative Communication across disciplines, communities, and cultures, participants must engage and understand each other to have a chance to begin. The sender is primarily responsible for initiating the engagement within the communication process.

The sender's objectives can differ, ranging from seeking consent, commitment, or consensus, which can impact the methods of persuasion used. Therefore, the contemporary use of persuasion in the context of TDC needs investigation to fully understand the associated terms and concepts related to endorsement or adoption. Notably, "there is no transdisciplinary *Esperanto*" [1, p. 521] organizational structures, and strategies for implementing transdisciplinarity. At the same time, they were mindful of the remaining impediments. This closing reflection builds on their insights in two parts: (1, implying that different fields have their jargon and terminology.

LINEAR COMMUNICATION MODEL

The evolution of the Aristotelian linear communication model, aimed at persuading a passive audience, was designed for speakers targeting message recipients that were typically similar in context and culture and often belonged to a community sharing common values and perspectives. This method was named Rethoric. These fundamental principles of persuasion, codified as Rhetoric, remain relevant today. Still, their simplistic conception must be expanded to incorporate various application notions, given the context of technology, Digital Media, and Communication.

In contrast to the linear model, the cooperation and collaboration model aims to democratize participation by involving everyone as participants. Therefore, concepts such as Engagement, Consent, Commitment, and Consensus become relevant to understanding the purposes of persuasion in TDC.

The importance of persuasion and argumentation in research communication and dialogue becomes evident as researchers aim to disseminate their ideas effectively. While research may not have a single winner, persuading others of the validity and significance of their work remains a priority. Doing this entails utilizing a blend of logical and emotional appeals, credibility, and ethics. Effectively communicating ideas and findings can be achieved by applying Aristotle's persuasion and poetics concepts. Although data and evidence ultimately validate or invalidate arguments, persuasion, and argumentation are indispensable tools for advancing knowledge and understanding. Particularly when engaging with the general public, the speaker's position and reputation play a crucial role in validating their message, as the public might not possess the depth of knowledge and context to comprehend the shared information fully.

COOPERATION AND COLLABORATION MODEL

TDC is a collective undertaking involving various disciplines and non-disciplinary participants, such as private organizations and communities, to address intricate issues and foster innovation. Effective Communication across disciplines necessitates a thorough understanding of the diverse fields and structures, including their language, culture, and practices. Such Communication can take various forms, including face-to-face meetings, *electronic mail* correspondence, Social Media, and other digital platforms. Success in Communication involves active listening, precise articulation of ideas, and mutual respect among all team members. Moreover, developing a shared language, standard concepts, and frameworks is crucial for enabling scientific participants to collaborate effectively with non-scientific members in trans-disciplinary settings.

Persuasion was a crucial element in developing a common language during the origins of philosophy.

At first, persuasion was essential for developing a common language [2], [3]. While persuasion can be used to manipulate and deceive, it can also foster understanding and collaboration. One approach is to view persuasion as an end in itself, using rhetoric as a personal tool to achieve a selfish goal. Another method is to use persuasion for scientifically appropriate purposes in search of objective truth. The rhetorician has been defined as someone who can always observe what is persuasive: "Aristotle defines the rhetorician as someone who is always able to see what is persuasive (*Topics* VI.12, 149b25); correspondingly, rhetoric is defined as the ability to see what is possibly persuasive in every given case (*Rhet.* I.2, 1355b26f.)." [4].

Rhetoric has a long history dating back to ancient Greece [5], [6]. The study of Rhetoric was initially considered a foundational part of education and was taught alongside other subjects like Mathematics and Philosophy. In addition, many of the most famous philosophers of ancient Greece, including Plato and Aristotle, wrote extensively about the art of persuasion [7], [8]. Philosophy began to divide into different sub-disciplines, such as Ethics, Metaphysics, and Epistemology. Over time, these sub-disciplines developed their methodologies and ways of thinking, which led to a fragmentation of knowledge and a lack of communication between different fields. However, the study of Rhetoric remained essential to education and scholarship throughout the centuries despite this fragmentation.

The study of Rhetoric as the art of persuasion in public speaking began in ancient Greece, where philosophers like Aristotle and Cicero studied and wrote extensively on the topic [9,

pp. 1–26]. Aristotle defined Rhetoric as the means of persuasion about any subject. The five canons of Rhetoric, a five-step process for developing a persuasive speech, is still used to teach public speaking today [10]. It is well known that Aristotle conceived public debates in civic forums as a performance to engage and persuade the audience effectively.

However, effectiveness, as a tool of influence, is incompatible with the quest for objective truth that defines scientific inquiry. Science must strive for objectivity rather than subjectivity. The goal of persuasion is to convince others of a specific outcome, whereas science seeks to uncover the truth through rigorous inquiry. Science recognizes inherent uncertainty in this pursuit and continually questions its assumptions. This ongoing process of questioning is at the heart of the scientific investigation.

The fragmentation of knowledge has led to a lack of integration between fields, giving rise to Trans-Disciplinary Research (TDR), a term first introduced by Jean Piaget in 1970 and later adopted in 1987 by the International Center for Transdisciplinary Research (CIRET) as an approach to overcome these limitations [11].

TDR brings together researchers from different areas to collaborate on complex problems and challenges that cannot be addressed within the boundaries of a single discipline.

As we can see, persuasion played a pivotal role in the origins of academic research, where disciplinary boundaries were fluid, and effective communication skills were honed through dialectical reasoning. Reintroducing these practices in TDR revitalizes effective communication's significance and persuasive discourse's positive aspects.

This approach aims to recapture the inter-disciplinary and trans-disciplinary spirits of the past, promoting greater Communication, integration, and collaboration between researchers from different fields. Therefore, it is essential to consider the positive aspects of persuasion and argumentation, particularly as they relate to effective Communication and collaboration across disciplinary boundaries. Such communication and collaboration are critical to the success of TDR in addressing complex problems and challenges that require multiple perspectives and expertise.

A systematic literature review becomes a valuable tool as we seek to revitalize the Trans-Disciplinary spirit of the past and promote greater communication, integration, and collaboration between researchers from different fields. By conducting a comprehensive review of existing research, we can gain deeper insights into the positive aspects of persuasion, particularly as they relate to effective communication and collaboration across disciplinary boundaries. This review will serve as a foundation for understanding the historical roots of persuasion in academic research and its potential applications in contemporary TDR.

SYSTEMATIC LITERATURE REVIEW

A Systematic Literature Review (SLR) explored 1,763,224 documents using previously identified search terms: "Research*" AND "Logos", "persuasion" AND "research", "research and persuasion", "Education*" AND "Ethos", "Research*" AND "Ethos, Logos, Pathos", "Research*" AND "Pathos", "Education*" AND "Pathos", "Research Pathos", "Education*" AND "Ethos, Logos, Pathos".

The protocol[2] for the SLR was discussed amongst the authors and adjusted to identify 112 documents to create the database "Review of the 112 documents form the exploratory selection for TDC and persuasion" [12]. Among the 112 documents analyzed, 97 of them already had keywords present, and an

2. The protocol can be access at: https://www.cristoleon.com/project/proceso-del-protocolo-de-revision-de-la-literatura/

additional 15 keywords were manually added. This gives us a total of 782 identified keywords. The maximum number of keywords found in a single document was 55, while the median number of keywords per document was 4. These keywords were translated into English and categorized for a preliminary analysis under the "Matrix for the GPS model for TDC and persuasion" [12]. In this initial analysis, we identified several terms with more than one word (i.e., Social and Behavioral Sciences, Action Research in Education, etc.). Additionally, some keywords used the names of the following authors: Aristotle (384-322 B.C.), Michel Foucault (1926-1984), Nicolai Hartmann (1882-1950), Edmund Husserl (1859-1938), Jacques Marie Emile Lacan (1901-1981), Gerald R. Miller (1931-1993), William Shakespeare (1564-1616), and Dante Alighieri (1265-1321).

In the present study, Bibliometric Network Analysis serves as more than a methodological choice; it is a reflection of the broader academic recognition of the utility and robustness of bibliometric tools in contemporary research. Building upon the foundational work by Donthu et al. [13]–[15], and Khan et al. [16], this analysis leverages the capabilities of VOSviewer software used to create the visualization [17] for the rigorous examination of large data sets. The bibliometric network analysis involved creating a *keyword co-occurrence map* using a list of keywords and a *text data co-occurrence map* using the titles and abstracts. It aligns with the burgeoning trend of employing bibliometric methodologies, initially rooted in information science, for explorations within business research

BIBLIOMETRIC NETWORK ANALYSIS

This approach identifies knowledge gaps and offers a consolidated overview of the field, providing fertile ground for subsequent investigations. The dataset, saved as a Research Information Systems (RIS) file, is transparently shared via the Center for Open Science 'OSF project' [12]. After separating the original 782 keywords by words, a new total of keywords was obtained (N=1,182). In this discussion, we will focus on the keyword co-occurrence map using Keywords (N=1,182) as the unit of analysis using the *full counting* method for analyzing the text data.

Full counting: We set a term's minimum number of occurrences as the keyword threshold of five. Out of the 1,182 keywords, 123 met this threshold. The relevance score was calculated using the default choice of 60%. As a result, a total of seventy-three keywords were selected. The three keywords with the highest number of occurrences were Interdisciplinary research (85), research (52), and collaboration (50). On the other hand, the three keywords with the highest total link strength were Interdisciplinary research (447), human (380), and collaboration (365).

In the visualization "Full counting 1182 keywords map for TDC and Persuasion", we observed that the keywords formed a strong cluster around cooperative behavior between 2006 and 2010. However, from 2010 to 2014, they shifted towards collaboration and inter-disciplinarity [18].

The second analysis specifically examined the title and abstract fields of 112 documents, identifying 2,127 terms.

Full counting: For full counting, a threshold of seven was chosen as the minimum number of occurrences required for a term. Of the 2,127 terms, sixty met this threshold and were assigned a relevance score using the default choice of 60%. Ultimately, 36 terms were

selected as the final set. Among the identified terms, the four with the highest occurrences were persuasion (83), Ethos (50), logo (45), and rhetoric (34). On the other hand, the four terms with the highest relevance scores were receiver (5.22), sender (4.92), school ethos (2.93), and play (1.62). The only term excluded from the final selection was "author." In the visualization "Full counting 2127 terms map for TDC and Persuasion", we observed a clear cluster of keywords associated with persuasion, representing the rhetorical triangle, between 2010 and 2018. However, between 2018 and 2020, there was a shift in focus toward communication, leading to fresh discussions on topics such as State, responsibility, and the recipient [19].

ORGANIZING THE DOCUMENTS USING THE GPS MODEL

The *General Particular Specific* (GPS) model is a tool designed for conducting systematic literature reviews. It provides a framework for organizing and analyzing research literature in a structured manner. The model has three main sections: General, Particular, and Specific.

General: This section encompasses broad concepts, theories, or background information related to the research topic. It provides a high-level overview and context for understanding the subject matter.

Particular: In this section, more aspects or subtopics related to the research question are addressed. It delves deeper into the subject and examines more particular details, theories, or ideas within the research area.

Specific: The specific section focuses on the narrowest aspects or elements of the research topic. It involves the examination of precise variables, methodologies, or empirical evidence related to the research question.

The GPS model aims to provide a structured approach to reviewing and synthesizing relevant literature, allowing researchers to identify key concepts, theories, and empirical findings related to their research topic. It helps organize information and facilitates a comprehensive understanding of the existing knowledge in the field.

By adopting the GPS model, researchers gain a structured framework that enables the systematic review and synthesis of pertinent literature. This approach facilitates the identification of key concepts, theories, and empirical findings relevant to the research topic, enhancing the organization and comprehension of existing knowledge within the field.

To illustrate the application of the GPS model, a matrix was constructed to create the "Matrix for the GPS model for TDC and persuasion," [12] centered around the theme of "Trans-Disciplinary Communication and Research (TDC&R)" [20]. The matrix delineates specific components that align with the GPS model, such as Inter-Disciplinary Research (IDR), TDR, and TDC&R. It also encompasses collaboration, the integration of knowledge from different disciplines, methods for TDC, communication skills, analysis of TDR effectiveness, and the development of TDR models. By employing the GPS model and leveraging the matrix, researchers can undertake comprehensive and structured literature reviews that effectively identify and synthesize critical elements of TDC&R. The listed components were identified and utilized to this end:

TDC is crucial to successful collaboration between professionals from different disciplines.

The literature review highlights critical elements for effective Communication, emphasizing the importance of mutual respect and trust, active listening, and plain language to facilitate understanding. Additionally, employing a common language, such as a

shared conceptual framework or terminology, enhances perspectives and promotes collaborative efforts. However, the takeaway from all the references in the article is not solely focused on effective Communication's foundational principles. The literature review also delves into the significance of persuasion in research, examining its manifestation within different theoretical frameworks and exploring its impact on group dynamics and decision-making processes. Furthermore, the review discusses the contentious debates surrounding TDC and Convergence Research, recognizing the need to address disciplinary biases and knowledge integration challenges. Finally, acknowledging and addressing any power imbalances within the team must ensure that all views are valued and integrated into decision-making processes. Therefore, TDC is essential for achieving a common goal and creating solutions to complex problems requiring multiple expertise areas. The resources identified on the SLR were categorized using the GPS model.

1. **Inter-Disciplinary Research (GG):** [11], [21]–[33]
2. **Trans-Disciplinary Research (GP):** [1], [34], [35]
3. **Trans-Disciplinary Communication and Research (GS):** [36]–[38]
4. **Collaboration (PG):** [27], [34], [36], [39]
5. **Integration of knowledge from different disciplines (PP):** [21], [25], [26], [40]–[42]
6. **Methods for Trans-Disciplinary Communication (PS):** [34], [39], [43], [44]
7. **Communication skills (SG):** [45]–[48]
8. **Analysis of Trans-Disciplinary Research Effectiveness (SP):** [34], [49]–[51]
9. **Development of Trans-Disciplinary Research models (SS):** [34], [35], [52], [53]

SLR REPORT AND KEY TOPICS

This literature review report extensively explores various resources categorized by the GPS model. This investigation offers valuable insights into the dynamic interconnections between TDC&R. Furthermore, it provides a greater understanding of the efficiency of collaborative efforts and the development of innovative research models, thereby enriching our comprehension of emerging knowledge generation and dissemination trends. The review conducts a centrality analysis, identifying three core topics: Communication, Persuasion, and Research. It establishes robust links between these central topics and their respective subtopics. Namely, these are Communication and Language, Persuasion and Communication, and Research and Education. We've adopted three specific lenses to further our exploration: GT, CT, and TITC. These lenses were selected from the 'Functions' subtopic, enabling a more focused investigation into these core areas. The relationships among these topics and subtopics can be visualized in Figure 1.

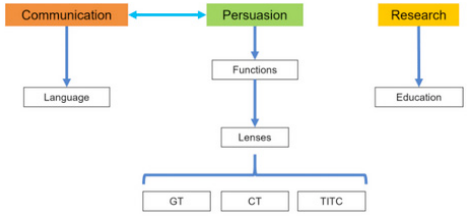

Figure 2.- SLR Key Topics

Communication: can take many forms and use many functions, including Interpersonal, Mass, and Digital Communication [54]–[57]. Interpersonal Communication involves face-to-face interactions between individuals or small groups, while Mass Communication involves disseminating information to large

audiences through various media outlets. Digital Communication refers to using electronic devices and software applications for exchanging information. This includes multiple social media platforms such as Facebook and Twitter, email, instant messaging, video conferencing, and other digital technologies. Also, with the widespread adoption of AI applications in new products and contexts and the increasing concerns about their impact on society [58]but despite concerns about AI's negative effects on society the social consequences of using it to communicate remain largely unexplored. We investigate the social consequences of one of the most pervasive AI applications, algorithmic response suggestions ("smart replies", these technologies play an essential role in communication and knowledge dissemination. Language serves several functions in Communication, including transmitting information, persuading participants, and establishing social norms.

Persuasion is a crucial element in effective Communication, playing a vital role in achieving the objectives of Interpersonal, Mass, and Digital Communication. Persuasion has several functions in Communication, including changing attitudes and beliefs, influencing behaviors, and creating a sense of social cohesion. These persuasion functions can be explored through the lenses of "*Game Theory* (GT)" [59], [60], "*Critical Theory* (CT)" [56], [61], [62], and the "*Theory of Interactive Team Cognition* (TITC)" [63], [64]. For instance, GT can help us understand how persuasive tactics can be used strategically to influence the behavior of others in a given situation. In addition, CT can illuminate how persuasion promotes social justice and challenges dominant power structures. Finally, the TITC can provide insights into how persuasion affects group dynamics and team decision-making processes. By examining the various functions of persuasion through these different theoretical frameworks, we can better understand persuasion's role in Communication and how it can be used to achieve multiple goals.

Research: The pursuit of objective truth has been a longstanding endeavor in philosophy and science. However, the Kuhn paradigm shift in Research challenges the notion of absolute objectivity. This shift views Research as a collaborative journey towards truth, emphasizing consensus-building among researchers rather than individual persuasion. While there is some distinction between research and education, they are not necessarily opposed.

Education is a philosophical pursuit influenced by personal beliefs and values. Behaviorism and social constructivism exemplify this perspective. Behaviorism seeks to compel behavior through mechanisms, while social constructivism emphasizes fostering experiences that enable individuals to comprehend group dynamics. Behaviorism focuses on finding mechanisms to force behavior, while social constructivism emphasizes building experiences that allow an individual to see how the group operates [65], [66].

Education is a complex field encompassing various aspects of the rhetorical triangle. Ethos refers to an educational institution's core values, attitudes, beliefs, and culture [67]. It plays a crucial role in shaping teacher identity and promoting social and emotional well-being for teachers and students [68]. Logos, on the other hand, involves the use of rational and logical arguments in educational practices. It can be seen in the analysis of late Byzantine court rhetorical praise and its influence on political attitudes and values [69]. Pathos, the appeal to emotions, is also present in education, particularly in using music to affect character and emotion [70]. However, there is a need for further research on the

effects of educational practices, such as loop electrosurgical excisional procedure (LEEP), on female sexual function [71]. Understanding and incorporating ethos, logos, and pathos in education can provide a more holistic and practical learning environment.

METHODOLOGY

The methodology of this paper takes a qualitative approach, exploring the manifestation of persuasion within three theoretical frameworks. These frameworks, namely Game Theory (GT), Critical Theory (CT), and the Theory of Interactive Team Cognition (TITC) were chosen due to their unique perspectives and contributions to understanding transdisciplinary research. Game Theory, a mathematical field, focuses on strategic decision-making involving multiple individuals, examining how their collective actions influence outcomes. Meanwhile, Critical Theory, a philosophical approach, delves into the power dynamics within society and underlines the pursuit of social justice. Lastly, the Theory of Interactive Team Cognition sheds light on team collaboration dynamics, focusing on how teams communicate and decide collectively. These approaches offer valuable insights into the study of persuasion in research, particularly regarding communication's impact on group dynamics and decision-making processes. We will explore these implications through three scenarios to gain a deeper understanding.

Scenario 1.- Game Theory Analysis of Socially Constructed Reality. Consider a game with specific rules and victory conditions, where success hinges on persuading others, particularly when reaching a consensus is one of the conditions. We must understand that such a game represents a socially constructed reality in this context. This artificially built environment doesn't necessarily align with all the conditions of Research and Science, such as Validity, Reliability, and Generalizability. Notably, the consensus amongst individuals doesn't ensure accuracy within this socially constructed reality [72].

In this scenario, persuasion manifests through appeals and efforts to reach a consensus in a game governed by specific rules and victory conditions; GT provides a valuable framework for analyzing strategic interactions and decision-making within the game. GT helps us understand how appeals and agreement among players can influence the outcome, especially when collective agreement is a crucial victory condition. On the other hand, CT offers a critical perspective to question the socially constructed reality and challenges the assumption that consensus automatically leads to accuracy. CT highlights the power dynamics and ideologies within the game, urging us to examine whether the rules and conditions truly uphold fairness and justice. Additionally, the TITC can further enhance our understanding by exploring how teams collectively process information, communicate, and make decisions within the game context.

Scenario 2.- Exploring Winning Conditions and Persuasion in Different Game Modes. In the realm of gaming, various modes of play exist, including contest-based and simulation-based formats, each with distinct winning conditions, strategies, and persuasive approaches. For instance, contest-based games often involve elements of bluffing and persuasion, while simulation-based games may revolve around gambling and vertical gameplay. Applying GT to this scenario enables the analysis of different modes of play and their corresponding winning conditions. GT facilitates the identification of optimal strategies and decision-making approaches for each method, taking into account factors such as bluffing, persuasion, and the dynamics of competition. Moreover, CT offers a critical

perspective on these game modes' underlying power structures and social implications. It prompts us to question notions of fairness, equity, and the potential for exploitation within contest-based or simulation-based games. TITC also helps us understand the impact of persuasive elements on gaming experiences and the broader implications for social dynamics and decision-making processes. By focusing on the cognitive dynamics within teams, TITC contributes significantly to enhancing team performance and deepening our understanding of the collaborative aspects of gameplay.

Scenario 3.- In the research context, the primary focus should not revolve around persuasion or achieving victory but instead on fostering innovation and making valuable discoveries. Collaboration among various domains, including Research, Communication, Administration, and Social Behavior, is essential to realize these objectives effectively. For instance, like the principle guiding science-fiction writers to write what they know, research endeavors should be guided by knowledge and evidence rather than attempts to manipulate outcomes. By embracing this approach, integrating research and communication can yield meaningful advancements and contribute to the broader body of knowledge. TITC aligns well with this scenario by emphasizing the importance of collaboration and effective communication between researchers and communicators. TITC offers insights into how teams collectively process information, share knowledge, and collaborate to drive innovative discoveries. It identifies cognitive processes and interactions that foster creativity and problem-solving within the research process. Furthermore, GT provides a mathematical framework to analyze strategic decision-making in research, helping researchers understand how different actions and choices can impact outcomes. In this scenario, CT reminds researchers about the significance of evidence-based approaches and pursuing knowledge rather than being solely driven by persuasion or manipulation. CT challenges dominant ideologies or biases within the research field and advocates for a more inclusive and objective approach.

DISCUSSIONS

The pursuit of objective truth can often be complicated by differing ethical perspectives, as evidenced by discrepancies between the approaches of scientists and philosophers. For example, scientists may present evolution as an established fact, yet this claim can be contrasted by parents teaching their children creationist beliefs [73, pp. 11–12]. Similarly, the controversy over vaccines potentially causing autism demonstrates the ongoing tension between pseudo-science, non-science, and the quest for verifiable truth [74]. Thus, searching for objective truth is a complex and challenging pursuit involving collaboration, philosophical beliefs, and ethical considerations.

It is important to explore the nature of the debate surrounding TDC, and convergence research is often associated with much discussion within the research community [75]. This debate revolves around the value and validity of Inter-Disciplinary Research (IDR) and disciplinary thinking and whether or not it is a practical approach to solving complex problems: "Forms of multi-, pluri-, and interdisciplinarity do not call into question disciplinary thinking. Transdisciplinarity does, through the principle of articulation between different forms of knowledge. Of necessity, transdisciplinary work is based on disciplinary practice" (Klein, 2004, p. 524). Critics argue that TDC and Convergence Research can lead to superficial and fragmented Research, while proponents say it is essential for developing holistic solutions to complex

problems [50]. Some contributing factors to this debate include differences in academic cultures, disciplinary biases, power dynamics, funding structures, and the prioritization of knowledge creation over application.

Additionally, there is a need to address epistemological and ontological differences in IDR and the challenges of integrating diverse knowledge systems. In the realm of academic research, presentations play a dual role. They serve as a platform for advocating a particular position and, concurrently, as a means to contribute to the disciplinary body of knowledge and broader society. These objectives present an additional dimension to explore concerning persuasion. Advocacy involves persuading the audience to align with a particular viewpoint or cause, aiming to raise awareness about a specific issue or influence policy decisions.

On the other hand, the contribution aspect of academic presentations seeks to persuade fellow researchers and the broader scholarly community about the significance and validity of the research findings, aiming to advance knowledge within a specific field. The decision to focus on advocacy or contribution significantly impacts the presentation's persuasive strategies and communication approaches. Presenters often employ compelling, logical arguments (logos) to support their position when advocating for a particular position. To make the argumentation more robust, it is also crucial to invoke the rhetorical aspect that relates to the credibility and character of the presenter (ethos). Additionally, presenters may use emotional appeals (pathos) to engage the audience's empathy and moral conviction. Logos serves to rationalize the position being presented, while pathos aims to galvanize the audience emotionally. Ethos manifests itself in several dimensions: the qualifications of the presenter, their relevance to the topic at hand, the inclusion of credible and properly documented sources, and a tone and diction appropriate for the audience and purpose. Conversely, a more evidence-based approach may be used in presentations geared towards contribution, relying heavily on data, rigorous methodology, and adherence to established academic conventions to persuade the audience of the research's scholarly value.

NEGOTIATING UNDERSTANDING

To achieve a more nuanced level of discussion, we must move beyond a simplistic, linear communication model to examine the integration of choices that enhance effective delivery. This shift allows for a holistic understanding of integrated delivery effectiveness. While content remains a crucial factor, this approach emphasizes how the sender utilizes various delivery mechanisms to improve the target audience's reception of the content in a specific context. The measure of a communication package's effectiveness depends on the extent to which the target receives and acts upon the message in the manner intended by the sender. In this regard, integration explores how the creator tailors both content and delivery to meet the target's needs in a given situation, facilitating a negotiated understanding of the intended message. This strategy aims to achieve the desired goals efficiently, thereby ensuring a successful transfer of meaning.

However, when communication is dynamic, simultaneous, and collaborative, success cannot be gauged solely by accurately replicating content and images in the receiver's mind. The work of Trans-Disciplinary Communication (TDC) in knowledge sharing and creation necessitates that involved parties negotiate a shared space for communication, complete with agreed-upon ground rules and a commitment to engage. Considering the linear model articulated

by Aristotle, wherein persuasion is integral, we find that the focus is mainly on content delivery. Even when interaction is introduced through modern models that involve message transfer, feedback, or encoding, the primary intention remains the same: to move the receiver to action or to bring both parties closer together. In this framework, Trans-Disciplinary Communication (TDC) serves as a mechanism for translation and clarification or as a means to create a lexicon that enables the shift towards a common language. Persuasive elements are strategically used to make analogies, metaphors, or other language conventions understandable to the other party. Meaning, in this context, is mainly about aligning the sender's viewpoints and understanding with the specific conditions of the audience. Thus, the communication aims to change the audience by introducing knowledge from outside the discipline. Persuasion can be viewed as a tool to facilitate engagement, spark interest, alter preconceived notions, or correct misconceptions held by a less knowledgeable participant.

Contrastingly, a collaborative communication perspective on TDC reveals a more complex scenario. When two or more individuals or groups engage in dialogue, they locate a shared space to collaborate, find common ground, and reach a consensus. In this setting, communication serves as a negotiation tool for establishing mutual understanding. Regardless of whether the interaction is face-to-face or mediated through technology, the principles of negotiation hold. On the one hand, as Mandate and Medina [76] assert, "All online negotiations replicate the common characteristics of negotiation situations." On the other hand, it is crucial to be mindful of the "Common Characteristics of Culture" as outlined by the Center for Substance Abuse Treatment (US) in "*Improving Cultural Competence*"[77]

- One or more parties involved
- Need for conflict management
- The power relationship between the parties
- Systematic process of offer and counteroffer with feedback
- Tangibles and intangibles of added value

These bullet points encapsulate a different facet of negotiation or conflict management, essential for effectively engaging in TDC in research.

Consider the example of coming to a table to discuss a topic. There must first be a willingness to approach the table with an open mind to initiate communication. Concurrently, a suitable table must exist to facilitate this interaction. In this sense, TDC creates a neutral space where two or more parties can converse without disciplinary norms or behavior constraints. At times, persuasive techniques may invite desired collaborators to the table. The negotiation of meaning can only commence when all parties have gathered at this metaphorical table.

Once participants are present, various other elements come into play. As meaning is negotiated, conflicts of a personal, intellectual, and intercultural nature are bound to arise. Although the ideal is for discussions to be collaborative and stress-free, this is not a realistic depiction of human interaction. Utilizing TDC tools can facilitate conflict resolution as the parties work toward consensus and argue for conceptual unification. This naturally segues into the issue of power dynamics, which connects to the aspects of Ethos discussed earlier. Although peer review processes are established today, and there are agreements on scientific methods, the position of authority of the person presenting an academic argument is still as important as in the time of Aristotle, when such resources

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did not exist. Unspoken, implicit biases and overt or covert power differences can hinder collaborative communication.

As we advance this discussion, the analogy of 'sitting at the table' shows its limitations. Every table is in a room, representing the prevailing system of expectations for the parties involved. For successful communication to occur, a system must be in place to facilitate Trans-Disciplinary Communication (TDC). If participants remain isolated within their disciplinary silos, collaborative TDC will not happen. The task for communicators, in part, involves creating a hybrid system of engagement and persuading the parties to align their existing communication styles and meaning-making processes with this new or hybrid system. In this context, TDC provides a novel space for effective meaning-making for all involved.

Moreover, the table must offer intrinsic or extrinsic value that all participants recognize. Without perceived value, negotiations are unlikely to commence, as there would be nothing worthwhile to discuss. Identifying and conveying this value is an integral part of the persuasive aspects tied to TDC. Often, the inability to venture beyond one's disciplinary confines can impede the effective communication of value and the extension of collaboration invitations. The greater the disparity between the participants, the more challenging it may be to negotiate a shared understanding of value and to agree upon a standard set of metrics for assessment.

Understanding the dynamics contributing to successful interactions is crucial in considering scenarios where researchers and stakeholders collaborate. As Kaisler and Grill (2021) articulate, "Enablers for successful transdisciplinary collaboration include researchers' open-mindedness toward new perspectives and approaches, flexibility in adapting to the research process, and creativity in managing diverse backgrounds and skill sets." This insight is particularly relevant when exploring the multi-faceted nature of the 'table' where such collaborations occur.

Transdisciplinary communicators exhibit several defining attributes. They champion transdisciplinarity and communicative action as catalysts for the paradigm shift from postmodernity to transmodernity. Employing innovative, communicative strategies, they supplement traditional methodologies [78]. Acknowledging the utility of transdisciplinary education and digital technology within pedagogical frameworks, they advocate for an education system that is inclusive, dialogic, and universally accessible [79]. These communicators utilize various evaluative methods to foster comprehensive and inclusive scholarly dialogue, including dual peer review and participative peer-to-peer assessment [80]. Additionally, they contribute to intelligent, sustainable, and inclusive growth by espousing a transdisciplinary framework that cohesively integrates theories, policies, politics, and practices. This framework encourages cross-sector collaboration among governmental agencies, academic institutions, industry, and civil society [81].

Scholars agree on the necessity of instructing future communicators in the salient characteristics of transdisciplinary communication (TDC). This view aligns with the curriculum established by the Transdisciplinary Studies Program at Claremont Graduate University, which outlines five core competencies: "Communicating Values, Reflective Practices, Effective Collaboration, Integrative Skills, and Imaginative Solutions" [82].

In the context of the rhetorical triangle, the role of ethical persuasion is paramount. Persuasion, inherently laden with power dynamics and value judgments, is instrumental in TDC. Ethical considerations are inextricable

from these discussions; since the time of Aristotle, unethical uses of persuasion have risked muddying rather than clarifying issues. Therefore, TDC tools' practical and ethical application is indispensable for promoting societal well-being and the pursuit of objective truth.

LIMITATIONS

The emergence of new technologies will likely shape the future of TDR and TDC, the increasing importance of Inter-Disciplinary (ID) collaboration, and the need to address complex social and environmental problems. Future directions for TDR and TDC include the development of new models of ID education, integrating diverse knowledge systems, and using digital platforms for collaboration and Communication.

Implementing TDC in research requires initiating with openness and extending an invitation for participation. TDC is inherently collaborative, aiming to create an environment where researchers can learn from others' disciplinary perspectives while imparting their own. At the same time, other things will impact Communication beyond disciplinary concerns**,** such as the differences in cultural and community norms. Therefore, effective implementation of TDC requires a significant investment in induction and norming processes to foster engagement and create a collaborative space for participants to develop a shared understanding. Participants exchange knowledge and norms within this space, leading to a new, convergent communication space. Once participants are motivated to engage and become accustomed to the language and discourse of the TDC, they can begin to engage in meaningful discussions, analysis, and persuasion. However, taking the first step towards fully-fledged TDC is crucial by inviting others to participate and allowing them to take the time to learn and teach the necessary norms. This initial step is essential in creating an inclusive environment where all participants can effectively engage and contribute to the collaborative learning process.

As part of our initiative to enhance transdisciplinary communication, we are excited to propose a virtual conference in January 2024. Our primary focus is to discuss the effective establishment, nurturing, and expansion of chapters within the American Association for Trans-Disciplinary Communication (AFTDC). Instead of building a preconceived structure, we invite everyone to join us in shaping this endeavor in the true spirit of transdisciplinary communication. We aim to persuade you of the essential nature of these discussions and the need to foster such dialogue. Therefore, we invite everyone to join in the co-design of a new organization devoted to TDC to broaden and strengthen our efforts to share the work that is done and which can benefit all of us. The conference is being built now; current information available at https://digitalcommons.njit.edu/tdc/

CONCLUSION

In closing, this paper underlines the critical role of Trans-Disciplinary Communication (TDC) and the use of persuasion in Research. Together, they create comprehensive strategies for tackling complex issues. We've explored how TDC and the Convergence Research Approach (CRA) demand attention to problems such as discipline biases, power imbalances, and integrating diverse knowledge sources. Additionally, we recognize the challenge of deciding whether to focus on advocating for a cause or contributing to scholarly knowledge during academic presentations, especially in the face of rapidly changing technologies. But, these challenges have potential solutions: adherence to best practices for effective TDC and forward-

thinking approaches to Transdisciplinary Research (TDR) and Communication. This study highlights the essential role of persuasive tactics within TDR, showing how they can lead to significant shifts in research outcomes. By using compelling communication effectively, we can encourage insightful discussions among varied stakeholders, cross disciplinary boundaries, and facilitate smooth idea exchanges. This paper underlines persuasion as a vital tool beyond traditional academic boundaries and enriches collaborative efforts. Our exploration of persuasion in different contexts, from specific scenarios to research communication, has revealed its power to change attitudes, foster cooperation, and boost problem-solving. This key finding highlights the need for researchers to skillfully use persuasive communication to spark innovation and propel scientific discovery forward. Blending time-tested persuasion techniques with modern communication concepts can empower researchers. It allows them to fully harness the power of collaboration and communication, accelerating collective knowledge growth. Integrating persuasive communication within TDR creates opportunities for deeper interdisciplinary exploration and understanding. As we further develop the principles of TDR, it's crucial to recognize and utilize the central role of persuasive communication in achieving our shared goals of encouraging innovation and expanding scientific knowledge. By strategically using persuasion, researchers can effectively tackle complex issues and significantly contribute to scientific understanding. The focus on advocacy or contribution in academic presentations should match the researchers' intended impacts and the presentation context. By carefully incorporating persuasive elements in their presentations, researchers can successfully engage their audience and convey the significance of their research within the broader academic and societal context.

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REFERENCES

[1] J. T. Klein, "Prospects for transdisciplinarity," *Futures*, vol. 36, no. 4, pp. 515–526, May 2004, doi: 10.1016/j.futures.2003.10.007.

[2] C. Amos, L. Zhang, S. King, and A. Allred, "Aristotle's modes of persuasion and valence effects on online review trustworthiness and usefulness," *Journal of marketing communications*, vol. 28, no. 4, pp. 360–391, 2022, doi: 10.1080/13527266.2021.1881806.

[3] T. Barr, "A Rule That Bends: Aristotle on Pathos and Equity," *Philosophy & rhetoric*, vol. 54, no. 2, pp. 149–170, 2021, doi: 10.5325/philrhet.54.2.0149.

[4] C. Rapp, "Aristotle's Rhetoric," in *The Stanford Encyclopedia of Philosophy*, Spring 2022., E. N. Zalta, Ed., Metaphysics Research Lab, Stanford University, 2022. Accessed: Jul. 24, 2023. [Online]. Available: https://plato.stanford.edu/archives/spr2022/entries/aristotle-rhetoric/

[5] J. Fahnestock, *Rhetorical style the uses of language in persuasion*. New York: Oxford University Press, 2011.

[6] F. Fischer and G. J. Miller, Eds., "Rhetoric in Policy Making: Between Logos, Ethos, and Pathos," in *Handbook of Public Policy Analysis*, 0 ed., Routledge, 2017, pp. 263–276. doi: 10.4324/9781315093192-28.

[7] T. Triadafilopoulos, "Politics, speech, and the art of persuasion: Toward an Aristotelian conception of the public sphere," *The Journal of Politics*, vol. 61, no. 3, pp. 741–757, 1999.

[8] H. Yunis, *Written texts and the rise of literate culture in ancient Greece*. Cambridge University Press, 2003.

[9] J. M. Valenzano III and S. W. Braden, *The speaker: The tradition and practice of public speaking*. Fountainhead Press, 2015.

[10] J. Heinrichs, *Thank You for Arguing: What Aristotle, Lincoln, and Homer Simpson Can Teach Us About the Art of Persuasion*. New York: Three Rivers Press, 2007.

[11] J. Piaget, "The Epistemology of Interdisciplinary Relationships," in *Interdisciplinarity Problems of Teaching and Research in Universities*, OECD Publications Center, Suite 1207, 1750 Pennsylvania Avenue, N, 1972, pp. 127–139.

[12] C. León, M. O. Cabobianco, and J. Lipuma, "Trans-Disciplinary Communication and Persuasion in Research (OSF Project)." Open Science Framework, Jul. 13, 2023. doi: 10.17605/OSF.IO/58JH9.

[13] N. Donthu, S. Kumar, N. Pandey, and G. Soni, "A retrospective overview of Asia Pacific Journal of Marketing and Logistics using a bibliometric analysis," *Asia Pacific Journal of Marketing and Logistics*, vol. 33, no. 3, pp. 783–806, Jan. 2020, doi: 10.1108/APJML-04-2020-0216.

[14] N. Donthu, S. Kumar, and D. Pattnaik, "Forty-five years of Journal of Business Research: A bibliometric analysis," *Journal of Business Research*, vol. 109, pp. 1–14, Mar. 2020, doi: 10.1016/j.jbusres.2019.10.039.

[15] N. Donthu, S. Kumar, D. Mukherjee, N. Pandey, and W. M. Lim, "How to conduct a bibliometric analysis: An overview and guidelines," *Journal of Business Research*, vol. 133, pp. 285–296, Sep. 2021, doi: 10.1016/j.jbusres.2021.04.070.

[16] M. A. Khan, D. Pattnaik, R. Ashraf, I. Ali, S. Kumar, and N. Donthu, "Value of special issues in the journal of business research: A bibliometric analysis," *Journal of Business Research*, vol. 125, pp. 295–313, Mar. 2021, doi: 10.1016/j.jbusres.2020.12.015.

[17] VOSviewer, "VOSviewer - Visualizing scientific landscapes," VOSviewer. Accessed: Jun. 30, 2022. [Online]. Available: https://www.vosviewer.com//

[18] C. Leon, "Full counting 1182 keywords map for TDC and Persuasion," OSF, Jul. 25, 2023. [Online]. Available: https://osf.io/jztr4

[19] C. Leon, "Full counting 2127 terms map for TDC and Persuasion," OSF, Jul. 25, 2023. [Online]. Available: https://osf.io/p9eux

[20] C. E. Yáñez León, P. del C. Gerónimo Ramos, Y. M. Borjas Mayorga, and V. H. Guzmán Zarate, "Capítulo 14.- Modelo General Particular Especifico (GPE): Una Herramienta Convergente para la Revisión Sistemática de la Literatura," *1*, vol. VI, pp. 173–183, Nov. 2022, doi: 10.37572/EdArt_16122271214.

[21] R. Allen, S. Rick, and N. William, Eds., *Interdisciplinary Research: Case Studies of Integrative Understandings of Complex Problems*. Thousand Oaks, CA, US: Sage Publications, 2011.

[22] G. Bataille, *Literature and Evil*, English and French Edition. New York: Marion Boyars, 1985.

[23] C. Fehr and K. S. Plaisance, "Socially relevant philosophy of science: an introduction," *Synthese*, vol. 177, no. 3, pp. 301–316, 2010.

[24] P. Galison, *Image and Logic: A Material Culture of Microphysics*. Chicago, IL: University of Chicago Press, 1997. Accessed: Feb. 03, 2023. [Online]. Available: https://press.uchicago.edu/ucp/books/book/chicago/I/bo3710110.html

[25] J. T. Klein, "The Taxonomy of Interdisciplinarity," *The Oxford Handbook of Interdisciplinarity*, pp. 15–30, Jan. 2010.

[26] J. T. Klein, "Research integration: A comparative knowledge base," in *Interdisciplinary Research: Case Studies of Integrative Understandings of Complex Problems*, Thousand Oaks, CA, US: Sage Publications, 2011, pp. 283–298.

[27] J. T. Klein, "Interdisciplinary teamwork: The dynamics of collaboration and integration," in *Interdisciplinary Collaboration: An Emerging Cognitive Science*, New York: Psychology Press, 2014, pp. 23–50. doi: 10.4324/9781410613073.

[28] A. Krishnan, "What Are Academic Disciplines? Some Observations on the Disciplinarity vs. Interdisciplinarity Debate." ESRC National Centre for Research Methods, NCRM Working Paper Series, Jan. 2009. Accessed: Jan. 06, 2013. [Online]. Available: http://eprints.ncrm.ac.uk/783/1/what_are_academic_disciplines.pdf.

[29] T. S. Kuhn, *The Road since Structure: Philosophical Essays, 1970-1993, with an Autobiographical Interview*, 2nd ed. Chicago, Ill.: University of Chicago Press, 2002.

[30] L. R. Lattuca, *Creating Interdisciplinarity: Interdisciplinary Research and Teaching among College and University Faculty*. Nashville, TN: Vanderbilt University Press, 2001. doi: 10.2307/j.ctv167563f.

[31] A. MacIntyre, *Whose Justice? Which Rationality?* Notre Dame, Ind: Notre Dame University Press., 1988.

[32] A. F. Repko and R. Szostak, *Interdisciplinary Research: Process and Theory*, 3rd edition. Los Angeles: SAGE Publications, Inc, 2016.

[33] T. R. Schatzki, "The Rationalization of Meaning and Understanding: Davidson and Habermas," *Synthese*, vol. 69, no. 1, pp. 51–79, 1986.

[34] G. H. Hadorn *et al.*, Eds., *Handbook of Transdisciplinary Research*. Dordrecht; London: Springer, 2008.

[35] J. T. Klein, W. Grossenbacher-Mansuy, R. Häberli, A. Bill, R. W. Scholz, and M. Welti, *Transdisciplinarity: Joint Problem Solving among Science, Technology, and Society: An Effective Way for Managing Complexity*. Birkhäuser, 2012.

[36] S. J. Derry, C. D. Schunn, and M. A. Gernsbacher, Eds., *Interdisciplinary Collaboration: An Emerging Cognitive Science*, 1st Edition. Mahwah, NJ: Psychology Press, 2005.

[37] R. Frodeman, J. T. Klein, and R. C. D. S. Pacheco, Eds., *The Oxford Handbook of Interdisciplinarity (Second Edition)*, 2nd ed. Oxford, United Kingdom: Oxford University Press, 2017.

[38] J.-F. Lyotard, *The Differend: Phrases in Dispute*. Minneapolis, 1988.

[39] *Trading Zones and Interactional Expertise: Creating New Kinds of Collaboration*. The MIT Press, 2010. Accessed: Feb. 03, 2023. [Online]. Available: https://www.jstor.org/stable/j.ctt5hhhrw

[40] D. Davidson, "On the Very Idea of a Conceptual Scheme," *Proceedings and Addresses of the American Philosophical Association*, vol. 47, pp. 5–20, 1973, doi: 10.2307/3129898.

[41] M. Gibbons, C. Limoges, H. Nowotny, S. Schwartzman, P. Scott, and M. Trow, *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*. SAGE, 1994. [Online]. Available: https://archive.org/details/mode1_2

[42] B. Nicolescu, "Multidisciplinarity, Interdisciplinarity, Indisciplinarity, and Transdisciplinarity: Similarities and Differences," *RCC Perspectives*, no. 2, pp. 19–26, 2014.

[43] J. B. Holbrook, "What is interdisciplinary communication? Reflections on the very idea of disciplinary integration," *Synthese*, vol. 190, no. 11, pp. 1865–1879, Jul. 2013, doi: 10.1007/s11229-012-0179-7.

[44] C. Pohl and G. H. Hadorn, "Methodological challenges of transdisciplinary research," *Natures Sciences Sociétés*, vol. 16, no. 2, Art. no. 2, Apr. 2008, doi: 10.1051/nss:2008035.

[45] S. Beebe, S. Beebe, and D. Ivy, *Communication: Principles for a Lifetime, Global Edition*, 8th edition. Pearson, 2021.

[46] J. Fiske, *Introduction to Communication Studies*, 3rd edition. London ; New York: Routledge, 2010.

[47] J. Habermas, *On the Pragmatics of Communication*, 1st ed. The MIT Press, 2000.

[48] D. A. Stone, "The experience of the tacit in multi- and interdisciplinary collaboration," *Phenom Cogn Sci*, vol. 12, no. 2, pp. 289–308, Jun. 2013, doi: 10.1007/s11097-011-9248-5.

[49] H. M. Collins and R. Evans, "The Third Wave of Science Studies: Studies of Expertise and Experience," *Soc Stud Sci*, vol. 32, no. 2, pp. 235–296, Apr. 2002, doi: 10.1177/0306312702032002003.

[50] NAS, *Convergence: Facilitating Transdisciplinary Integration of Life Sciences, Physical Sciences, Engineering, and Beyond*. Washington, DC: The National Academy Press, 2014. doi: 10.17226/18722.

[51] B. Nicolescu, *Manifesto of Transdisciplinarity*. SUNY Press, 2002.

[52] G. Bataille, *Inner Experience (SUNY Series Intersections: Philosophy and Critical Theory)*. Albany: SUNY Press, 1988.

[53] A. Macintyre, *Three Rival Versions of Moral Enquiry: Encyclopaedia, Genealogy And Tradition*, 1st ed. London: Bloomsbury Academic, 1990.

[54] D. K. Berlo, *The process of communication; an introduction to theory and practice*. New York, Holt, Rinehart and Winston, 1960. Accessed: May 31, 2022. [Online]. Available: http://archive.org/details/processofcommuni0000berl

[55] L. R. Frey, D. S. Gouran, and M. S. Poole, *The Handbook of Group Communication Theory & Research*. Thousand Oaks, Calif: Sage Publications, Inc., 1999.

[56] C. Fuchs, *Critical Theory of Communication: New Readings of Lukács, Adorno, Marcuse, Honneth and Habermas in the Age of the Internet*. University of Westminster Press, 2016. [Online]. Available: https://www-jstor-org.libdb.njit.edu:8443/stable/j.ctv5vddf2

[57] K. Nordenstreng and C. Christians, *Intersections in Communications and Culture: Global Approaches and Transdisciplinary Perspectives*, vol. 31. in Intersections in Communications and Culture: Global Approaches and Transdisciplinary Perspectives, vol. 31. Peter Lang, 2014.

[58] J. Hohenstein *et al.*, "Artificial intelligence in communication impacts language and social relationships," *Sci Rep*, vol. 13, no. 1, Art. no. 1, Apr. 2023, doi: 10.1038/s41598-023-30938-9.

[59] J. V. Neumann and O. Morgenstern, *Theory of Games and Economic Behavior: 60th Anniversary Commemorative Edition*. 2020.

[60] C. Shannon and W. Weaver, *The Mathematical Theory of Communication*, 1st ed. The University of Illinois Press, 1963.

[61] B. Best, W. Bonefeld, and C. O'Kane, Eds., *The SAGE Handbook of Frankfurt School Critical Theory*. Thousand Oaks, CA, 2018.

[62] J. Bohman, J. Flynn, and R. Celikates, "Critical Theory," in *The Stanford Encyclopedia of Philosophy*, Spring 2021., E. N. Zalta, Ed., Metaphysics Research Lab, Stanford University, 2021. Accessed: Jun. 24, 2022. [Online]. Available: https://plato.stanford.edu/archives/spr2021/entries/critical-theory/

[63] L. M. Bennett and H. Gadlin, "Collaboration and Team Science: From Theory to Practice," *J Investig Med*, vol. 60, no. 5, pp. 768–775, Jun. 2012, doi: 10.231/JIM.0b013e318250871d.

[64] N. J. Cooke, J. C. Gorman, C. W. Myers, and J. L. Duran, "Interactive Team Cognition," *Cognitive Science*, vol. 37, no. 2, pp. 255–285, 2013, doi: 10.1111/cogs.12009.

[65] M. G. Jones and L. Brader-Araje, "The impact of constructivism on education: Language, discourse, and meaning," *American Communication Journal*, vol. 5, no. 3, pp. 1–10, 2002.

[66] S. D. Simon, "From neo-behaviourism to social constructivism: The paradigmatic non-evolution of Albert Bandura," *Unpublished thesis, Bachelor of Arts Honors, Division of Educational Studies, Faculty of Emory College of Emory University*, 2001.

[67] F. Leonte, *Ethos, Logos, and Perspective: Studies in Late Byzantine Rhetoric*, 1st ed. London: Routledge, 2023. doi: 10.4324/9781003321583.

[68] P. Burden, "Goodwill or Wind Chill?: The Importance of Evaluating Ethos Within Japanese Tertiary Education," in *Advances in Higher Education and Professional Development*, S. Karpava, Ed., IGI Global, 2023, pp. 357–371. doi: 10.4018/978-1-6684-7275-0.ch019.

[69] P. C. Ozoaghuta and E. V. Ojukwu, "Enhancing the enrollment of students into music education in Nigerian tertiary institutions through ethos and pathos," *J. Assoc. Nig. Mus.*, vol. 16, no. 1, pp. 39–47, Aug. 2022, doi: 10.4314/janm.v16i1.3.

[70] T. Eroshenko and M. Finko, "The Ethos of Modern Education," *HUMANITIES OF THE SOUTH OF RUSSIA*, vol. 11, no. 5, pp. 122–133, Dec. 2022, doi: 10.18522/2227-8656.2022.5.10.

[71] N. N. Kim, "Finding Our Way From the Bench to the Bedside: The Ethos, Logos, and Pathos of Biomedical Research," *Sexual Medicine Reviews*, vol. 10, no. 3, pp. 353–359, Jul. 2022, doi: 10.1016/j.sxmr.2022.06.001.

[72] L. Leung, "Validity, reliability, and generalizability in qualitative research," *J Family Med Prim Care*, vol. 4, no. 3, pp. 324–327, 2015, doi: 10.4103/2249-4863.161306.

[73] R. A. Segal, *Myth: A Very Short Introduction*, 2nd edition. New York, New York: Oxford University Press, 2015.

[74] M. Davidson, "Vaccination as a cause of autism—myths and controversies," *Dialogues Clin Neurosci*, vol. 19, no. 4, pp. 403–407, Dec. 2017.

[75] D. Fam, J. Palmer, C. Riedy, and C. Mitchell, Eds., *Transdisciplinary Research and Practice for Sustainability Outcomes*, 1st edition. London ; New York: Routledge, 2016.

[76] L. Munduate and F. J. Medina Díaz, *Gestión del conflicto, negociación y mediación*, Edición edition. Ediciones Pirámide, 2005.

[77] Center for Substance Abuse Treatment (US), *Improving Cultural Competence*. in SAMHSA/CSAT Treatment Improvement Protocols. Rockville (MD): Substance Abuse and Mental Health Services Administration (US), 2014. Accessed: Oct. 25, 2023. [Online]. Available: http://www.ncbi.nlm.nih.gov/books/NBK248428/

[78] S. Vladutescu, "Transdisciplinarity and Communicative Action. A Postmodern Perspective (Editorial)," *Postmodern Openings*, vol. 5, no. 4, pp. 9–14, Dec. 2014, doi: 10.18662/PO/2014.0504.01.

[79] M. E. M. Vieira, S. Alves-Hopf, J. T. R. Collado, and M. D. G. L. Hoefel, "Articulating Methodology – Weaving a Trans-Disciplinary Knowledge," *JSCI*, vol. 20, no. 1, pp. 270–295, Jan. 2022, doi: 10.54808/JSCI.20.01.270.

[80] N. Callaos, "Trans-Disciplinary Communication (editorial)," *JSCI*, vol. 20, no. 1, pp. 1–44, Apr. 2022, doi: 10.54808/JSCI.

[81] E. Carayannis, L. Hens, and P. Nicolopoulou-Stamati, "TRANS-DISCIPLINARITY AND GROWTH: Nature and Characteristics of Trans-disciplinary Training Programs on the Human-Environment Interphase," *J Knowl Econ*, vol. 8, no. 1, pp. 1–22, Mar. 2017, doi: 10.1007/s13132-015-0294-z.

[82] CGU, "Abilities, Domains, and the Transdisciplinary Mindset," Transdisciplinary Studies. Accessed: Oct. 25, 2023. [Online]. Available: https://my.cgu.edu/transdisciplinary/abilities-domains-and-the-transdisciplinary-mindset