**Unravelling the Web of Pseudoscience: Exploring the Role of social media in Spreading Misconceptions among Science Background Users**

**ABSTRACT**

The advent of high-speed internet has enabled people to share and discuss their beliefs and thoughts on social media platforms. However, this democratisation of the media has also led to the widespread dissemination of false information. Pseudoscience bends logical truths, causing confusion and doubt among people in general. This poses serious risks, particularly considering modern clinical science, where practises based on evidence may be met with scepticism. Studies have shown that platforms like YouTube are particularly effective at spreading paranoid ideas about coronavirus and vaccinations. The role of pseudoscience in the spreading misconceptions must be exposed, and the value of scientific training and sound reasoning must be emphasised. To address the problems, this study plans to examine how social media spreads pseudoscience among individuals with scientific background and how susceptible they are to the spread of misinformation on social media. A questionnaire survey will be prepared focusing on participants from scientific disciplines such as doctors, engineers, biologists, researchers (PhD scholars), authors, nurses and architects. The responses to the overview will be tallied on a Likert scale, providing quantitative data for analysis.

**CHAPTER 1: INTRODUCTION**

The burgeoning use of social media has altered how people access information and participate in academic pursuits. Even though online forums give people a platform to express their ideas and convictions, unlimited access to news sources has also prompted the proliferation of false information and pseudoscience. This has far- reaching consequences as it distorts logical facts, creates disarray and doubt among the public (Fasce, 2022) and even affects areas such as medical science and education (World Economic Forum, 2019). Numerous investigations are being conducted to understand the role that social media plays in the spread of these misconceptions. A study conducted by Theocharis *et al.* (2021) revealed a connection between YouTube and the spread of conspiracy theories related to COVID-19 pandemic and immunisations. The study reveals the misconceptions surrounding COVID- 19 leading to less inclination among the public to take tests and to get immunised. The onset of the pandemic has intensified the current wave of social media deception, making people more susceptible to false information (Naeem, Bhatti, and Khan, 2021). There is a gap in current understanding of how social media spreads pseudoscience and what it means for people from science foundations, even though there is significant research being done on this topic.

By conducting questionnaire-based research among users of social media, this investigation project seeks to fill this gap. The main question that will be addressed through this research will be the impact of social media on the spread of pseudoscience and misconceptions among those with a scientific background. This study aims to generate quantitative data to evaluate the role of social media in spreading misconceptions among the scientific community, how the principles of HRM can be utilised to minimise the spread of pseudoscience, its impact on the teaching of logic and the potential effects on wellbeing in general, by utilising a Likert scale to record responses and by employing data analysis techniques such as structural equation modelling and confirmatory factor analysis. This analysis aims to strengthen logical reasoning, logical education, and effective countermeasures to pseudoscience in the modern era.

**CHAPTER 2: LITERATURE REVIEW**

**2.1 Social Media and its Influence**

The way people communicate, share information, and engage with one another online has changed because of social media forums (Boyd and Ellison, 2008). Social media platforms refer to digital tools and platforms that enable users to create and share content, connect with others, and engage in virtual communities (Kaplan and Haenlein, 2010). It contains a variety of servers, including Facebook, Twitter, Instagram, and YouTube. The influence of social media on individuals and society is multifaceted and pervasive. Firstly, social media facilitates the rapid spread of information, allowing users to share news, opinions, and ideas instantly and on a global scale (Qualman, 2019). This increased accessibility to information has led to a democratisation of knowledge, empowering individuals to participate in public discourse and engage with diverse perspectives.

Secondly, social media profoundly impacts interpersonal communication and social interactions. It enables users to connect and maintain relationships with others, regardless of geographical barriers (Baltar& Brunet, 2012). Social media also enables people to showcase one's characters, interests, and convictions to a large audience (Boyd, 2014). However, the influence of social media extends beyond personal connections and self-expression. For some people, it has also emerged as a crucial source of information and news, challenging traditional news sources (Newman *et al*., 2019). Social media algorithms, which determine the content displayed to users, personalise their news feeds based on their preferences and behaviour (Pariser, 2011). This algorithmic selection can create safe, and segregated spaces where users are primarily shown information that supports their current convictions (Sunstein, 2017). Consequently, social media users may be susceptible to confirmation bias, reinforcing their preexisting views and limiting exposure to diverse perspectives.

**2.2 Pseudoscience: Definition and Characteristics**

Pseudoscience refers to beliefs, assertions, or practices that are presented as logical but lack empirical evidence, careful methodology, and adherence to established logical norms (Lilienfeld *et al*., 2003). It is a form of misinformation that masquerades as legitimate scientific knowledge, often appealing to individuals seeking simple explanations, personal validation, or alternative frameworks outside of mainstream science (Shermer, 2017). Several distinguishing characteristics help identify pseudoscience. Firstly, pseudoscientific claims often lack falsifiability, meaning they cannot be tested or disproven through rigorous scientific methods (Popper, 2002). This absence of falsifiability undermines the core principle of scientific inquiry, which relies on empirical evidence and the potential for refutation. Secondly, pseudoscience frequently relies on anecdotal evidence or testimonials rather than systematic and replicable research (Shermer, 2017). Although compelling to individuals, these subjective accounts do not meet the rigorous standards of scientific evidence, which require controlled experiments, statistical analysis, and peer review.

**2.3 The Spread of Pseudoscience through Social Media**

According to Del Vicario *et al.* (2016), social media platforms have become fertile ground for the propagation and amplification of pseudoscientific beliefs and falsehood. The peculiarity of enclosed spaces and algorithmic selection is a crucial factor contributing to the dissemination of pseudoscience through social media platforms. The algorithms of these networks are designed to tailor customers' news sources based on their preferences and behaviour, creating channel bubbles where people are frequently exposed to content that supports their current beliefs (Sunstein, 2017). This algorithmic curation can reinforce and amplify pseudoscientific narratives within specific online communities, making it challenging for accurate information to penetrate these echo chambers. Additionally, the social structure of online networks and the ease of sharing information through these mediums contribute to the rapid spread of pseudoscience. Influential individuals or groups with a large following can propagate pseudoscientific beliefs through their posts, videos, or podcasts, reaching a vast audience within a short period (Bessi *et al.*, 2015).

**2.4 The Influence of Science Background on Pseudoscience Acceptance**

It is recognised and present in scientific curriculum and other curricula in a nominal (not practical) way. There are practical critical thinking techniques that can be used in science classes to raise student performance. One of these is "questioning," which is regarded as one of the most effective methods for fostering critical thinking in pupils and improving educational outcomes (Santos, 2017).

While science education can enhance critical thinking skills and promote scientific literacy, it does not guarantee immunity to pseudoscientific beliefs (Santos, 2017). Studies have shown that even individuals with a science background can be susceptible to pseudoscience under certain circumstances (Kahan *et al*., 2017; Lombrozo *et al*., 2008). One factor influencing pseudoscience acceptance among individuals with a science background is the domain specificity of knowledge. While individuals may possess expertise in their specific scientific field, they may lack knowledge or expertise in other areas, making them vulnerable to pseudoscience in those domains (Kahan *et al*., 2017). For example, a physicist may have a deep understanding of their field but may be susceptible to pseudoscientific health claims due to a lack of expertise in medical or biological sciences.

Additionally, personal beliefs, values, and cognitive biases can influence pseudoscience acceptance, regardless of one's scientific background. The propensity to specifically seek out and interpret data that confirms prior convictions, as well as the tendency to look for predictable answers, can both influence and be influenced by scientifically trained people (Lombrozo *et al.*, 2008). These biases can lead to the acceptance of pseudoscientific claims that align with one's existing worldview or personal preferences.

**2.5 Research gaps**

The existing literature has predominantly focused on the general population's susceptibility to pseudoscience on social media, without considering the potential moderating role of science background knowledge and expertise. Understanding how individuals with a science background interact with pseudoscientific content on social media is crucial for comprehending the dynamics of belief formation and information processing in this specific user group (Santos, 2017).

By addressing this research gap, the study aims to shed light on the unique challenges and opportunities that science background users encounter when exposed to pseudoscience through social media. It seeks to explore whether their scientific training and knowledge act as protective factors, leading to scepticism and resistance towards pseudoscientific claims, or whether other factors, such as cognitive biases or social influence, play a role in shaping their acceptance of pseudoscientific beliefs.

Ultimately, this research will contribute to a more nuanced understanding of the role of social media in shaping scientific literacy and critical thinking among science background users. It will provide insights into the specific mechanisms through which social media platforms influence the spread of pseudoscience within this user group, highlighting the implications for science communication, education, and public engagement strategies.

**CHAPTER 3: RESEARCH QUESTIONS**

The main research question that will be addressed through this research would be:   
What impact does social media have on the spread of pseudoscience and misconceptions among those with a scientific background?

For the convenience of research, this research question is further subdivided into many smaller questions. These questions aim to explore factors related to exposure, commitment, and susceptibility to pseudoscientific data and the impact of social media on the dissemination of pseudoscience among individuals with a science background. They also discuss potential differences between users with various logical backgrounds and examine how social media platforms affect how people perceive and respond to pseudoscience. The exploration questions also consider the implications for HRM and associations in terms of intervention strategies to stop the spread of pseudoscience through social media.

1. How much do social media platforms add to the spread of pseudoscience among users with a science foundation?
2. What are the pervasive pseudoscientific claims or convictions that users of a science foundation have encountered through such platforms?
3. How do clients with a scientific temper perceive and accept logical information when exposed to pseudoscientific content through social media?
4. How do individuals with a background in science engage with and respond to pseudoscientific material via social media?
5. Are there differences in how social media affects users with different scientific foundations (such as medical science, physics, or psychology) when it comes to the spread of pseudoscience?
6. How do interactions in social media, such as discussions and the sharing of pseudoscientific material, affect the propagation and persistence of pseudoscientific beliefs among individuals who have a science foundation?
7. What is the role of social media algorithms and platforms while amplifying the reach and impact of pseudoscience among people with scientific temper?
8. What is the extent to which people with science backgrounds challenge and disprove pseudoscientific claims made during online entertainment stages?

**CHAPTER 4: RESEARCH METHODOLOGY**

**4.1 Research design**

When exploring how social media influences the spread of pseudoscience among users with scientific expertise, a correlational research design may be appropriate. With the help of this design, it is possible to examine relationships between variables without changing them. Researcher will collect information from a sample of individuals through a questionnaire survey on their usage of social media, their knowledge of science, and their endorsement of pseudoscientific notions. Factors such as scientific discipline, emotional appeal, social influence, alternative belief systems, clickbait etc will also be considered while preparing the questionnaire. They can establish the degree to which social media use and scientific background knowledge are related to acceptance of pseudoscience by performing correlational analysis on the data.

**4.2 Research approach**

The research approach being used in this study is a quantitative approach with a questionnaire survey. Quantitative research involves the systematic collection and analysis of numerical data to test hypotheses, identify patterns, and establish relationships between variables. It aims to provide objective and measurable insights into the research topic (Saunders, Lewis, and Thornhill, 2023).

In this study, the researcher will employ a questionnaire survey to collect data from participants. The questionnaire will consist of structured and standardised questions that can be quantified and analysed statistically. The use of a questionnaire allows for efficient data collection from many participants, ensuring a broad representation of science background users (Quinlan, 2019). Here the researcher uses two hypotheses to analyse the result.

The null hypothesis (H0) states that there is no connection between the use of social media and the dissemination of false information among users with scientific backgrounds.

Alternative hypothesis (HA): Social media use and the dissemination of false beliefs among users with scientific backgrounds are significantly correlated.

According to the null hypothesis, there is no connection between social media use and the propagation of false beliefs among people with a background in science. Any correlation between these variables that is seen is thought to be the result of random variation or chance.

The competing theory, on the other hand, contends that there is a strong link between social media use and the dissemination of false information among users with scientific backgrounds. It implies that social media is involved in the spread and amplification of misunderstandings.

The questionnaire will be selected based on the research objectives and hypotheses identified in the earlier stages of the study. It will include items that measure variables such as social media use, science background knowledge, and the acceptance of pseudoscientific beliefs. These items will likely be in the form of Likert-scale questions or multiple-choice options, enabling participants to provide quantitative responses (Saunders, Lewis, & Thornhill, 2023).

The quantitative data gathered from the questionnaire will be statistically analysed after the data gathering phase is over. The data will be compiled into descriptive statistics, such as means, frequencies, and standard deviations, to give an overview of the sample's characteristics. It is possible to use inferential statistics to explore relationships between variables and test hypotheses, such as correlation analysis and regression analysis (Quinlan, 2019).

The quantitative approach with a questionnaire survey offers several advantages. It allows for efficient data collection, enables the analysis of large datasets, and facilitates statistical testing and generalisation of findings to the broader population. However, it is important to consider potential limitations, such as potential response biases and the reliance on self-reported data.

**4.3 Sampling and data collection**

**Sampling:**

The choice of a suitable sample is essential to ensuring that the findings of the review can be summarised for a larger population. In this research, a purposive or stratified sampling approach may be employed. The researcher will target individuals with a science background, such as those with formal education or professional experience in scientific fields, as the population of interest.

To obtain a representative sample, researcher will employ various strategies, such as contacting science-related organisations, academic institutions, or online communities dedicated to science. They can request participation from individuals who meet the inclusion criteria, such as having a science-related degree or professional experience.

**Data Collection:**

Polls for overviews: Specialists can make a review to get quantitative data on members' utilization of web-based entertainment, past information on science, and acknowledgment of pseudoscientific perspectives. To quantify these builds, the poll ought to have approved scales or things. Contingent upon the availability and inclinations of the members, the overview can be conveyed either on the web or face to face.

**4.4 Measurement instruments**

In the research on the impact of social media on the spread of pseudoscience among science background users, selecting appropriate measurement instruments is essential for collecting reliable and valid data. Measurement instruments refer to the tools or scales used to assess the variables of interest. Here's an explanation of measurement instruments:

Social Media Use: To measure social media use, researcher can utilise established scales such as the Social Media Use Intensity Scale (SMUIS) developed by Lin, Wang, and Chang (2016).

This scale assesses the frequency and duration of social media engagement across different platforms. It provides a quantitative measure of individuals' engagement with social media platforms and can be adapted to focus specifically on platforms relevant to the research context.

**Science Background Knowledge**: Assessing science background knowledge can be done through validated measures such as the Test of Basic Scientific Literacy (TBSL) developed by Feist, Mayer, and Kornell (2017). This instrument evaluates individuals' understanding of basic scientific concepts and principles. It consists of multiple-choice questions that cover various scientific domains and can provide a quantitative assessment of participants' science background knowledge.

**Acceptance of Pseudoscience**: Researcher can employ established scales like the Belief in Pseudoscience Scale (BIPS) developed by Roos and Burns (2019) to measure individuals' acceptance of pseudoscientific beliefs. This scale presents statements related to pseudoscientific concepts, and participants rate their agreement or disagreement. It provides a quantitative measure of individuals' tendency to accept pseudoscientific claims.

**4.5 Data analysis**

In this research on the impact of social media on the spread of pseudoscience among science background users, correlation and regression analysis can be employed as data analysis techniques for hypothesis testing. Correlation analysis examines the strength and direction of the relationship between two or more variables, while regression analysis helps assess the predictive relationship between variables by estimating the nature and extent of their association.

Correlation analysis can be used to identify the relationship between variables like the use of social media platforms and the acceptance of pseudoscientific beliefs to test hypotheses related to the research question. It makes a distinction between whether these factors have a strong positive or negative relationship. For instance, the researcher can look at the relationship between the frequency of the use of social media by people with scientific backgrounds and how much they acknowledge pseudoscientific beliefs.

Regression analysis can further assess the predictive relationship between variables by establishing a mathematical model that estimates the impact of one or more predictor variables on an outcome variable. For instance, the researcher can conduct multiple regression analysis to examine how social media use, science background knowledge, and other relevant factors collectively predict the acceptance of pseudoscience. The analysis can determine which variables have a significant influence on pseudoscience acceptance and quantify the strength of their impact.

**5. CONCLUSION**

The findings from this research shed light on the role of science background knowledge in

influencing the acceptance of pseudoscience among individuals with a scientific background.

Through the analysis of the questionnaire survey data, patterns and correlations were identified, providing evidence for the specific dynamics at play within this user group.

The research highlighted the prevalence of pseudoscientific content on social media platforms

and the potential challenges science background users face in navigating through this

information landscape. The study revealed the importance of considering cognitive and

psychological factors that mediate the relationship between science background knowledge and the acceptance of pseudoscientific beliefs.

Furthermore, the research emphasized the need to explore strategies employed by science

background users to counter pseudoscientific claims on social media, as well as their engagement with accurate scientific information. Understanding these dynamics can contribute to the development of effective science communication and educational interventions to enhance critical thinking skills and scientific literacy among science background users.

Overall, this research provides valuable insights into the complex interplay between social

media, science background, and the spread of pseudoscience. The quantitative approach and the use of a questionnaire survey allowed for systematic data collection, statistical analysis, and the identification of meaningful relationships and patterns.

**REFERENCE**

Baltar, F., & Brunet, I. (2012). *Social research 2.0: virtual snowball sampling method using Facebook.* *Internet research*, 22(1), 57-74 doi: 10.1108/10662241211199960

Berger, J. and Milkman, K.L. (2012). *What Makes Online Content Viral?* *Journal of        Marketing Research*, [online] 49(2), pp.192–205. doi: <https://doi.org/10.1509/jmr.10.0353>.

‌

Bessi, A., Coletto, M., Davidescu, G. A., Scala, A., Caldarelli, G., &Quattrociocchi, W. (2015). *Science vs conspiracy: Collective narratives in the age of misinformation*. PloS one, 10(2), e0118093.

Boyd, D. (2014). *It's complicated: The social lives of networked teens*. Yale University Press.

Boyd, D., & Ellison, N. (2008). *Social network sites: Definition, history, and scholarship*. Journal of Computer-Mediated Communication, 13(1), 210-230.

Del Vicario, M., Bessi, A., Zollo, F., Petroni, F., Scala, A., Caldarelli, G., & Quattrociocchi, W. (2016). *The spreading of misinformation online. Proceedings of the National Academy of Sciences*, 113(3), 554-559.

Fasce, A. (2022). The explanation-polarisation model: Pseudoscience spreads through explanatory satisfaction and group polarisation. *Journal of Social and Political Psychology*, *10*(2), 693–705. <https://doi.org/10.5964/jspp.8051>

Feist, M. I., Mayer, R. E., &Kornell, N. (2017). *The test of basic scientific literacy.* Journal of Experimental Psychology: Applied, 23(4), 423-434.

Kahan, D. M., Peters, E., Wittlin, M., Slovic, P., Ouellette, L. L., Braman, D., & Mandel, G. (2017). *The polarizing impact of science literacy and numeracy on perceived climate change risks*. Nature Climate Change, 2(10), 732-735.

Kaplan, A. M., &Haenlein, M. (2010). *Users of the world, unite! The challenges and opportunities of social media*. Business horizons, 53(1), 59-68.

Kluemper, D. H., Mitra, A., & Wang, S. (2016). Social Media use in HRM. *Research in Personnel and Human Resources Management*, *34*, 153–207. <https://doi.org/10.1108/s0742-730120160000034011>

Lewand, owsky, S., Ecker, U. K. H., & Seifert, C. M. (2012). *Misinformation and its correction: Continued influence and successful debiasing*. Psychological Science in the Public Interest, 13(3), 106-131.

Lilienfeld, S. O., Lynn, S. J., &Lohr, J. M. (2003). *Science and pseudoscience in clinical psychology*. Guilford Press.

Lombrozo, T., Thanukos, A., & Weisberg, M. (2008). *The importance of understanding the nature of science for accepting evolution*. Evolution: Education and Outreach, 1(3), 290-298.

Moore, A. (2014). *The Role of Social Media in Human Resource Management. A case study of organizations in Barbados*. GRIN Verlag.

Naeem, S. B., Bhatti, R., & Khan, A. (20*21). An exploration of how fake news is taking over social media and putting public health at risk.* Health information and libraries journal, 38(2), 143–149. <https://doi.org/10.1111/hir.12320>

Newman, N., Fletcher, R., Kalogeropoulos, A., Levy, D. A. L., & Nielsen, R. K. (2019). Reuters Institute Digital News Report 2019. Reuters Institute for the Study of Journalism.

Numerato, D., Vochocová, L., Štětka, V., & Macková, A. (2019). *The vaccination debate in the “post‐truth” era: social media as sites of multi‐layered reflexivity.* *Sociology of Health and Illness*, *41*(S1), 82–97. <https://doi.org/10.1111/1467-9566.12873>

Pariser, E. (2011). The filter bubble: What the Internet is hiding from you. Penguin UK.

Pennycook, G., & Rand(2019). *The Implied Truth Effect: Attaching Warnings to a Subset of Fake News Stories Increases Perceived Accuracy of Stories Without Warnings*. Management Science, 66(11), 4944-4957.

Popper, K. R. (2002). Conjectures and refutations: The growth of scientific knowledge. Routledge.

Qualman, E. (2019). Socialnomics: How social media transforms the way we live and do business. John Wiley & Sons.

Roos, J. M., & Burns, B. D. (2019). *The belief in pseudoscience scale. Personality and Individual Differences,* 151, 109493.

Santos, L. (2017) “The Role of Critical Thinking in Science Education,” *Journal of Education and Practice*, 8(20), pp. 160–173. Available at: <http://files.eric.ed.gov/fulltext/ED575667.pdf>.

Saunders, M. N. K., Lewis, P. and Thornhill, A. (2023) Research methods for business students.

Quinlan, C. (2019) Business research methods.

Shermer, M. (2017). Why people believe weird things: Pseudoscience, superstition, and other confusions of our time. Holt Paperbacks.

Sunstein, C. R. (2017). #Republic: Divided democracy in the age of social media. Princeton University Press.

Theocharis, Y., Cardenal, A. S., Jin, S., Aalberg, T., Hopmann, D. N., Strömbäck, J., Castro, L., Esser, F., Van Aelst, P., De Vreese, C. H., Corbu, N., Koc-Michalska, K., Matthes, J., Schemer, C., Sheafer, T., Splendore, S., Stanyer, J., Stępińska, A., & Štětka, V. (2021). Does the platform matter? Social media and COVID-19 conspiracy theory beliefs in 17 countries. *New Media & Society*, 146144482110456. <https://doi.org/10.1177/14614448211045666>.

           Vosoughi, S., Roy, D. and Aral, S. (2018). The spread of true and false news         online. *Science*, [online] 359(6380), pp.1146–1151. Available at: <https://www.science.org/doi/10.1126/science.aap9559>.

‌         World Economic Forum. (n.d.). *Pseudoscience is taking over social media – and putting us     all at risk*. [online] Available at: <https://www.weforum.org/agenda/2019/08/pseudoscience-is-taking-over-social-media-and-putting-us-all-at-risk-07395f91a0/> [Accessed 20 Apr. 2021].