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Norbert Vrabec, Lukáš Pieš

Popularisation of Science and Science Journalism on Social Media in Slovakia

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ABSTRACT

This study focuses on the presentation and interpretation of scientific information and data by Slovak creators on the social platform *Instagram*. Media content presented on social media often becomes problematic, as popular science posts are more in an entertaining than scientific form. It happens that popular science content is presented inaccurately, without deeper context. In addition, scientific misinformation and misleading information appears, which can pose a danger to audience members who trust such information. Science journalism has found its place not only in traditional media, but also on social media platforms, where problematic information on scientific topics goes viral and achieves a high level of user interaction. In an unregulated or under-regulated social networking environment, it is also more difficult for users to discern the credibility and relevance of the information presented, especially when referring to existing scientific studies or authorities. However, data from these sources may be taken out of context, interpreted in a misleading way or accompanied by completely fabricated or distorted conclusions. Such false scientific content undermines confidence in objective science journalism and discredits the work of science journalists. Several digital tools are now available that can help readers distinguish real scientific information from false information. Critical thinking, media literacy and scientific literacy are key skills that can be used to detect manipulative techniques and navigate the issue of false media content. In this paper, we therefore clarify the importance of media, scientific and information literacy skills to help identify misinformation in media content related to science and research.

KEY WORDS

Instagram. Popularisation of Science. Pseudoscience. Scientific Information. Science Journalism. Scientific Literacy. Social Media.

1 Introduction

We understand the concept of popularization as a process of dissemination of knowledge in any field that is understandable in content and form to the general population of recipients. Thus, the primary target audience of the popularisation process is individuals who are not experts in a given field, but who, for various reasons, may find the knowledge presented interesting and useful. The basic principle of popularisation is the ability to convey the key parameters and characteristics of the presented topic in a comprehensible way, including a reasonable degree of simplification of technical terms from the relevant domain of expertise. According to M. Bucchi popularization can take different forms, including the media, museums, science festivals, science blogs, and science cafés.[1] The media plays a critical role in popularizing science by presenting scientific information in a way that is accessible and relevant to the general public. Similarly, science museums and science festivals provide an opportunity for the public to interact with science in a more informal and engaging way. However, there is an ongoing debate about the effectiveness of popularization in promoting scientific literacy and public engagement with science.

Some scholars argue that popularization can lead to the oversimplification and distortion of scientific information, which may result in misunderstandings and misconceptions.[2] Others argue that popularization can be a useful tool in enhancing public engagement with science and promoting informed decision-making.[3] Popularization can also foster a better understanding of science as a social and cultural phenomenon, highlighting the ways in which science is shaped by societal values and beliefs.[4] B. Jurdant defines popularisation of science as a process of communicating scientific knowledge, emphasising that popularisation of science can take different forms and the entities that represent these activities.[5] Different groups of actors are involved in the process of science popularization – especially scientists, science communicators, educators, journalists, and policymakers.[6] On the one hand, it is the scientists themselves who are an important element in the popularisation of science and technology. An examination of their efforts to popularise science allows us to identify the many different motivations, attitudes and intentions that lead them to this activity.[7] However, communicating scientific findings to the general public can be challenging for scientists, as the technical language and jargon used in scientific publications may be inaccessible to non-experts. Science communicators can bridge this gap by translating scientific language into more accessible terms and formats such as infographics, videos, and podcasts.[8] In the context of social dissemination of scientific knowledge, educators also play a vital role by teaching science in schools and universities.

1 See: BUCCHI, M.: Of Deficit, Deviations and Dialogues: Theories of Public Communication of Science. In M. BUCCHI, B., TRENCH, B. (eds.): *Handbook of Public Communication of Science and Technology*. London : Routledge, 2008, p. 57-76.

2 See: WYNNE, B.: Misunderstood Misunderstanding: Social Identities and Public Uptake of Science. In *Public Understanding of Science*, 1992, Vol. 1, No. 3, p. 281-304.

3 See: IRWIN, A., MICHAEL, M.: *Science, Social Theory and Public Knowledge*. Maidenhead : Open University Press, 2003.

4 See: GIERYN, T. F.: *Cultural Boundaries of Science: Credibility on the Line*. Chicago, IL : University of Chicago Press, 1998.

5 See: JURDANT, B.: Popularization of Science as the Autobiography of Science. In *Public Understanding of Science*, 2016, Vol. 2, No. 4, p. 365-373.

6 See: POLIAKOFF, E., WEBB, T. L.: What Factors Predict Scientists' Intentions to Participate in Public Engagement of Science Activities? In *Science Communication*, 2007, Vol. 29, No. 2, p. 242-263.

7 MASSARANI, L., MOREIRA, C. I.: Popularisation of Science: Historical Perspectives and Permanent Dilemmas. In *Quark*, 2004, No. 32, p. 75.

8 See: BURNS, T. W., O'CONNOR, D. J., STOCKLMAYER, S. M.: Science Communication: A Contemporary Definition. In *Public Understanding of Science*, 2003, Vol. 12, No. 2, p. 183-202.

Effective science education can help cultivate scientific literacy and critical thinking skills in the general public, promoting a more informed public discourse about scientific issues.[9] Policymakers also have an important role to play in science popularization. They can use scientific information to inform policy decisions and promote evidence-based policymaking.[10] Journalists are one of the most important actors in the process of popularizing science towards the general public. They have the ability to frame scientific information in ways that can influence public perceptions as well as decisions about public policies. However, it is crucial for journalists to accurately report scientific findings and avoid sensationalism or misinterpretation of research.[11]

Scientific information in the online space can take the form not only of text, but also of images, video or sound. The Internet and social media are also flooded with fabricated and unverified scientific information, often created with malicious intent on the part of the creator. Fake scientific information is often rapidly becoming popular among social media users. According to B. Francistyová and J. Višňovský, it is currently impossible to set limits on where and whom media content can reach.[12] Such information may pose a certain danger to the public. A. G. B. Radin and C. J. Light argue that the Covid-19 pandemic and its consequences have led to an increase in the use of social media. Social distancing has also reinforced the value and power of effective science communication on social networking platforms.[13] Despite strict regulations, false scientific information is still being created and posted on social media platforms such as *Facebook*, *Instagram*, *Twitter*, *YouTube*, and so on. According to a *Pew Research Center* survey, as many as 33% of Americans consider social media, especially the *Facebook* platform, as an important way to obtain science information.[14] There are several methods and digital tools through which the authenticity of scientific information can be verified. In this study, we will discuss why fake scientific information is becoming popular, how to defend against it, and how it is regulated.

2 Current Status of the Issue

Instagram and other social networking platforms provide the opportunity to discover and understand science topics, especially for Generation Z and Generation Alpha, who spend most of their time on *Instagram*. For many people, once they have left formal schooling, the media become the main and often even the only source of scientific information.[15] In 2015, research was conducted to assess the state of public awareness of science and the popularisation of science and technology in Slovakia by the agency *TNS SK* (now the name of the organisation is *Kantar Slovakia*). The research sample included 1600 respondents, of which 50.1% were women and 49.9% were men. The largest number of respondents indicated that they most

[9] MILLER, S., SCOTT, E. C., OKAMOTO, S.: Public Acceptance of Evolution. In *Science*, 2006, Vol. 313, No. 5788, p. 765-766.

[10] See: MILLER, J. D.: Public Understanding of Science at the Crossroads. In *Public Understanding of Science*, 2001, Vol. 10, No. 1, p. 115-120.

[11] PETERS, H. P., BROSSARD, D., DE CHEVEIGNÉ, S. et al.: Interactions with the Mass Media. In *Science*, 2008, Vol. 321, No. 5886, p. 204-205.

[12] FRANCISTYOVÁ, B., VIŠŇOVSKÝ, J.: Neo-Acceptance of Hallyu as a Result of Changes in the Film Industry: K-Pop in Europe and on Slovak Radio. In PROSTINÁKOVÁ HOSSOVÁ, M., GRACA, M., SOLÍK, M. (eds.): *Marketing & Media Identity 2022: Metaverse Is the New Universe.* Trnava : FMK UCM in Trnava, 2022, p. 46.

[13] RADIN, A. G. B., LIGHT, C. J.: TikTok: An Emergent Opportunity for Teaching and Learning Science Communication Online. In *Journal of Microbiology & Biology Education*, 2022, Vol. 23, No. 1, p. 1-2.

[14] KRÄMER, K.: *As a Bogus Food Safety Video Reaches 83 Million on Facebook, Fact Checkers Take Up the Fight Against Fake Science.* [online]. [2023-02-08]. Available at: <https://www.chemistryworld.com/news/fact-checkers-take-up-the-fight-against-fake-science-on-facebook/4010452.article>.

[15] See: GUENTHER, L.: Science Journalism. In ORNEBRING, H. (ed.): *Oxford Encyclopedia of Journalism*. New York, NY : Oxford University Press, 2019.

often use the Internet to find information about science and technology. Young people aged between 18 and 25 showed the greatest interest in this topic. Interest in science and technology is sinusoidal in nature, as it subsequently decreases with increasing age for adults and only increases again after the age of 50.[16] In this sense, social networks can be described as one of the most important tools for popularising science among young people.

Since the 1980s, the popularity of science has expanded significantly on a global scale.[17] B. Jurdant defines popularisation of science as the process of communicating scientific knowledge. He emphasises that popularisation of science need not be limited to written texts, but other forms can also be used.[18] According to Z. Vitková, popularisation is understood in the literature as a process of dissemination of knowledge in a generally understandable way. This process seeks to ensure that its basic elements – information, popularisation and journalism – influence the audience in an appropriate way, complement each other and gradually convey new knowledge through different information and journalistic genres. Z. Vitková states that the creators of this process strive for flexibility, adaptability and the ability to convey theoretical impulses from basic and applied research, but at the same time they must respond to the demands of practice. A common feature of this process is the simplification of professional terms so that they can be understood by a lay audience.[19] Scientists have been and still are one of the main actors in the popularisation of science and technology. An examination of their efforts to popularise science makes it possible to identify many different motivations, attitudes and intentions that have led them to this activity.[20] However, we now observe that science popularisation on social networking platforms such as *Instagram* is not only undertaken by scientists, but also by science journalists, influencers, science enthusiasts, nutritionists, fitness trainers and others who have not completed a university degree, are not authors of scientific studies and research, and are not familiar with the process and criteria of scientific inquiry. Therefore, it is important to recognise that such authors may not have the expertise to correctly interpret scientific data and information. Published media content from such creators may only be opinions, tips and cannot always be described as reliable scientific popularisation content.

Another problem may be that popularizers of science who are not scientists are not always able to recognize pseudoscience from real science. This problem is also pointed out by G. C. Cornelis, who talks about the dangers of popularizing science where pseudoscience can appear. He stresses the importance of presenting science objectively and clearly distinguishing between science and pseudoscience. He suggests avoiding the more speculative aspects of science in order to avoid confusion and misleading the public, even though these aspects may be attractive to the public.[21]

Media content published on social networking platforms promoting science does not have to be published only by competent persons who can distinguish real science from pseudoscience, i.e. true information from false information. On the other hand, the question arises as to who is qualified to determine the reliability of the facts and to judge the veracity

[16] BUNČÁK, J., HRABOVSKÁ, A., SOPÓCI, J.: *Popularizácia vedy medzi verejnosťou.* Bratislava : Centrum vedecko-technických informácií SR, 2015. [online]. [2023-02-12]. Available at: <https://vedanadosah.cvtisr.sk/wp-content/uploads/2020/10/Popularizacia_vedy_medzi_verejnostou_-_zaverecna_analyza_-_final.pdf>.

[17] MASSARANI, L., MOREIRA, C. I.: Popularisation of Science: Historical Perspectives and Permanent Dilemmas. In *Quark*, 2004, No. 32, p. 75.

[18] JURDANT, B.: Popularization of Science as the Autobiography of Science. In *Public Understanding of Science*, 2016, Vol. 2, No. 4, p. 365-366.

[19] VITKOVÁ, Z.: Ako prezentovať svoj výskum laikom prostredníctvom médií. In POSPIŠOVÁ, J. (ed.): *Ako popularizovať vedu.* Martin : Neografia, 2015, p. 47.

[20] MASSARANI, L., MOREIRA, C. I.: Popularisation of Science: Historical Perspectives and Permanent Dilemmas. In *Quark*, 2004, No. 32, p. 75.

[21] CORNELIS, G. C.: Is Popularization of Science Possible? In OLSON, A. M. (ed.): *The Paideia Archive: Twentieth World Congress of Philosophy*. Bowling Green, OH : Philosophy Documentation Center, 1998, p. 30-31.

of such information. In 2004, R. Keyes declared that we are living in a post-truth era and that we are in a stage of social development in which lying has become common at all levels of contemporary life. Facts and their denial are no longer decided by any authority, but essentially by each individual, regardless of his or her education and reputation or acquired knowledge in the field. The manipulation of data by anyone, including scientists, is becoming easier and easier. Today, due to the easy availability of information and communication technologies and the Internet, it is possible to create and disseminate various types of manipulated media content in unlimited quantities.[22]

Common criticisms that are made in relation to science journalism include lack of accuracy, lack of depth and lack of consideration of the text. This means that it happens that important information is omitted or misinterpreted. The author only superficially treats a topic that lacks the context and background of scientific research and does not provide the public with an overall picture of the results of science and research. This phenomenon can also be observed in the case of media content published on social networking platforms. This problem is also pointed out by Z. Vitková, who states that *"the line between popularisation, which serves greater clarity, and oversimplification at the expense of factual accuracy, even tabloidisation, is therefore very fragile"*.[23] She also recommends using photographs, easy-to-understand graphs, examples from practice, etc., when communicating scientific results to the general public.

Online communication platforms are increasingly used by scientific institutions and scientists themselves to disseminate their research and scientific information. By combining traditional scientific news and publications in peer-reviewed scientific journals with scientific news on social media, it is possible to engage more science enthusiasts. However, in this busy online space, readers use a variety of conscious and unconscious heuristics to judge the veracity of content. Some authors suggest that in the battle against misinformation, scientists should make more use of their existing profiles on social media platforms to present credible scientific information, as the credibility of information on social media is heavily influenced by any personal connections to the author themselves.[24] Today, researchers are not only using social media platforms to present the results of their work – in many cases they are becoming the subject of research, or integrating them at different stages of research, such as in the selection of research questions, research samples, etc. However, there is a concern about maintaining the reliability of the information presented on these platforms.[25] According to A. D. Scheufele and M. N. Krause *"some scholars have argued that decreasing public and policy support for science, among other factors, has created new incentives for scientific organizations to use mass media and other public-facing channels to promote particular findings or areas of research. Media, in turn, rely on celebrity scientists as resources for newsworthy accounts of breakthrough science. This has engendered concerns that hype and overclaims in press releases and other scientific communication can lead to misperceptions among nonexpert audiences about the true potential of emerging areas of science, especially if science is unable to deliver on early claims of cures for diseases, for instance."*[26]

[22] HOPF, H., KRIEF, A., MEHTA, G., MATLIN, A. S.: Fake Science and the Knowledge Crisis: Ignorance Can Be Fatal. In *Royal Society Open Science*, 2019, Vol. 6, No. 5, p. 190161.

[23] VITKOVÁ, Z.: Ako prezentovať svoj výskum laikom prostredníctvom médií. In POSPIŠOVÁ, J. (ed.): *Ako popularizovať vedu.* Martin : Neografia, 2015, p. 49.

[24] BOOTHBY, C. et al.: Credibility of Scientific Information on Social Media: Variation by Platform, Genre and Presence of Formal Credibility Cues. In *Quantitative Science Studies*, 2021, Vol. 2, No. 3, p. 845-846.

[25] Ibidem.

[26] SCHEUFELE A. D., KRAUSE, M. N.: Science Audiences, Misinformation, and Fake News. In *PNAS*, 2019, Vol. 116, No. 16, s. 7667.

Disinformation, misinformation or malinformation is a real problem of the 21st century in the field of scientific information. We have also seen a number of disinformation or false information in recent months in relation to Covid-19[27] or the war in Ukraine[28]. Disinformation in the context of this study is seen as false information that is deliberately created to harm a person, social group, organisation or country.[29] B. Staats includes here deliberately created conspiracy theories or rumors.[30] Misinformation is also false information, but not created with the intent to harm.[31] These are unintentional errors, such as inaccurate descriptions of photographs, dates, statistics, and the like. The last category is malinformation, which B. Staats defines as the intentional publication of private information for personal or corporate interest and the intentional alteration of the context, date, or time of the actual content.[32] A study by researchers at the Massachusetts Institute of Technology (MIT) found that fake news spreads faster on *Twitter* than real news. The MIT researchers say it is possible that the same phenomenon occurs on other social media platforms, but caution that thorough studies on the issue are needed.[33]

Information, images and videos have been and are being produced in relation to Covid-19 that are not scientifically verified and pose a threat to society as a whole. For this reason, it can be described as disinformation scientific information. Also in the Slovak Republic, we have seen many pieces of fake scientific information related to Covid-19, which, due to sensational headlines, topicality and non-congruent manipulated visual content, is becoming viral and spreading rapidly among users on social networking platforms. In addition to scientific, misinformation is also being created in relation to the Covid-19 pandemic. This is misinterpretation of the results of scientific studies. Here too, *Meta* has launched an information hub that brings information on Covid-19 from government, civil, medical and other sites.

There are several initiatives underway or under discussion to address the societal problem of the dissemination of false scientific information. Current initiatives include developing tools that automatically identify false information, improving social media policy and self-regulation, taking responsibility for content published on social media, engaging scientists in the fight against fake news, increasing critical thinking and scientific literacy, educating and promoting ethical practices and research integrity in science.[34]

Meta, which owns the social networking platforms *Facebook* and *Instagram*, seeks to combat scientific disinformation and fake news in three areas – disrupting economic incentives, creating new products to curb the spread of fake news, and helping people make more informed decisions when faced with fake information. When it comes to combating fake news, one of the most effective approaches is to remove the economic incentives for the spreaders of

27 PANASENKO, N., MOROZOVA, O., GAŁKOWSKI, A. et al.: COVID-19 as a Media-Cum-Language Event: Cognitive, Communicative, and Cross-Cultural Aspects. In *Lege Artis. Language Yesterday, Today, Tomorrow*, 2020, Vol. 5, No. 2, p. 123-124.

28 See: HUDÁKOVÁ, V., PIEŠ, L.: Rusko-ukrajinský konflikt: analýza vybraných príspevkov serióznych a alternatívnych médií na sociálnej sieti Facebook. In MAGÁLOVÁ, L., MACÁK, M., KOLENČÍK, P.: *Quo vadis massmedia, quo vadis marketing.* Trnava : FMK UCM in Trnava, 2022, p. 284-301.

29 See: IRETON, CH., POSETTI, J.: *Journalism, Fake News & Disinformation: Handbook for Journalism Education and Training.* Paris : UNESCO, 2018.

30 STAATS, B.: *Misinformation, Disinformation, Malinformation: What's the Difference?* [online]. [2023-02-08]. Available at: <https://minitex.umn.edu/news/elibrary-minnesota/2022-05/misinformation-disinformation-malinformation-whats-difference>.

31 See: IRETON, CH., POSETTI, J.: *Journalism, Fake News & Disinformation: Handbook for Journalism Education and Training*. Paris : UNESCO, 2018.

32 STAATS, B.: *Misinformation, Disinformation, Malinformation: What's the Difference?* [online]. [2023-02-08]. Available at: <https://minitex.umn.edu/news/elibrary-minnesota/2022-05/misinformation-disinformation-malinformation-whats-difference>.

33 DIZIKES, P.: *Study: On Twitter, False News Travels Faster Than True Stories*. [online]. [2023-02-17]. Available at: <https://news.mit.edu/2018/study-twitter-false-news-travels-faster-true-stories-0308>.

34 STAATS, B.: *Misinformation, Disinformation, Malinformation: What's the Difference?* [online]. [2023-02-08]. Available at: <https://minitex.umn.edu/news/elibrary-minnesota/2022-05/misinformation-disinformation-malinformation-whats-difference>.

misinformation, as many fake news stories are created with a financial profit motive. For this reason, *Meta* has taken certain steps – to apply machine learning in detecting fake news, to strictly enforce social network policies that will make it more difficult for disinformation creators to purchase advertising space on the platform, and to update fake account detection tools. The company has decided to work with news organizations to co-develop products, provide tools and services for journalists, and help people get relevant information. *Meta* is part of the *News Integrity Initiative*, whose mission is to improve news literacy and increase trust in journalism around the world.[35] Another important step by *Meta* was the launch of the *Climate Science Information Centre*. The main objective of the centre is to make relevant articles and information on climate science available.[36]

A perfect example is the fake food safety video that has reached over 83 million views on *Facebook*. The video showed rice being heated to melt pieces of plastic that had been deliberately added to it. The theory that real rice contains plastic was never backed up by scientific studies and was just misinformation. K. Douglas, a conspiracy theory researcher at the University of Kent in the UK, says that *"it's unsurprising that people worry about what goes into their food, but they often find it difficult to tell the difference between real and fake information. It is therefore very easy for fake scientific information to spread far and wide on the internet."*[37]

Although much disinformation is related to politics, some fact-checkers are beginning to focus more on the misuse of scientific data. User reports and machine learning tools are helping *Facebook* identify potentially misleading videos, images, or articles. These are automatically compiled into a list for each fact-checking partner, who can then pick and choose the pieces of content they want to address. *Full Fact* checks 30 to 40 pieces of content each month, Lead Stories around 60 – although the time it takes to evaluate a story varies considerably. Scientific claims are often the trickiest to disprove. Fact-checkers then use one of eight rating options, including "true", "false" and "satire". Posts that are rated as false or contain a combination of accurate and misleading information are downgraded so that they appear lower on users' timelines. According to *Meta*, this reduces the number of views on *Facebook* by approximately 80%. In addition, any user who wants to share disinformation content is shown a link to the rebuttal article.[38] As tech companies continue to struggle with changes to their algorithms and interfaces, third-party fact-checking groups such as *Factcheck.org* have emerged.[39] Also in the Slovak Republic, there are platforms and sites that verify facts and refute disinformation and hoaxes, such as *hoax.sk* or the Slovak Police *Facebook* page – *Hoaxy a podvody – Polícia SR* (eng. *Hoaxes and Scams - Police SR*). Strict social networking guidelines, numerous initiatives, and partnerships with technological platforms are unable to control bogus scientific material. Given the volume of postings and newly generated accounts that occur every day, social media cannot automatically identify all false information and phony accounts.

35 MOSSERI, A.: *Working to Stop Misinformation and False News*. [online]. [2023-03-02]. Available at: <https://www.facebook.com/formedia/blog/working-to-stop-misinformation-and-false-news>.

36 CHEE, Y. F., PAUL, K.: *Facebook Launches Climate Science Info Center Amid Fake News Criticism*. [online]. [2023-02-13]. Available at: <https://www.reuters.com/article/facebook-climatechange-int-idUSKBN2660M5>.

37 KRÄMER, K.: *As a Bogus Food Safety Video Reaches 83 Million on Facebook, Fact Checkers Take Up the Fight Against Fake Science*. [online]. [2023-02-08]. Available at: <https://www.chemistryworld.com/news/fact-checkers-take-up-the-fight-against-fake-science-on-facebook/4010452.article>.

38 Ibidem.

39 SCHEUFELE, A. D., KRAUSE, M. N.: Science Audiences, Misinformation, and Fake News. In *PNAS*, 2019, Vol. 116, No. 16, p. 7667.

1.1 Scientific and Media Literacy as an Important Skill in the Validation of Scientific Information

Important skills for science journalists include evaluating the evidence behind a scientific claim and recognizing problematic scientific reports and errors in scientific studies.[40] This skill is also important for science popularizers who create media content on social media platforms. The main reason for this is that it happens that journalists or media makers craft articles based on biased scientific research, which they then publish in news outlets or on social media, presenting false or empirically unsubstantiated information about the results of science and research to their readers.

Another problem is that various media content creators, such as science journalists or science popularisers, produce and interpret information from scientific studies that are not credible and have low relevance, or the source of the information is news articles that do not refer to the original source of the research. Today there are several predatory journals that publish studies with manipulated results for a high fee.

A perfect example is the misleading scientific study by J. Bohannon, director of the *Institute for diet and health*, who published a study in 2015 on accelerating weight loss by eating chocolate. This report was picked up by countries and media around the world. In reality, J. Bohannon is not the director of the institute, but a science journalist who wanted to point out how easily biased scientific information is disseminated in the mainstream media. The research itself was indeed carried out, but the research sample was insufficient and the research measured too many factors.[41] For this reason, it is very important that a science journalist or science populariser does not fall victim to false scientific information.

The *Science Media Centre* recommends several points that can help to distinguish real science from pseudoscience:

- Correlation and Causation – there are differences between the established ones, whereas correlation implies that there may not be a consequence between variables, or one may not influence or cause the other.
- Unsupported conclusions – scientific studies must present facts that are proven and clearly articulated.
- Research sample size – research with small sample sizes often poses a threat to the credibility of the research and its results. A larger research sample provides results that can be considered representative.
- Unrepresentative sample – if a sample is used that is not sufficiently reflective of the population as a whole, the conclusions can be considered biased.
- Control group – In clinical trials, a control group of test subjects is required to be matched to a control group that has not yet been administered a test substance. In more general experiments, a control test is also needed, but in this all variables under study are controlled.
- Blind testing – is considered difficult to perform and often unethical, as subjects are not told that they are part of a test or control group for the sake of the relevance of the results.
- Sensational headlines – are created to attract the reader. The problem with such headlines is that they often oversimplify research results or present biased information to make the articles appear more appealing.

[40] *Spotting Bad Science: The Definitive Guide for Journalists*. [online]. [2023-02-04]. Available at: <https://www.sciencemediacentre.co.nz/coveringscience/spotting-bad-science-the-definitive-guide-for-journalists/>.

[41] GODOY, M.: *Why a Journalist Scammed the Media into Spreading Bad Chocolate Science*. [online]. [2023-02-04]. Available at: <https://www.npr.org/sections/thesalt/2015/05/28/410313446/why-a-journalist-scammed-the-media-into-spreading-bad-chocolate-science>.

- Misinterpretation of results – can lead to the publication of incorrect, false or distorted information. For this reason, it is important to verify information from the original source, i.e., the research, rather than just from another article that may have published incorrect information.
- Conflict of interest – although many companies employ scientists to research and publish results, while this does not mean that the research is invalid, on the other hand, we must take these results in the context that the research may be biased or influenced by outside influence for monetary or personal gain.
- Selective reporting of data – represents the deliberate selection of data and claims that support research results but ignore research that does not support the results or data.
- Non-repeatable results – consistency of results, is an important element and therefore results must be repeatable by independent researchers. Every hypothesis or assumption requires rigorous proof, even more so when we are talking about an independent study.
- Peer review – during this scientific process, researchers and experts critically review studies before they are published. Research that does not pass peer review may indicate that the research or data is flawed.[42]

In addition to the above points, scientific and media literacy is also important to help detect disinformation. According to K. Lodl, Associate Dean of Nebraska Extension, scientific literacy is the knowledge of science as well as the scientific framework by which people make decisions based on facts, research, and knowledge, not opinions or rumours. Scientific knowledge helps people be better informed and make the best possible decisions based on the best available knowledge.[43] P. Cormax, who teaches science education, focuses on the study and promotion of scientific literacy, which he believes is key in analyzing information and disinformation.[44] While early definitions of media literacy focused on the ability to consume and produce media, more recent definitions see it as a framework of participation that includes consumption and production, but also builds an understanding of the role of media in society, as well as the essential skills of research and self-expression necessary for citizens of a democracy. Media literacy also has a protective function. It helps individuals in the media world to protect their personal information, to avoid cybercrimes such as phishing, and to detect fake news, hoaxes and other problematic content. Media literacy in the context of scientific information helps to make more informed decisions. The importance of media literacy also extends to information sharing. Individuals need to be able to critically assess the quality of sources and news, but they also need to have responsible responses when it comes to sharing information.[45] Another possible solution may be to hone critical thinking skills so that people can distinguish between real scientific information and conspiracy theories. As an example of good practice, a data literacy initiative in nearly 150 public schools is trying to give children the skills to distinguish between authentic and fake information.[46]

[42] *Spotting Bad Science: The Definitive Guide for Journalists*. [online]. [2023-02-04]. Available at: <https://www.sciencemediacentre.co.nz/coveringscience/spotting-bad-science-the-definitive-guide-for-journalists/>.

[43] GARBACZ, M.: *What Is Science Literacy and Why Is It Important?* [online]. [2023-02-10]. Available at: <https://sdn.unl.edu/article/what-science-literacy-and-why-it-important>.

[44] HOLSOPPLE, K.: *How to Fight Fake News with Scientific Literacy.* [online]. [2023-02-07]. Available at: <https://www.alleghenyfront.org/how-to-fight-fakes-news-with-scientific-literacy/>.

[45] See: ROSENTHAL, S.: Media Literacy, Scientific Literacy, and Science Videos on the Internet. In *Frontiers in Communication*, 2020, Vol. 5, no paging. [online]. [2023-02-07]. Available at: <https://doi.org/10.3389/fcomm.2020.581585>.

[46] VIJAYKUMAR, S.: *Pseudoscience Is Taking Over Social Media and Putting Us All at Risk*. [online]. [2023-02-13]. Available at: <https://www.independent.co.uk/news/science/pseudoscience-fake-news-social-media-facebook-twitter-misinformation-science-a9034321.html>.

The CRAAP test is most commonly used to assess the credibility of information. This can help the reader evaluate the information. The CRAAP test includes: timeliness of the information, relevance of the information, authority, accuracy and purpose of the information.[47] A science populariser can also apply the CRAAP test to the processing of videos, photographs and other media based on scientific articles published by journalists in journals or on online news portals. There are a number of free platforms and tools that can be used to verify the authenticity and source of a photo, such as *TinEye* or *Google*. This search will show where else on the web the image has appeared. We can also see if the photo has been tampered with, for example through deepfake technology.[48]

The mentioned above information shows that the different competences complement and overlap each other. A reader who has a sufficiently high level of critical thinking and media and scientific literacy can evaluate the relevance of scientific information and visual content and reject unverified facts, conspiracy theories and rumours.

3 Methodology

The main aim of the study is to find out how scientific data and information are presented and interpreted by Slovak media creators on the popular social network *Instagram* through quantitative and qualitative content analysis. The secondary aim is to clarify, through semi-structured interviews, the practices of science popularizers on the *Instagram* platform in the creation of science popularization posts.

Through expressions, we identified profile accounts that are primarily focused on the dissemination of media content that contains scientific data and the author(s) aim to popularize science. We conducted searches on *Instagram* using the terms: „výskum“ (eng. research), „veda“ (eng. science), „vedu“, „vede“, „vedy“, „vedecký“, „vedecké“, „vedecká“, „vedecké dáta“. We also included relevant synonyms in the search. We used the above terms to identify relevant profile accounts that are public and in the Slovak language. The search was terminated when the saturation threshold was reached, i.e., no other current and research-relevant *Instagram* accounts appeared in the results. In the research material we also included *Instagram* accounts that were offered to us by *Instagram* based on its algorithm. The profile accounts had to meet certain criteria – the author had published at least one science-popularization post in 2022, the published content is available in the Slovak language, and the *Instagram* account is publicly accessible, i.e., the published content can be seen by all *Instagram* users, not just followers, who must be pre-approved by the author.

The identified contributions will be categorised according to a model developed by *The Dutch Research Council*, a Dutch institution. The content that popularises science will be divided into four main categories:

[47] MUIS, R. K., DENTON, C., DUBE, A.: Identifying CRAAP on the Internet: A Source Evaluation Intervention. In *Advances in Social Sciences Research Journal*, 2022, Vol. 9, No. 7, p. 240-241.

[48] *Tips for Students on How to Identify Fake News.* [online]. [2023-02-15]. Available at: <https://onlinedegrees.und.edu/masters-cyber-security/tips-for-students-on-how-to-identify-fake-news/>.

Disciplines of science and technology	Subgroups
Humanities	Archaeology; field studies; philosophy; history; art and architecture; music, theatre, performing arts and media; religious studies and theology; language and literature; linguistics; history of science.
Technical Sciences	Science and technology; computer science technology; electronics and telecommunications; engineering.
Natural Sciences	Agriculture; biology and environmental science; clinical medicine; life sciences; physical chemical and earth sciences; veterinary medicine.
Social Sciences	Business administration; public administration and political science; communication science; cultural anthropology; demography; economics; gender studies; educational sciences; development studies; pedagogy; psychology; law; sociology.

TABLE 1: *Disciplines of science and technology and their subgroups*

Source: own processing based on categorization from the Dutch institution *The Dutch Research Council,* 2023

In the last phase, we conducted semi-structured interviews with the creators of selected profile accounts that produce media content containing scientific data and information about the results of scientific research. The research sample consisted of three media creators of these *Instagram* accounts – *@veda_vkocke* (Šimon Popovič), *@kreslim_vedu* (Lucia Ciglar) and *@vedeckeokienko* (Ivan Gábriš). Semi-structured interviews were conducted via the *Google Meet* platform. Through semi-structured interviews, we investigated how (social media content creators) process information and what skills are important in interpreting scientific information. Based on this, we highlight the variation or uniformity in the processing of scientific information by media makers who have different highest educational attainments. Furthermore, we also focus on the practices in verifying the scientific data and information they present on their profile accounts, which are available to the general public or to users of the social network *Instagram*.

As part of the qualitative part of our research, we formulated the following research questions (RQs):

RQ1: Which skills are important for a social media maker and how can they be improved?

RQ2: What sources of expertise (digital platforms, databases, guides and courses) are used by social media creators and can help them improve their skills and expertise in interpreting scientific data and information?

RQ3: What practices do social media creators apply when creating popularization media content?

4 Results

Through the terms and suggested *Instagram* accounts, we identified nine *Instagram* accounts that published at least one post interpreting scientific information or data in 2022 and can be thematically categorized under the scientific discipline – humanities, social sciences, engineering, and natural sciences. Another important criterion we used to determine whether the content was popularization content was language that should be simple and understandable to the general public, i.e., recipients are not required to have expert knowledge. The last criterion was the goal of the popularization content, i.e., whether the author sufficiently explains the information in order for the general public to better understand the topic presented. We added as contributions aimed at popularizing science contents that deal with topics in different fields of science and the information focuses on popularizing science. We included images, videos and texts about prominent scientists and their discoveries, examples of science in everyday life, scientific theories, experiments and trials among the contributions that focus on popularising science.

Instagram username	Number of followers	Number of published posts in 2022	Number of published posts in 2022 that popularize science
@vedeckeokienko	40 103	72	45
@kreslim_vedu	15 597	3	2
@veda_vkocke	5263	5	3
@vedator_sk	58 072	52	8
*@_skumavka_*	22 120	32	17
@sofiin__svet	1836	14	10
@aurelium_zcv	430	97	16
@karin_science	15 981	22	10
@dvebabyajovede	1827	13	1

TABLE 2: *Number of followers and published posts in 2022*

Source: own processing, 2023

Through quantitative research, we highlighted the current state of popular *Instagram* accounts and their published content in 2022, such as images, videos and carousel – a type of post where the author has the option to publish multiple videos or still images within a single post. In Table 2, we provide information on nine *Instagram* accounts where we can find science-popularization content. Specifically, we report the number of followers and the number of posts they published in 2022, while we also report the number of posts that popularize science. The total number of followers for these users ranges from 430 (for user *@aurelium_zcv*) to 58,072 (for user *@vedator_sk*). In terms of the number of published posts, the differences between users are more pronounced. The user *@vedeckeokienko* published the most science-popularization posts in 2022, while the user *@kreslim_vedu* published only 3 posts. Interestingly, *@kreslim_vedu* publishes detailed infographics, which may explain the lower number of posts compared to other users. On average, the number of posts in 2022 is around 25. An interesting finding relates to the number of posts that popularize science. The user *@vedeckeokienko* published almost three quarters of his posts (i.e. 45 out of 72) with the aim of popularizing science. In contrast, the user *@dvebabyajovede* published only one post aimed at popularising science.

The Table 2 shows that, on average, each user has at least half of their posts aimed at popularizing science. A significant difference between the number of posts published in 2022 and the number of posts that popularise science can be observed for users *@vedator_sk*, *@karin_science*, *@dvebabyajovede* and *@aurelium_zcv*, for whom the proportion of popularisation posts is less than half. An interesting finding is that user *@vedator_sk* has the highest number of followers, but the share of its popularization posts is only 15.4%. Nevertheless, *@vedator_sk* is one of the most popular Slovak science popularizers, with more than 170 podcast episodes. On *Instagram*, his work contributes not only to the popularisation of science, but also to the fight against scientific misinformation narratives, such as the impact of 5G technology on human health or the topic dedicated to Covid-19. On the other hand, the user *@sofiin__svet*, which has only 1,836 followers, dedicated 71.4% of its posts to the popularization of science. Overall, popularizing science on *Instagram* is not a priority for all users and there are differences in the number of posts. Users *@vedeckeokienko* and *@_skumavka_* are the most active in this regard and focus primarily on science-popularization content. On the other hand, users *@dvebabyajovede* and *@aurelium_zcv* also cover other topics.

Instagram username	Image and photo	Video and reels	Carousel
@vedeckeokienko	8	33	4
@kreslim_vedu	1	0	1
@veda_vkocke	0	0	3
@vedator_sk	5	0	3
*@_skumavka_*	4	0	13
@sofiin__svet	2	0	8
@aurelium_zcv	6	0	10
@karin_science	1	1	8
@dvebabyajovede	1	0	0

TABLE 3: *Number of individual types of posts aimed at popularising science in 2022*

Source: own processing, 2023

From the Table 3, it can be seen that images and carousel posts are the most popular type of posts aimed at popularising science on *Instagram*. This type of content allows users to present more detailed information, as up to ten still images, videos or a combination of both can be used within a single post. The use of different types of posts may depend on what type of content the account is sharing and what target audience they are trying to reach. User *@vedecke_okienko* has posted up to 33 videos and reels that appeal primarily to a younger audience. One possible reason why this account focuses mainly on videos and reels could be the fact that the author of the account is a high school chemistry teacher who uses these videos and reels to show how chemical processes work, how different chemicals react with each other, and to explain and show different chemical experiments. In addition, short engaging videos have a greater potential to go viral, reach a wider audience and get more interaction from users. However, reels and videos are not the only type of content shared by the *@vedecke_okienko* account. As it comes from the data presented in Table 3, it is evident that the user also presents scientific topics through static images.

Instagram username	Humanities	Technical sciences	Natural sciences	Social sciences
@vedeckeokienko	0	3	42	0
@kreslim_vedu	0	0	2	0
@veda_vkocke	0	2	1	0
@vedator_sk	0	3	4	1
*@_skumavka_*	0	0	17	0
@sofiin__svet	0	6	3	1
@aurelium_zcv	0	4	12	0
@karin_science	0	0	9	1
@dvebabyajovede	0	0	1	0

TABLE 4: *Categorization of published posts into disciplines of science and technology*

Source: own processing, 2023

Based on an analysis of the posts published on *Instagram*, it can be observed that the largest share of them was focused on the field of natural sciences. It can be assumed that the obtained results reflect the knowledge, interests and preferences of individual science popularizers on the *Instagram* platform, who are more interested in natural and technical sciences than in humanities and social sciences. It is the majority of the authors of the *Instagram* accounts analysed by us, such as *@vedeckeokienko*, *@_skumavka_*, *@kreslim_vedu* and others, who are university-educated people who are graduates in fields that we classify as natural sciences. One possible reason that may explain this phenomenon is that the natural sciences include

various subfields such as chemical, physical, biological and other sciences. These subgroups can be considered interesting and attractive to the recipient as they can be presented in visually appealing images, photographs and videos – chemical experiments, different types of animals, space, etc. Another reason may be that the natural sciences are quite dynamic and new discoveries and research within the social and technical sciences are constantly emerging. *The Web of Science Group Master Journal List*[49] database lists 7342 journals[50] in the natural sciences and engineering category, 3090 journals[51] in the social sciences category and 1551 journals[52] in the humanities category. This means that research and publication activity in the natural sciences is now much more extensive and intensive than in the other sciences. In Table 5 we show what types of sources are mentioned by science popularizers on *Instagram*.

Instagram username	The source of the information is a news agency report	The source of the information is an article from another medium	The information has been drawn from several sources	The source of the information is scientific studies	Information on the sources used is not given
@vedeckeokienko	0	0	0	0	45
@kreslim_vedu	0	0	0	2	0
@veda_vkocke	0	0	0	0	3
@vedator_sk	0	1	1	2	5
*@_skumavka_*	0	0	0	0	17
@sofiin__svet	0	0	5	0	5
@aurelium_zcv	0	1	0	0	15
@karin_science	0	0	5	2	3
@dvebabyajovede	0	1	0	0	0

TABLE 5: *Source of the information presented*

Source: own processing, 2023

In the Table 5, we present individual numbers that show what sources the nine *Instagram* users drew from when creating their science posts. The majority of users did not provide any information on where they drew from when creating science popularisation posts. The profiles *@sofiin__svet* and *@karin_science* listed multiple sources from which they drew information in 5 posts. For example, *@sofiin__svet* used science studies, a wiki encyclopedia, and foreign news outlets such as cnn.com to create her post. The *Instagram* profile *@karin_science*, for example, sourced several scientific studies in 1 post and combined them with links to the World Health Organization's website.

As we reported above, the user *@vedeckeokienko* primarily displays various chemical experiments in videos and reels posted on the profile. These may be his own chemical experiments that are unique, in which case citing sources would be irrelevant. However, for content that is based on existing scientific literature and research, it is important to cite sources for the specific information that users provide in their content or in the descriptions of a given post. Also on social media, the scientific information presented needs to be supported by

[49] *Web of Science Group Master Journal List*. [online]. [2023-02-12]. Available at: <https://mjl.clarivate.com/search-results>.

[50] Note of the authors: We have included the following categories of disciplines registered in the *Web of Science Group Master Journal List* database: Agriculture, Biology and Environmental Sciences, Clinical Medicine, Electronics and Telecommunications, Engineering, Computing and Technology, Life Sciences, Physical, Chemical and Earth Sciences.

[51] Note of the authors: We have included the following categories of disciplines registered in the *Web of Science Group Master Journal List* database: Social and Behavioral Sciences, Business Collection.

[52] Note of the authors: We have included the following categories of disciplines registered in the *Web of Science Group Master Journal List* database: Arts and Humanities.

relevant sources in order to maintain credibility and reliability. This is also the case when presenting well-known scientific discoveries, as it is on social networking platforms that scientific misinformation and hoaxes are created and disseminated. Often, the correct citation of sources for individual posts allows the general public to verify the information and also to learn more about the topic presented, as *Instagram* limits the total number of characters in the description of a post. When analysing the posts, we encountered that, for example, *@vedator_sk* posted additional relevant information about the presented topic in the comments section. The main drawback on *Instagram* are the inactive hyperlinks in the description of posts. Users cannot simply click through to the link. Instead, they have to manually copy and paste the URL into their browser, which can be impractical for users. For this reason, we recommend that authors of science content use platforms such as *bit.ly*, where it is possible to shorten the hyperlink.

We conducted interviews with three individuals who create and disseminate media content, offering their interpretations of scientific data and information pertaining to the outcomes of scientific research. Further characteristics of the research sample:

- the first interview was conducted with Šimon, who created an *Instagram* profile called *@veda_vkocke*. Šimon is 14 years old and a primary school pupil,
- the second interview was conducted with Ivan, who studied at the Faculty of Science at Masaryk University in Brno. He is currently a high school chemistry teacher and popularizes the science of chemistry through his *Instagram* profile called *@vedeckeokienko*. Ivan is 25 years old and his highest educational attainment is a university degree,
- the third interview we conducted was with Lucia, a molecular biologist who studied biochemistry and cell biology at Jacobs University in Bremen, Germany. She did her PhD at the European Molecular Biology Laboratory (EMBL) in Heidelberg. Lucia is 38 years old and is currently involved in consulting, education and mentoring in the field of life sciences. In addition, she is dedicated to creating professional infographics for the general public, data visualization and graphics for the scientific community through the *Instagram* account *@kreslim_vedu* popularizes science.

Using semi-structured interviews with selected science-focused media content creators, we found out how they process and approach the creation of media content with scientific information and data. We also focused on the issue of scientific misinformation and investigated how they verify the credibility of the research information, press release, news or journalistic article from which they draw and publish information. Qualitative research offered us a deeper understanding of the issues under study.

In the first question, we were interested in what skills are important for science journalists and media makers who create media content focused on science topics.

Lucia replied that science popularisers *"need to be mainly science literate. They have to be knowledgeable about science and have an overview of what they are writing about. By that I don't mean knowledge, knowledge in a specific field, but they have to be familiar with the scientific literature, they have to understand what the scientific method is about, how scientific information is published, what the differences are in the quality of scientific publications."* She went on to say that it is important to be able to communicate and interpret scientific information, but she thinks it is just a matter of training.

Ivan stated that *"first and foremost you probably need to be an expert in what someone does. So I can't go interpret scientific data and information and popularize science if I don't know anything about it. Even in the scientific realms, there are a lot of topics that I avoid because I don't feel I'm expert enough to discuss them. In that case, if such a topic strikes my fancy, I'll just repost someone who I know has written about it correctly. I guess one of those things is definitely expertise and then creativity I guess. Because that's where you have to engage the curriculum because I'm a high school teacher and if I give dry facts, nobody's going to read it. So I have to somehow connect the dots."*

Šimon considers it important to be able to search and evaluate which sources are reliable and trustworthy.

RQ1: Which skills are important for a social media maker and how can they be improved?

In response to the first question that which skills are important for them and media content creators interpreting scientific information and data, they confirmed that scientific literacy and expertise are very important when interpreting scientific data. It is Lucia who sees scientific literacy as the most important and crucial in processing and interpreting scientific data information. She also points to scientific methodology and differences in the quality of published research. Ivan considers expertise in a scientific topic and creativity as important skills in processing scientific information. Šimon considers it important to work with sources that are credible.

The second question was as follows: what sources of expertise (databases, manuals, courses, and other materials) are you familiar with or have you worked with that can improve your skills and expertise in creating media content that contains scientific information and scientific data?

Lucia responded that *"I like to follow other accounts of how they do it and I like to be inspired. There are a lot of accounts abroad that do a great job communicating science. For example, what I use a lot are different articles written for non-specialists."* She went on to say that *"as far as resources that would improve skills, like how to communicate science, I confess I don't know if I know of any. I simply take inspiration from other science popularizers."*

Ivan does not know of any manuals or courses for science journalists or science popularisers. He further stated that *"whenever I think of something that I want to create, I have to have some background behind it. Mostly I draw from scientific articles. I try to use Google Scholar the most, where I look up some scholarly publications and try to transcribe them into language that even a non-expert in the subject can understand. And based on that, I improve my skills and expertise."*

Šimon also responded that he does not know of any sources of expertise that can improve skill and proficiency in media content creation.

RQ2: What sources of expertise (digital platforms, databases, guides and courses) are used by social media creators and can help them improve their skills and expertise in interpreting scientific data and information?

Responses from respondents indicate that none of the respondents are aware of specific sources of expertise that can improve skills and proficiency in creating media content that contains scientific information and scientific data. Lucia takes inspiration from foreign accounts that communicate science. Ivan improves his skills and expertise by simplifying information from scholarly publications.

The third question focused on procedures for processing scientific information and data and ways of verifying the veracity and credibility of the information.

Lucia said that the idea is important and then it just depends on the specific topic. She further states that *"some of the pictures I was able to draw just off the top of my head, but that's really the exception. So most of the time I really have to go to the literature to search and verify, which takes quite a long time. Then I draw, create, improve and often simplify. I try to figure out what doesn't need to be in the picture, what's unnecessary, and I try to put those superfluous things away in the interest of simplification but I'm also careful not to lose that scientific precision there."* For some topics, such as those dealing with vaccinations, she collaborated with a geneticist to create media content. Feedback from the target audience is also important to her, among whom she has a base of people who are willing to review information and images. Based on their comments, she further edits them, improves them and finally publishes them.

Šimon starts by looking for a topic that interests him. Next, he searches for an issue that is related to that topic. He uses the *Google* browser to search for resources that sufficiently cover the topic. He further stated that *"I definitely check if the sources are credible. I then divide the information into two groups – information that I understand and information that I have yet to understand through other sources."* Šimon also draws on news articles, but he verifies their credibility through the sources on which the author has drawn.

Ivan most often draws directly from articles that have been handled by a journalist. Ivan further adds *that "I rarely follow up on the original sources of a given piece of research. That is, if I know it is a credible author or journalist I try to take the idea and go a different way. I don't want to exactly copy the information from the article, but I want to come up with some innovation to link it to something else, for example. In the vast majority of cases I draw from other popularizers, that is, science journalists."* In some cases, Ivan draws information directly from videos. He verifies their credibility through the DOIs listed in the videos.

RQ3: What practices do social media creators apply when creating popularization media content?

All three respondents agreed that the first thing they do is to come up with a topic they want to report on. Lucia next searches for professional and relevant literature, which takes her the most time. She then devotes herself to the creative process of the actual writing of the article. After coming up with an idea for a topic, Šimon searches for relevant sources from which he then draws information. He then also begins the creative process of creating the images. This process is also similar for Ivan. We see the difference in the sources they draw from and the way they verify the credibility of the source and the information. Lucia draws mainly from primary research, i.e. primary data. When creating media content, she works with specialist literature or with an expert on the scientific topic. Šimon and Ivan also draw information from news articles. Šimon checks the credibility of news articles through sources that link to original research. Ivan relies on the credibility of the author of the news article. He is the only respondent who also draws information from videos or other popularizers of science. He verifies the credibility of the videos through the DOIs that are published in the videos.

5 Conclusion

The research focused on the analysis of popular *Instagram* accounts that share science-related content and aimed to determine the state of science popularisation on this platform. The study identified nine *Instagram* accounts grouped into different scientific disciplines and evaluated their content based on criteria such as ease of language and the goal of popularization. The accounts differed in the number of followers and posts published in 2022. Some accounts had a significant proportion of posts aimed at popularizing science, while others had fewer. The analysis also showed that images and carousel posts were the most popular content types for science popularization. In addition, the study found that natural sciences received the most attention among the accounts analyzed, likely due to their visual attraction and more intensive research activity in the field. The sources of information for the posts varied, with some users providing no information about their sources. The study highlighted the importance of citing sources to maintain credibility and combat scientific misinformation. We found out that there are very few *Instagram* accounts in Slovakia that are dedicated to popularising science. This may be due to the fact that the same skills and expertise are needed for a media creator as for a science journalist. Unlike science journalists, media creators should have more skills in creating graphics, editing audio or video.

The study did not address the effectiveness of science popularisation efforts or the accuracy of the information presented. Future research could explore these aspects and include a larger sample of *Instagram* accounts to provide a more comprehensive understanding of science popularization on this platform.

Based on the semi-structured interviews, we found that respondents did not know about any sources of expertise that could help them improve their professionalism and skills. Lucia, Ivan and Šimon recognise the importance of publishing validated and objective scientific information. They draw inspiration from other popularizers of science and use resources such as lay articles and scholarly publications. Their creative content creation process includes topic selection, research, simplifying complex information, and engaging audiences.

Low levels of scientific and media literacy and critical thinking are one of the reasons why media producers and science journalists are unable to find, process and interpret credible and relevant scientific data and information. For this reason, it is important for media makers who are involved in science popularisation to realise a common goal with science journalism, namely to help people understand science and its relevance to society.

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Authors

Prof. Mgr. Norbert Vrabec, PhD.
University of Ss. Cyril and Methodius in Trnava
Faculty of Mass Media Communication
Nám. J. Herdu 2,
917 01 Trnava
SLOVAK REPUBLIC
norbert.vrabec@ucm.sk
ORCID ID: https://orcid.org/0000-0003-2612-4856

Norbert Vrabec is a Professor at the Department of Media Education, Faculty of Mass Media Communication, University of Ss. Cyril and Methodius in Trnava and the director of the *Media Literacy Center (IMEC)*. His research focuses on media literacy, competencies, critical thinking, digital media, online communication, data and scientific journalism. He participates in several international projects in the field of media studies. He is the co-author of *Public Policies in Media and Information Literacy in Europe: Cross-Country Comparisons* (Abingdon, Routledge, 2017) and a *member of the International Communication Association,* the *International Association for Media Education (IAME)* and other renowned academic and professional organisations.

Mgr. Lukáš Pieš
University of Ss. Cyril and Methodius in Trnava
Faculty of Mass Media Communication
Nám. J. Herdu 2,
917 01 Trnava
SLOVAK REPUBLIC
pies1@ucm.sk
ORCID ID: https://orcid.org/0000-0003-1375-0145

Lukáš Pieš is a full-time PhD. student at the Faculty of Mass Media Communication of the University of Ss. Cyril and Methodius in Trnava, Slovakia. He completed his bachelor's and master's degree at the FMK UCM in Trnava in the study programme of Applied Media Studies. In 2021 he completed additional pedagogical studies at the Faculty of Philosophy of the University of Ss. Cyril and Methodius. In his scientific activity he is devoted to the current state and current trends of scientific journalism. His research focuses on the status of scientific journalism in the Slovak media environment, the role and activities of journalists in the media presentation of scientific and technological information and the outputs of scientific research.