The Use of Critical Thinking to Identify Fake News: A Systematic Literature Review

Paul Machete and Marita Turpin[(✉)]

Department of Informatics, University of Pretoria, Pretoria 0001, South Africa
`marita.turpin@up.ac.za`

Abstract. With the large amount of news currently being published online, the ability to evaluate the credibility of online news has become essential. While there are many studies involving fake news and tools on how to detect it, there is a limited amount of work that focuses on the use of information literacy to assist people to critically access online information and news. Critical thinking, as a form of information literacy, provides a means to critically engage with online content, for example by looking for evidence to support claims and by evaluating the plausibility of arguments. The purpose of this study is to investigate the current state of knowledge on the use of critical thinking to identify fake news. A systematic literature review (SLR) has been performed to identify previous studies on evaluating the credibility of news, and in particular to see what has been done in terms of the use of critical thinking to evaluate online news. During the SLR's sifting process, 22 relevant studies were identified. Although some of these studies referred to information literacy, only three explicitly dealt with critical thinking as a means to identify fake news. The studies on critical thinking noted critical thinking as an essential skill for identifying fake news. The recommendation of these studies was that information literacy be included in academic institutions, specifically to encourage critical thinking.

Keywords: Critical thinking · Fake news · Information literacy · Systematic literature review

1 Introduction

The information age has brought a significant increase in available sources of information; this is in line with the unparalleled increase in internet availability and connection, in addition to the accessibility of technological devices [1]. People no longer rely on television and print media alone for obtaining news, but increasingly make use of social media and news apps. The variety of information sources that we have today has contributed to the spread of alternative facts [1]. With over 1.8 billion active users per month in 2016 [2], Facebook accounted for 20% of total traffic to reliable websites and up to 50% of all the traffic to fake news sites [3]. Twitter comes second to Facebook, with over 400 million active users per month [2]. Posts on social media platforms such as Facebook and Twitter spread rapidly due to how they attempt to grab

the readers' attention as quickly as possible, with little substantive information provided, and thus create a breeding ground for the dissemination of fake news [4].

While social media is a convenient way of accessing news and staying connected to friends and family, it is not easy to distinguish real news from fake news on social media [5]. Social media continues to contribute to the increasing distribution of user-generated information; this includes hoaxes, false claims, fabricated news and conspiracy theories, with primary sources being social media platforms such as Facebook and Twitter [6]. This means that any person who is in possession of a device, which can connect to the internet, is potentially a consumer or distributor of fake news. While social media platforms and search engines do not encourage people to believe the information being circulated, they are complicit in people's propensity to believe the information they come across on these platforms, without determining their validity [6]. The spread of fake news can cause a multitude of damages to the subject; varying from reputational damage of an individual, to having an effect on the perceived value of a company [7].

The purpose of this study is to investigate the use of critical thinking methods to detect news stories that are untrue or otherwise help to develop a critical attitude to online news. This work was performed by means of a systematic literature review (SLR). The paper is presented as follows. The next section provides background information on fake news, its importance in the day-to-day lives of social media users and how information literacy and critical thinking can be used to identify fake news. Thereafter, the SLR research approach is discussed. Following this, the findings of the review are reported, first in terms of descriptive statistics and the in terms of a thematic analysis of the identified studies. The paper ends with the Conclusion and recommendations.

2 Background: Fake News, Information Literacy and Critical Thinking

This section discusses the history of fake news, the fake news that we know today and the role of information literacy can be used to help with the identification of fake news. It also provides a brief definition of critical thinking.

2.1 The History of Fake News

Although fake news has received increased attention recently, the term has been used by scholars for many years [4]. Fake news emerged from the tradition of yellow journalism of the 1890s, which can be described as a reliance on the familiar aspects of sensationalism—crime news, scandal and gossip, divorces and sex, and stress upon the reporting of disasters, sports sensationalism as well as possibly satirical news [5]. The emergence of online news in the early 2000s raised concerns, among them being that people who share similar ideologies may form "echo chambers" where they can filter out alternative ideas [2]. This emergence came about as news media transformed from one that was dominated by newspapers printed by authentic and trusted journalists to one where online news from an untrusted source is believed by many [5]. The term later grew to describe "satirical news shows", "parody news shows" or "fake-news

comedy shows" where a television show, or segment on a television show was dedicated to political satire [4]. Some of these include popular television shows such as *The Daily Show* (now with Trevor Noah), *Saturday Night Live*'s "The Weekend Update" segment, and other similar shows such as *Last Week Tonight* with John Oliver and *The Colbert Report* with Stephen Colbert [4]. News stories in these shows were labelled "fake" not because of their content, but for parodying network news for the use of sarcasm, and using comedy as a tool to engage real public issues [4]. The term "Fake News" further became prominent during the course of the 2016 US presidential elections, as members of the opposing parties would post incorrect news headlines in order to sway the decision of voters [6].

2.2 Fake News Today

The term fake news has a more literal meaning today [4]. The Macquarie Dictionary named fake news the word of the year for 2016 [8]. In this dictionary, fake news is described it as a word that captures a fascinating evolution in the creation of deceiving content, also allowing people to believe what they see fit. There are many definitions for the phrase, however, a concise description of the term can be found in Paskin [4] who states that certain news articles originating from either social media or mainstream (online or offline) platforms, that are not factual, but are presented as such and are not satirical, are considered fake news. In some instances, editorials, reports, and exposés may be knowingly disseminating information with intent to deceive for the purposes of monetary or political benefit [4].

A distinction amongst three types of fake news can be made on a conceptual level, namely: serious fabrications, hoaxes and satire [3]. Serious fabrications are explained as news items written on false information, including celebrity gossip. Hoaxes refer to false information provided via social media, aiming to be syndicated by traditional news platforms. Lastly, satire refers to the use of humour in the news to imitate real news, but through irony and absurdity. Some examples of famous satirical news platforms in circulation in the modern day are *The Onion* and *The Beaverton*, when contrasted with real news publishers such as *The New York Times* [3].

Although there are many studies involving fake news and tools on how to detect it, there is a limited amount of academic work that focuses on the need to encourage information literacy so that people are able to critically access the information they have been presented, in order to make better informed decisions [9].

Stein-Smith [5] urges that information/media literacy has become a more critical skill since the appearance of the notion of fake news has become public conversation. Information literacy is no longer a nice-to-have proficiency but a requirement for interpreting news headlines and participation in public discussions. It is essential for academic institutions of higher learning to present information literacy courses that will empower students and staff members with the prerequisite tools to identify, select, understand and use trustworthy information [1]. Outside of its academic uses, information literacy is also a lifelong skill with multiple applications in everyday life [5]. The choices people make in their lives, and opinions they form need to be informed by the appropriate interpretation of correct, opportune, and significant information [5].

2.3   Critical Thinking

Critical thinking covers a broad range of skills that includes the following: verbal reasoning skills; argument analysis; thinking as hypothesis testing; dealing with likelihood and uncertainties; and decision making and problem solving skills [10]. For the purpose of this study, where we are concerned with the evaluation of the credibility of online news, the following definition will be used: critical thinking is "the ability to analyse and evaluate arguments according to their soundness and credibility, respond to arguments and reach conclusions through deduction from given information" [11]. In this study, we want to investigate how the skills mentioned by [11] can be used as part of information literacy, to better identify fake news.

The next section presents the research approach that was followed to perform the SLR.

3   Research Method

This section addresses the research question, the search terms that were applied to a database in relation to the research question, as well as the search criteria used on the search results. The following research question was addressed in this SLR:

- *What is the role of critical thinking in identifying fake news, according to previous studies?*

The research question was identified in accordance to the research topic. The intention of the research question is to determine if the identified studies in this review provide insights into the use of critical thinking to evaluate the credibility of online news and in particular to identify fake news.

Delimitations. In the construction of this SLR, the following definitions of fake news and other related terms have been excluded, following the suggestion of [2]:

- Unintentional reporting mistakes;
- Rumours that do not originate from a particular news article;
- Conspiracy theories;
- Satire that is unlikely to be misconstrued as factual;
- False statements by politicians; and
- Reports that are slanted or misleading, but not outright false.

Search Terms. The database tool used to extract sources to conduct the SLR was Google Scholar (https://scholar.google.com). The process for extracting the sources involved executing the search string on Google Scholar and the retrieval of the articles and their meta-data into a tool called Mendeley, which was used for reference management.

The search string used to retrieve the sources was defined below:

("critical think*" OR "critically (NEAR/2) reason*" OR "critical (NEAR/2) thought*" OR "critical (NEAR/2) judge*" AND "fake news" AND (identify* OR analyse* OR find* OR describe* OR review).

To construct the search criteria, the following factors have been taken into consideration: the research topic guided the search string, as the key words were used to create the base search criteria. The second step was to construct the search string according to the search engine requirements on Google Scholar.

Selection Criteria. The selection criteria outlined the rules applied in the SLR to identify sources, narrow down the search criteria and focus the study on a specific topic. The inclusion and exclusion criteria are outlined in Table 1 to show which filters were applied to remove irrelevant sources.

Table 1. Inclusion and exclusion criteria for paper selection

Inclusion criteria	Exclusion criteria
Publications related to alternative facts, fake news and fabrications	Publications related to alternative facts, fake news and fabrications
Academic journals published in information technology and related fields	Academic journals published in information technology and related fields
Academic journals should outline critical thinking, techniques of how to identify fake news or reviewing fake news using critical thinking	Academic journals should outline critical thinking, techniques of how to identify fake news or reviewing fake news using critical thinking
Academic journals should include an abstract	Academic journals should include an abstract
	Publications related to alternative facts, fake news and fabrications

Source Selection. The search criteria were applied on the online database and 91 papers were retrieved. The criteria in Table 1 were used on the search results in order to narrow down the results to appropriate papers only.

PRISMA Flowchart. The selection criteria included four stages of filtering and this is depicted in Fig. 1. In then Identification stage, the 91 search results from Google Scholar were returned and 3 sources were derived from the sources already identified from the search results, making a total of 94 available sources. In the screening stage, no duplicates were identified. After a thorough screening of the search results, which included looking at the availability of the article (free to use), 39 in total records were available – to which 55 articles were excluded. Of the 39 articles, nine were excluded based on their titles and abstract being irrelevant to the topic in the eligibility stage. A final list of 22 articles was included as part of this SLR. As preparation for the data analysis, a data extraction table was made that classified each article according to the following: article author; article title; theme (a short summary of the article); year; country; and type of publication. The data extraction table assisted in the analysis of findings as presented in the next section.
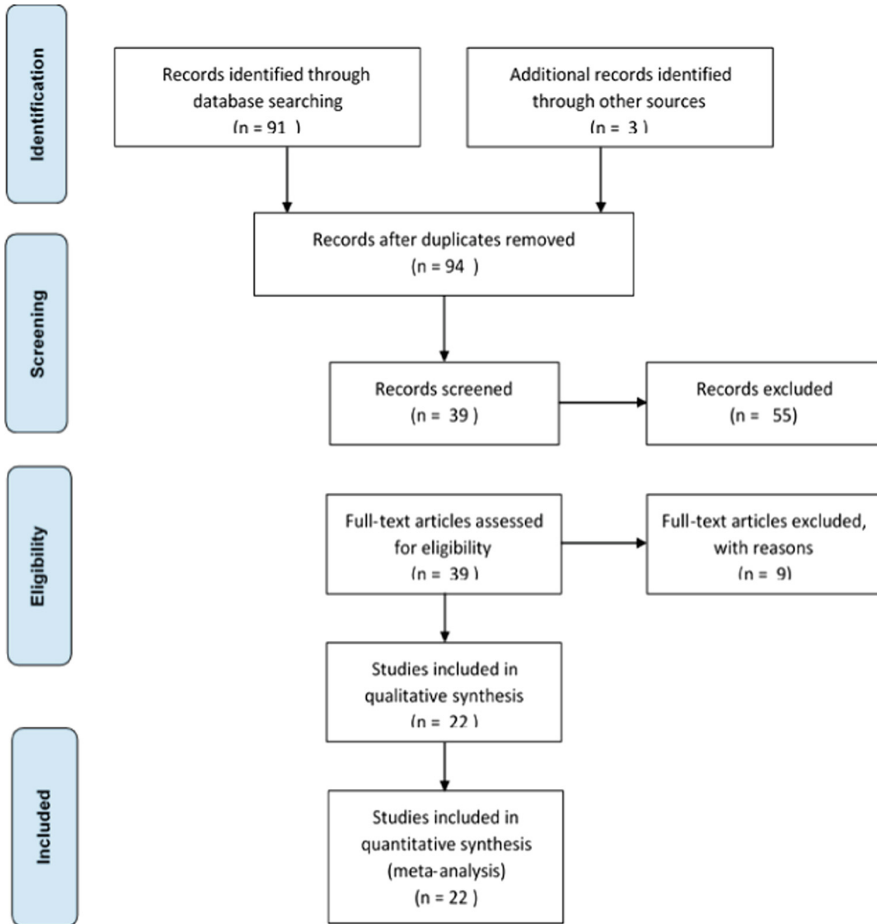
Fig. 1. PRISMA flowchart

4 Analysis of Findings

4.1 Descriptive Statistics

Due to the limited number of relevant studies, the information search did not have a specified start date. Articles were included up to 31 August 2019. The majority of the papers found were published in 2017 (8 papers) and 2018 (9 papers). This is in line with the term "fake news" being announced the word of the year in the 2016 [8].
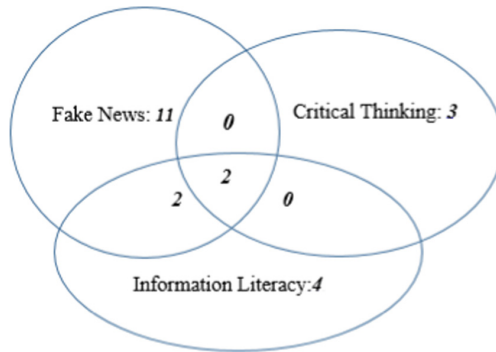
Fig. 2. Venn diagram depicting the overlap of articles by main focus

The selected papers were classified into themes. Figure 2 is a Venn diagram that represents the overlap of articles by themes across the review. Articles that fall under the "fake news" theme had the highest number of occurrences, with 11 in total. Three articles focused mainly on "Critical Thinking", and "Information Literacy" was the main focus of four articles. Two articles combined all three topics of critical thinking, information literacy, and fake news.

An analysis of the number of articles published per country indicate that the US had a dominating amount of articles published on this topic, a total of 17 articles - this represents 74% of the selected articles in this review. The remaining countries where articles were published are Australia, Germany, Ireland, Lebanon, Saudi Arabia, and Sweden - with each having one article published.

In terms of publication type, 15 of the articles were journal articles, four were reports, one was a thesis, one was a magazine article and one, a web page.

4.2 Discussion of Themes

The following emerged from a thematic analysis of the articles.

Fake News

Fake News and Accountability. With the influence that social media has on the drive of fake news [2], who then becomes responsible for the dissemination and intake of fake news by the general population? The immediate assumption is that in the digital age, social media platforms like Facebook and Twitter should be able to curate information, or do some form of fact-checking when posts are uploaded onto their platforms [12], but that leans closely to infringing on freedom of speech. While different authors agree that there need to be measures in place for the minimisation of fake news being spread [12, 13], where that accountability lies differs between the authors. Metaxas and Mustafaraj [13] aimed to develop algorithms or plug-ins that can assist in trust and postulated that consumers should be able to identify misinformation, thus making an informed decision on whether to share that information or not. Lazer et al. [12] on the other hand, believe the onus should be on the platform owners to put restrictions on the kind of data distributed. Considering that the work by Metaxas and Mustafaraj [13] was

done seven years ago, one can conclude that the use of fact-checking algorithms/plug-ins has not been successful in curbing the propulsion of fake news.

Fake News and Student Research. There were a total of four articles that had a focus on student research in relation to fake news. Harris, Paskin and Stein-Smith [4, 5, 14] all agree that students do not have the ability to discern between real and fake news. A Stanford History Education Group study reveals that students are not geared up for distinguishing real from fake news [4]. Most students are able to perform a simple Google search for information; however, they are unable to identify the author of an online source, or if the information is misleading [14]. Furthermore, students are not aware of the benefits of learning information literacy in school in equipping them with the skills required to accurately identify fake news [5]. At the Metropolitan Campus of Fairleigh Dickson University, librarians have undertaken the role of providing training on information literacy skills for identifying fake news [5].

Fake News and Social Media. A number of authors [6, 15] are in agreement that social media, the leading source of news, is the biggest driving force for fake news. It provides substantial advantage to broadcast manipulated information. It is an open platform of unfiltered editors and open to contributions from all. According to Nielsen and Graves as well as Janetzko, [6, 15], people are unable to identify fake news correctly. They are likely to associate fake news with low quality journalism than false information designed to mislead. Two articles, [15] and [6] discussed the role of critical thinking when interacting on social media. Social media presents information to us that has been filtered according to what we already consume, thereby making it a challenge for consumers to think critically. The study by Nielsen and Graves [6] confirm that students' failure to verify incorrect online sources requires urgent attention as this could indicate that students are a simple target for presenting manipulated information.

Fake News That Drive Politics. Two studies mention the effect of social and the spread of fake news, and how it may have propelled Donald Trump to win the US election in 2016 [2, 16]. Also, [8] and [2] mention how a story on the Pope supporting Trump in his presidential campaign, was widely shared (more than a million times) on Facebook in 2016. These articles also point out how in the information age, fact-checking has become relatively easy, but people are more likely to trust their intuition on news stories they consume, rather than checking the reliability of a story. The use of paid trolls and Russian bots to populate social media feeds with misinformation in an effort to swing the US presidential election in Donald Trump's favour, is highlighted [16]. The creation of fake news, with the use of alarmist headlines ("click bait"), generates huge traffic into the original websites, which drives up advertising revenue [2]. This means content creators are compelled to create fake news, to drive ad revenue on their websites - even though they may not be believe in the fake news themselves [2].

Information Literacy. Information literacy is when a person has access to information, and thus can process the parts they need, and create ways in which to best use the information [1]. Teaching students the importance of information literacy skills is key, not only for identifying fake news but also for navigating life aspects that require

managing and scrutinising information, as discussed by [1, 17], and [9]. Courtney [17] highlights how journalism students, above students from other disciplines, may need to have some form of information literacy incorporated into their syllabi to increase their awareness of fake news stories, creating a narrative of being objective and reliable news creators. Courtney assessed different universities that teach journalism and media-related studies, and established that students generally lack awareness on how useful library services are in offering services related to information literacy. Courtney [17] and Rose-Wiles [9] discuss how the use of library resources should be normalised to students. With millennials and generation Z having social media as their first point of contact, Rose-Wiles [9] urges universities, colleges and other academic research institutes to promote the use of more library resources than those from the internet, to encourage students to lean on reliable sources. Overall, this may prove difficult, therefore Rose-Wiles [9] proposes that by teaching information literacy skills and critical thinking, students can use these skills to apply in any situation or information source.

Referred to as "truth decay", people have reached a point where they no longer need to agree with facts [18]. Due to political polarisation, the general public hold the opinion of being part of an oppressed group of people, and therefore will believe a political leader who appeals to that narrative [18]. There needs to be tangible action put into driving civil engagement, to encourage people to think critically, analyse information and not believe everything they read.

Critical Thinking. Only three of the articles had critical thinking as a main theme. Bronstein et al. [19] discuss how certain dogmatic and religious beliefs create a tendency in individuals to belief any information given, without them having a need to interrogate the information further and then deciding ion its veracity. The article further elaborates how these individuals are also more likely to engage in conspiracy theories, and tend to rationalise absurd events. Bronstein et al.'s [19] study conclude that dogmatism and religious fundamentalism highly correlate with a belief in fake news. Their study [19] suggests the use of interventions that aim to increase open-minded thinking, and also increase analytical thinking as a way to help religious, curb belief in fake news. Howlett [20] describes critical thinking as evidence-based practice, which is taking the theories of the skills and concepts of critical thinking and converting those for use in everyday applications. Jackson [21] explains how the internet purposely prides itself in being a platform for "unreviewed content", due to the idea that people may not see said content again, therefore it needs to be attention-grabbing for this moment, and not necessarily accurate. Jackson [21] expands that social media affected critical thinking in how it changed the view on published information, what is now seen as old forms of information media. This then presents a challenge to critical thinking in that a large portion of information found on the internet is not only unreliable, it may also be false. Jackson [21] posits that one of the biggest dangers to critical thinking may be that people have a sense of perceived power for being able to find the others they seek with a simple web search. People are no longer interested in evaluation the credibility of the information they receive and share, and thus leading to the propagation of fake news [21].

5   Discussion of Findings

The aggregated data in this review has provided insight into how fake news is perceived, the level of attention it is receiving and the shortcomings of people when identifying fake news. Since the increase in awareness of fake news in 2016, there has been an increase in academic focus on the subject, with most of the articles published between 2017 and 2018. Fifty percent of the articles released focused on the subject of fake news, with 18% reflecting on information literacy, and only 13% on critical thinking.

The thematic discussion grouped and synthesised the articles in this review according to the main themes of fake news, information literacy and critical thinking. The *Fake news and accountability* discussion raised the question of who becomes accountable for the spreading of fake news between social media and the user. The articles presented a conclusion that fact-checking algorithms are not successful in reducing the dissemination of fake news. The discussion also included a focus on *fake news and student research*, whereby a Stanford History Education Group study revealed that students are not well educated in thinking critically and identifying real from fake news [4]. The *Fake news and social media* discussion provided insight on social media is the leading source of news as well as a contributor to fake news. It provides a challenge for consumers who are not able to think critically about online news, or have basic information literacy skills that can aid in identifying fake news. *Fake news that drive politics* highlighted fake news' role in politics, particularly the 2016 US presidential elections and the influence it had on the voters [22].

Information literacy related publications highlighted the need for educating the public on being able to identify fake news, as well as the benefits of having information literacy as a life skill [1, 9, 17]. It was shown that students are often misinformed about the potential benefits of library services. The authors suggested that university libraries should become more recognised and involved as role-players in providing and assisting with information literacy skills.

The articles that focused on critical thinking pointed out two areas where a lack of critical thinking prevented readers from discerning between accurate and false information. In the one case, it was shown that people's confidence in their ability to find information online gave made them overly confident about the accuracy of that information [21]. In the other case, it was shown that dogmatism and religious fundamentalism, which led people to believe certain fake news, were associated with a lack of critical thinking and a questioning mind-set [21].

The articles that focused on information literacy and critical thinking were in agreement on the value of promoting and teaching these skills, in particular to the university students who were often the subjects of the studies performed.

6   Conclusion

This review identified 22 articles that were synthesised and used as evidence to determine the role of critical thinking in identifying fake news. The articles were classified according to year of publication, country of publication, type of publication

and theme. Based on the descriptive statistics, fake news has been a growing trend in recent years, predominantly in the US since the presidential election in 2016. The research presented in most of the articles was aimed at the assessment of students' ability to identify fake news. The various studies were consistent in their findings of research subjects' lack of ability to distinguish between true and fake news.

Information literacy emerged as a new theme from the studies, with Rose-Wiles [9] advising academic institutions to teach information literacy and encourage students to think critically when accessing online news. The potential role of university libraries to assist in not only teaching information literacy, but also assisting student to evaluate the credibility of online information, was highlighted. The three articles that explicitly dealt with critical thinking, all found critical thinking to be lacking among their research subjects. They further indicated how this lack of critical thinking could be linked to people's inability to identify fake news.

This review has pointed out people's general inability to identify fake news. It highlighted the importance of information literacy as well as critical thinking, as essential skills to evaluate the credibility of online information.

The limitations in this review include the use of students as the main participants in most of the research - this would indicate a need to shift the academic focus towards having the general public as participants. This is imperative because anyone who possesses a mobile device is potentially a contributor or distributor of fake news.

For future research, it is suggested that the value of the formal teaching of information literacy at universities be further investigated, as a means to assist students in assessing the credibility of online news. Given the very limited number of studies on the role of critical thinking to identify fake news, this is also an important area for further research.

References

1. Taala, W., Franco Jr., F.B., Teresa, P.H.S.: Library literacy program: library as battleground for fighting fakenews. Open Access Libr. J. **6**, e5296 (2019)
2. Allcott, H., Gentzkow, M.: Social media and fake news in the 2016 election. J. Econ. Perspect. **31**(2), 211–236 (2017)
3. Pérez-Rosas, V., Kleinberg, B., Lefevre, A., Mihalcea, R.: Automatic detection of fake news, arXiv preprint arXiv:1708.07104 (2017)
4. Paskin, D.: Real or fake news: who knows? J. Soc. Media Soc. **7**(2), 252–273 (2018)
5. Stein-Smith, K.: Librarians, information literacy, and fake news. Strateg. Libr. **37**, 1–4 (2017)
6. Nielsen, R.K., Graves, L.: News you don't believe": audience perspectives on fake news. Reuters Institute for the Study of Journalism (2017). https://reutersinstitute.politics.ox.ac.uk/ourresearch/news-you-dont-believe-audience-perspectives-fake-news
7. Vosoughi, S., Roy, D., Aral, S.: The spread of true and false news online. Science **359**(6380), 1146–1151 (2018)
8. Hunt, E.: Fake news' named word of the year by Macquarie Dictionary. The Guardian (2017). https://www.theguardian.com/australia-news/2017/jan/25/fake-news-named-word-of-the-year-by-macquarie-dictionary
9. Rose-Wiles, L.M.: Reflections on fake news, librarians, and undergraduate research. Ref. User Serv. Q. **57**(3), 200–204 (2018)

10. Halpern, D.F.: Teaching critical thinking for transfer across domains: disposition, skills, structure training, and metacognitive monitoring. Am. Psychol. **53**(4), 449 (1998)
11. Tiruneh, D.T., Verburgh, A., Elen, J.: Effectiveness of critical thinking instruction in higher education: a systematic review of intervention studies. High. Educ. Stud. **4**(1), 1–17 (2014)
12. Lazer, D.M., et al.: The science of fake news. Science **359**(6380), 1094–1096 (2018)
13. Metaxas, P.T., Mustafaraj, E.: Trails of trustworthiness in real-time streams (extended summary) (2012)
14. Harris, F.J.: CIPA/Internet filtering. In: The International Encyclopedia of Media Literacy, pp. 1–11 (2019)
15. Janetzko, D.: Social bots and fake news as (not) seen from the viewpoint of digital education frameworks. MedienPädagogik: Zeitschrift für Theorie und Praxis der Medienbildung, pp. 61–80 (2017)
16. Bodine-Baron, E., Helmus, T.C., Radin, A., Treyger, E.: Countering Russian Social Media Influence. RAND Corporation, Santa Monica (2018)
17. Courtney, I.: In an era of fake news, information literacy has a role to play in journalism education in Ireland. Dublin Business School (2017)
18. O'Brien, S., Rich, M.D., Fukuyama, F.: The Perils of Truth Decay: Q&A with Three RAND Leaders (2018). https://www.rand.org/blog/rand-review/2018/02/the-perils-of-truth-decay-qa-with-three-rand-leaders.html. Accessed 17 Nov 2019
19. Bronstein, M.V., Pennycook, G., Bear, A., Rand, D.G., Cannon, T.D.: Belief in fake news is associated with delusionality, dogmatism, religious fundamentalism, and reduced analytic thinking. J. Appl. Res. Mem. Cogn. **8**(1), 108–117 (2019)
20. Howlett, B.: What evidence-based practice is and why it matters. In: Evidence-Based Practice for Health Professionals: An Interprofessional Approach, pp. 5–30 (2014)
21. Jackson, S.: How a Critical Thinker Uses the Web, Windsor Studies in Argumentation (2019)
22. Koulolias, V., Jonathan, G.M., Fernandez, M., Sotirchos, D.: Combating Misinformation: An ecosystem in co-creation. OECD Publishing (2018)