Fake News in the Digital Age: the Role of Science and Media Literacy in Identifying Truth

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In the digital age, called the post-truth era, emotions and beliefs frequently overshadow objective facts. The concept of "post-truth," Oxford Dictionary's Word of the Year in 2016, underscores the influence of fake news, conspiracy theories, and opinion-driven narratives in distorting perceptions of reality. The 2024 oooScience! project study, conducted as part of the European Researchers' Night and Researchers at Schools initiative of the Marie Sklodowska-Curie Actions (MSCA) & Citizens examined the ability of 921 respondents to distinguish fake news from credible information. The research, involving diverse groups such as the general public, educators, high school students, and event attendees, revealed the critical role of science and media literacy in combating misinformation. Accessible scientific communication emerged as a key tool for fostering trust in science and bridging gaps between experts and the public. These findings highlight the importance of collaborative educational strategies to enhance media literacy, build resilience against fake news, and empower individuals to make informed decisions in the digital age.

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1 Introduction

In the digital age, commonly called the post-truth era, information appealing to emotions, beliefs, and desires often precedes objective facts. The term "post-truth," declared the Word of the Year by the Oxford Dictionary in 2016, captures the growing influence of fake news, conspiracy theories, and opinion-driven narratives in shaping perceptions of reality that frequently diverge from factual truth. Although fake news is not a new phenomenon, the internet and social media have dramatically expanded the reach and impact of misinformation and disinformation. Fake news may arise unintentionally through the spread of unchecked information (*misinformation*), be deliberately created to deceive or harm (*disinformation*), or consist of accurate information shared with the intent to cause damage (*malinformation*) (Christian, 2020).

1.1 A Short Review of the Literature on Fake News

Fake news has emerged as a pressing concern across multiple domains, including science, health, politics, and media. Scholars have explored its causes, mechanisms of spread, and impacts while proposing strategies for mitigation. This review synthesises these insights, establishing connections between studies to provide a cohesive understanding of fake news. Harper et al. (2020) highlight its detrimental effects, particularly in science and health. Defined as fabricated information mimicking credible content without editorial rigour, fake news includes misinformation (unintentional inaccuracies) and disinformation (deliberately deceptive content). On social media it spreads faster than truthful information, appealing to novelty and leveraging biases like confirmation and desirability bias. This rapid dissemination undermines public health and trust in science. Harper et al. (2020) advocate for reliable sources, critical thinking, and evidence-based platforms to combat these issues.

Wu et al. (2022) broaden the analysis, revealing that fake news often emerges during significant events driven by financial, ideological, or sensational motives. Amplified by platform algorithms, echo chambers, and emotional triggers, fake news exacerbates political polarisation and erodes trust in institutions. They propose regulatory frameworks and technological innovations to counteract these challenges, aligning with Harper et al.'s (2020) findings. Lazer et al. (2018) examine fake news'

proliferation through declining trust in traditional media and increasing polarisation. They emphasise the role of social media algorithms and bots in amplifying misinformation, particularly in politics. Cognitive biases, such as repeated exposure increasing perceived credibility, pose significant challenges. Authors call for global efforts integrating education, platform accountability, and collaboration between governments and researchers. Similarly, Tandoc (2019) underscores audience susceptibility to fake news, highlighting the role of media literacy in addressing cognitive biases and emotional appeals. However, he notes limitations in fact-checking and algorithmic interventions.

Mann (2018) situates fake news in the "post-truth" era, where emotional appeals often override factual information, challenging scientific integrity. His focus on fostering transparency complements Harper et al.'s (2020) emphasis on rebuilding trust in science. Taddicken and Wolff (2020) explore disinformation's emotional and cognitive dimensions, advocating media literacy and emotional awareness to build resilience against misinformation. Field-Fote (2019) highlights misinformation in scientific research, stressing rigorous standards to preserve credibility. Baissa et al. (2024) analyse how fake news combines traditional and novel narrative strategies to influence public discourse on critical issues. Zhang (2024) and Patel and Surati (2024) emphasise multimodal detection methods, integrating text, images, and videos for greater accuracy while acknowledging challenges like scalability and dataset diversity.

The literature underscores the multifaceted nature of fake news and its societal consequences. Interdisciplinary approaches are essential, integrating technological advancements, media literacy education, platform accountability, and robust scientific standards. Collaboration among academia, policymakers, and media organisations is vital to fostering an informed, resilient public.

The 2024 oooScience! project study, conducted as part of the European Researchers' Night and Researchers at Schools initiative under MSCA & Citizens, aimed to evaluate individuals' ability to differentiate between fake news and factual information and examine their media consumption habits. It surveyed diverse groups, including the general population, educators, high school students, and European Researchers' Night event attendees across Slovenian cities. The research highlighted the vital role of science and research in addressing misinformation in a

digital society. By focusing on critical thinking and scientific literacy, the study sought to identify how scientific inquiry can combat the spread of fake news and equip individuals—especially young people—with the skills needed to discern credible information, ultimately fostering a fact-based society resilient to misinformation.

2 Description of Methodology, Instrumentation, and Sample

The European Researchers' Night and Researchers at Schools under the auspices of the European Union aim at science engagement with society, inspiring young people to embark on scientific careers, raising public awareness of the importance of science, enforcing researchers' public recognition by illuminating their key role and impact in society. In 2024 and 2025, the European Researchers' Night, which is the largest science outreach event in Europe, occurs simultaneously in 23 countries and over 400 cities across Europe and beyond (European Research Council, n.d.). As part of the project titled *Fake news and conspiracy theories? Let's empower (ourselves for) science!* (oooScience!) *(Lažne novice in teorije zarote? Opolnomočimo (se za) znanost!"* - oooZnanost!), we conducted a study to explore how various stakeholders perceive science and research activities. For this purpose, we developed five distinct questionnaires tailored to different population groups: high school students, teachers and professors, university researchers, participants in the European Researchers' Night event, and the general public. The questionnaires were available on the online platform *1ka-arnes*, while a physical version was provided to participants of the European Researchers' Night event (held on the last Friday of September 2024). Participation in the study was voluntary, and respondents were guaranteed complete anonymity. Consent for data collection, processing, and storage was obtained from all participants. Data collection took place between June and December 2024.

The questionnaire included a five-item scale on fake news and conspiracy theories rated on a five-point Likert scale, ranging from 1 ("strongly disagree") to 5 ("strongly agree"). The scale's reliability, as measured by Cronbach's alpha, was 0.756, indicating good internal consistency. In social science research, values above 0.7 are generally considered acceptable, suggesting that the scale is suitable for further analysis. Factor analysis revealed that all items contribute to a single underlying construct. Based on the content of the items, the scale measures perceived ability

and the importance of identifying fake news and attitudes toward this issue. All items relate to the theme of recognising, understanding, and addressing the problem of fake news and misinformation. The construct can be summarised as *Perceived competence and awareness of the fake news problem*. The factor analysis results showed that all items loaded well on a single factor, confirming that the scale measures a unified concept. The items capture multiple dimensions of this construct, including self-confidence and skills, social and democratic impact, and the importance of scientific communication. Teachers in primary and secondary schools and university researchers responded to two additional items on teachers' and high school students' perceptions of knowledge and skills for communicating scientific findings and distinguishing fake news. Demographic data, including gender, age, employment status, and education level, were collected for all respondents.

The study included 921 participants. The sample consisted of diverse individuals differing in age, gender, education, and participant type. 68.0% were women, 29.8% were men, and 2.2% chose "prefer not to answer" or "other." The gender distribution was slightly negatively skewed, with women predominating. Participants ranged in age from 15 to 89 years, with an average age of 32.18 (SD = 16.53). The largest age group was 15–19 years (40.8%), followed by 41–60 years (29.4%). Other age groups included 20–30 years (12.5%), 31–40 years (12.7%), and 61 years and older (4.6%). The age distribution was slightly positively skewed, indicating a higher proportion of younger respondents. The sample included a mix of participant types: 50.8% European Researchers' Night participants, 18.9% teachers in primary and secondary schools, 15.4% high school students, 5.6% university staff, and 9.2% general public. Most respondents had secondary education or were enrolled in secondary school (44.2%). Other education levels included (a) primary education: 3.4%, (b) higher vocational education: 5.3%, (c) bachelor's degree (first Bologna cycle): 18.9%, (d) master's degree, specialisation, or old university degree (second Bologna cycle): 17.4%, and (e) master's in science or Ph.D.: 10.9%.

3 Results

We asked respondents to evaluate several statements regarding news that distort reality or are even false, with the following prompt: "*Below are some statements about the nature of news and the quality of information we encounter through various channels. For each statement, please assess the extent to which you agree or disagree. Use a scale from 1 (strongly*

disagree) to 5 (strongly agree). Select 'I don't know' if you cannot decide or evaluate." Table 1 provides insights into respondents' perceptions of news that distorts reality or is false, focusing on their ability to recognise such information, their knowledge and skills to differentiate credible news, and their views on the broader implications of false information.

Table 1: Respondents' Evaluation of Statements on News that Distort Reality or Contain False Information

	N		Mean	S.D.	I disagree (1+2)	Neutral 3	I agree (3+4)	I don't know
	Valid	Missing						
I believe I can recognise news or information that distorts reality or is even false.	841	80	3,70	,96	9,0 %	25,2 %	58,9 %	6,9 %
I believe I have enough knowledge and skills to distinguish credible news from fake news.	874	47	3,80	,95	9,4 %	21,3 %	65,7 %	3,6 %
I believe that news or information that distorts reality or is even false is a problem in Slovenia.	829	92	3,86	,97	8,0 %	21,3 %	62,4 %	8,3 %
I believe that news or information that distorts reality or is even false is a problem for democracy in general.	834	87	4,16	,97	6,0 %	13,5 %	73,5 %	7,0 %
I believe that clearly communicated scientific results would personally help me distinguish between fake news and verified facts.	835	86	3,96	1,01	7,2 %	20,2 %	65,7 %	6,9 %

Respondents generally believe they can recognise news or information that distorts reality, with a mean score of 3.70. A majority (58.9%) agree with this statement, while 25.2% are neutral and 9.0% disagree. A small percentage (6.9%) were undecided. Confidence in distinguishing credible from fake news scored slightly higher, with a mean of 3.80. A significant majority (65.7%) agree, and only 9.4% disagree, indicating higher self-assessed competence in this area. Neutral responses accounted for 21.3%, and only 3.6% chose "I don't know."

The belief that distorted or false news is a problem in Slovenia yielded a mean score of 3.86. Most respondents (62.4%) agree with this statement, 21.3% are neutral, and 8.0% disagree. An additional 8.3% selected "I don't know." The strongest agreement was on the statement that false information is a problem for democracy, with a mean of 4.16. A substantial majority (73.5%) agree, while only 6.0% disagree and 13.5% are neutral. Those undecided accounted for 7.0%. Respondents also agree that clearly communicated scientific findings would help distinguish between fake news and verified facts, with a mean of 3.96. The agreement stands at 65.7%, with 20.2% neutral and 7.2% disagreeing. A small portion (6.9%) expressed indecision.

In the following analysis, we conducted additional statistical tests to determine whether any of the socio-demographic factors of respondents are associated with opinions about the nature of fake news. We identified significant relationships involving education and the recognition of fake news. Education is statistically significantly and positively associated with the perceived ability to recognise fake news ($r=0.089$; $p=0.016$), indicating that individuals with higher levels of education are more likely to believe they can identify false information. Education was also linked to the perception of fake news as a societal problem in Slovenia and globally. A statistically significant and positive correlation ($r=0.118$; $p=0.002$) indicates that more educated individuals are more likely to perceive fake news as a problem in Slovenia. Similarly, a positive and statistically significant correlation ($r=0.146$; $p<0.001$) with the perception of fake news as a threat to democracy highlights that individuals with higher education levels are more likely to view fake news as a danger to democratic systems. Furthermore, education is significantly and positively associated with recognising the benefits of clear communication of scientific results ($r=0.112$; $p=0.003$). This suggests that more educated individuals value scientific communication more in distinguishing fake news from verified facts.

We also identified two statistically significant and positive correlations involving age and the perception of fake news as a societal problem. A positive correlation ($r=0.130$; $p<0.001$) indicates that older individuals are likelier to perceive fake news as a problem in Slovenia. Additionally, a weak but statistically significant correlation ($r=0.083$; $p=0.017$) shows that older respondents are more inclined to view fake news as threatening democracy. The t-test results revealed a statistically significant difference between genders for the statement: *"I believe that clearly communicated scientific results would personally help me distinguish between fake news and verified facts."* ($t=-1.986$; $p = 0.024$). Women ($M = 4.01$; $SD = 0.97$) agreed with this statement more strongly than men ($M = 3.86$; $SD = 1.08$).

In summary, higher education levels and older age significantly influence the perception of fake news as a societal issue. Educated individuals are more confident in identifying fake news and perceiving it as a more significant threat to Slovenia and its democracy. They also value clear and accessible communication of scientific findings as a key tool in distinguishing fake news from verified information. Similarly, older respondents are more likely to view fake news as a societal problem, particularly its impact on democratic processes. These findings underline the necessity of targeted educational initiatives and tailored scientific communication to address the needs of diverse demographic groups.

In addition to the statements about fake news presented in Table 1, we posed two additional statements to teachers and high school students, focusing on teachers' and high school students' perceptions of knowledge and skills for communicating scientific findings and distinguishing fake news. This approach allows for a comparison between the opinions of teachers and students. The results (Table 2) highlight differences in perceptions between teachers (elementary school, high school, university) and high school students regarding their own and their professors' ability to communicate and emphasise knowledge and skills necessary for distinguishing between fake news and verified facts. Regarding sufficient knowledge and skills to communicate scientific findings, teachers rated their ability to effectively communicate scientific findings with a mean score of 3.54, with 12.0% disagreeing and 58.1% agreeing. High school students evaluated their professors' ability to communicate these findings slightly higher, with a mean score of 3.71, where 10.9% disagreed, and 68.1% agreed. The t-test result shows no statistically significant difference between the two groups. The effect size suggests a small

negative effect, indicating that students view their professors' skills somewhat more favourably than teachers view their own.

In terms of emphasis on knowledge and skills to distinguish fake news from verified facts, teachers reported emphasising these skills in their work with students, with a mean score of 3.74. Only 9.3% disagreed, while 68.4% agreed with the statement. High school students rated their professors' emphasis on these skills lower, with a mean score of 3.27. Among students, 21.9% disagreed, and only 40.9% agreed. The t-test result indicates a statistically significant difference between the two groups. The effect size (d=0.486) suggests a moderate positive effect, highlighting that teachers believe they emphasise these skills more than how students perceive their professors' efforts.

Table 2: Comparison of Teachers' and High School Students' Perceptions of Knowledge and Skills for Communicating Scientific Findings and Distinguishing Fake News

Teachers (elementary school, high school, university)				Students (high school)				t-test Cohen's d
	M	S.D.	I agree (3+4)		M	S.D.	I agree (3+4)	
I believe that I have sufficient knowledge and skills to effectively communicate scientific findings, which would help distinguish between fake news and verified facts. (n=217)	3,54	,84	58,1%	I believe that my professors have sufficient knowledge and skills to effectively communicate scientific findings, which help us distinguish between fake news and verified facts. (n=138)	3,71	,94	68,1%	t=-1,86 p=,064 d= -,20
In my work with pupils, high school students, or university students, I specifically emphasise knowledge and skills that would help them distinguish between fake news and verified facts. (n=215)	3,74	,92	68,4%	My professors specifically emphasise knowledge and skills during lectures that would help us distinguish between fake news and verified facts. (n=137)	3,27	1,03	40,9%	t=4,33 p=,001 d=0,49

While both groups recognise the importance of knowledge and skills for distinguishing fake news, students perceive their professors' communication efforts more favourably but see less emphasis on these skills during lectures. This discrepancy suggests a potential gap in communicating the importance of these skills during teaching. Educators may need to address this gap better to align students' perceptions with their intended teaching efforts.

4 Discussion

The recognition and understanding of fake news present a significant societal challenge in the digital age. As confirmed by the findings of this study, a majority of respondents believe they can identify news that distorts reality or is outright false. Even greater confidence is expressed regarding distinguishing credible news from fake news. However, a notable proportion of neutral responses indicates that many individuals remain uncertain about their abilities, underscoring the need for targeted interventions to improve these skills. Awareness of the societal impact of fake news is similarly high, with 62.4% of respondents identifying fake news as a problem in Slovenia and 73.5% recognising its broader threat to democracy. This awareness highlights the pervasive nature of misinformation and its potential to undermine trust in democratic processes. Respondents also strongly agree that clearly communicated scientific findings can aid in distinguishing fake news from verified information, emphasising the critical role of accessible and reliable scientific communication in combating misinformation. The findings reveal some demographic variations in perceptions of fake news. Higher education is positively associated with greater confidence in recognising fake news and perceiving it as a societal problem in Slovenia and globally. Educated individuals also place greater value on clear and comprehensible scientific communication. Similarly, older respondents are more likely than younger ones to view fake news as a serious societal issue and a threat to democracy. Gender differences further emerge, with women placing higher importance on scientific communication clarity than men.

A notable gap exists between teachers and students regarding their perceptions of knowledge and skills in combating misinformation. Students tend to rate their professors' ability to communicate scientific findings more favourably than teachers rate themselves. However, students also report that insufficient emphasis is placed on teaching the skills to distinguish fake news from credible information. This

discrepancy highlights a need for educators to communicate their efforts better and to integrate media literacy into their teaching practices more effectively.

Conspiracy theories often attribute events to covert actions by malicious and powerful actors, typically with political motives. These theories rely on circular reasoning, where evidence against the conspiracy or the lack of supporting evidence is interpreted as proof of its validity. As a result, conspiracy theories become matters of belief rather than empirical verification (Christian, 2020). Fake news similarly exploits cognitive and emotional mechanisms to manipulate public opinion. By leveraging anger and other emotions, which strongly motivate action (Posner et al., 2005), creators of fake news focus on popular topics and design content to prompt engagement—clicking, reading, and commenting—which generates profit.

Media literacy is essential for combating fake news (Deuze & Prenger, 2019). Competent individuals critically evaluate sources, distinguish clickbait tactics, and verify information using multiple outlets (Kiely & Robertson, 2016). Steps such as checking the credibility of sources, verifying authorship, and confirming publication dates can help identify false information. While journalistic ethics demand accuracy, public scepticism is necessary, given the varying interests of media organisations. As Chan (2019) and Christian (2020) emphasise, fostering critical thinking, media literacy, and awareness of personal biases can empower individuals to resist misinformation and make informed decisions in the digital age. The findings of this study emphasise that combating fake news in the digital age requires a multifaceted approach that integrates media literacy, critical thinking, and scientific communication. The role of science in identifying truth is indispensable; clear, accessible, and reliable communication of scientific findings can serve as a cornerstone in distinguishing verified information from misinformation.

Educators, policymakers, and media organisations must collaborate to design educational initiatives that address the diverse needs of demographic groups, especially those most vulnerable to misinformation. Events such as the European Researchers' Night promote public understanding of science, foster research trust, and bridge the gap between experts and the general public. By building public resilience against fake news and conspiracy theories, societies can strengthen their democratic foundations and empower individuals to navigate the complexities of the digital age with confidence and discernment. The interplay between science and

media literacy holds the key to preserving the integrity of information in a world increasingly dominated by digital media.

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