Undergraduates’ News Consumption and Perceptions of Fake News in Science

Wei Zakharov, Haiyan Li, and Michael Fosmire

Abstract: This study investigates undergraduates’ news consumption and their perceptions of fake news in science while they took an online introductory geography course at a large Midwestern university. The authors collaborated with university science instructors to design and integrate a news literacy curriculum into a set of learning activities to promote critical thinking and research skills. A qualitative analysis of 108 students’ written essays presents empirical evidence of their perceptions of fake news in terms of content (what), purpose (why), and source (who). The results show that students primarily sought news from traditional sources, such as CNN, the British Broadcasting Corporation (BBC), and the New York Times, while working on their research assignments. They spent, on average, about 7 hours per week reading, watching, or listening to news while taking the online course. More than half the students indicated that they used mobile devices to browse news most of the time. The strategies and tools the students used to manage multiple news sources are discussed.

Introduction

Fake news has become a popular term globally since the 2016 presidential election in the United States. The Internet and social media are awash with misinformation, and the credibility of the free press is constantly being challenged. In education, it is imperative to equip students with knowledge to critically engage with the news they consume. Sam Wineburg of the Stanford Graduate School of Education in education, it is imperative to equip students with knowledge to critically engage with the news they consume.
Stanford, California, points out the serious situation in schools and the importance of information literacy. He says, “Schools are preparing a generation of bubble children without the immunities to deal with the information toxins that surround them.” Hence, it is necessary for young adults to improve their critical literacy skills for the digital age, including increasing their awareness of the tools and motivations behind fake news.

Meanwhile, science education reform movements also promote “scientific literacy,” which requires students to engage more critically with science news. Effective collection, evaluation, and presentation of scientific information are necessary qualifications for successful undergraduate study in any discipline, especially as students prepare to work in a future information-rich world.

In this study, we collaborated with science instructors at Purdue University in West Lafayette, Indiana, to integrate news literacy into an online introductory geography course. For this project, we investigated the following research questions:

1. When completing course assignments, what are undergraduate students’ favorite news sources and preferred technological platforms, and how much time do they spend reading news?
2. What are undergraduate students’ perceptions of fake news in the context of geographical information?

Context

The course goals for Introduction to Geography include identifying and applying basic principles of Earth system science—including the processes that shape Earth’s surface, the people and places on the planet, and the distribution of resources—to explain how these factors change the world. Another goal is to identify the relevance of geographic concepts to addressing key societal issues. For the course, students must complete five “geography in the news” writing assignments in which they find and summarize news published within the past month that relates to course topics. Each assignment asks for news from a different continent, so the five writing assignments cover five continents. Our research explores undergraduate students’ behaviors while completing research assignments requiring news information and investigates whether social media is their main news source for those assignments.

Information professionals from the Purdue University Libraries worked with the course instructors to develop an open online educational resource (http://guides.lib.purdue.edu/eaps120) and structured activities to support media and information literacy concepts within the context of geography news. The open educational resources (OER) LibGuide includes links to a variety of news sources, both free and subscription-based; an introduction to different definitions of fake news; techniques to spot fake news; sources for fact-checking information; evaluation criteria for sources; and strategies for managing news sources and using information ethically. The guide provides links to further reading and podcasts, including current commentary on fake news. It also includes tips tailored to the various assignments. Tabs in the LibGuide are designed to be revealed sequentially over time to correspond with the homework. The assignments are scaffolded throughout the course, providing successive levels of support to help students
master the desired learning outcomes, with prompts integrated into each Geography in the News essay. Each prompt is intended to examine students’ progressive use and understanding of information literacy concepts.

**Literature Review**

**News Consumption**

Research about news consumption indicates new trends, especially among younger audiences. The Pew Research Center found that the websites and apps of social media and news organizations were used far more than search engines, e-mails, and texts from news organizations. Similarly, the Media Insight Project found half the interviewees got at least some of their news from social media. In David Levy and Damian Radcliffe’s 2016 article “Social Media Is Changing Our Digital News Habits,” the authors found that 46 percent of participants from the United States and the United Kingdom named social media, such as Facebook or Twitter, as a source of news. That percentage was almost twice as large as it was in 2013. These trends move fastest among younger audiences globally. Digital News Report 2016, based on a survey of more than 50,000 people in 26 countries, found 51 percent of participants used social media as a source of news each week, in addition to TV, radio, news websites, and other sources. For people ages 18 to 24, social media is the most important source of news.

**Fake News**

Academic scholars and journalists use three factors when defining fake news: content (what), purpose (why), and source (who). Many experts define fake news as false content, misinformation, and incorrect stories—that is, they focus on the subject matter. Western University in London, Ontario, has a “deception detector” that defines fake news as “jokes taken at face value, large-scale hoaxes, slanted reporting of real facts, and stories where the truth is contentious.” Claire Wardle identifies seven types of fake news: (1) satire or parody, (2) false connection, (3) misleading content, (4) false content, (5) impostor content, (6) manipulated content, and (7) fabricated content. According to Prakash Punjabi, fake news can be used to describe “stories containing partial truths, stories that are speculative and not based on evidence, and stories that we simply do not agree with.” Jeffrey J. Hunt, Eugene Volokh, and Paul S. Edwards believe fake news is a type of journalism that comprises deliberate misinformation. David Lazer, Matthew Baum, Yochai Benkler, Adam Berinsky, Kelly Greenhill, Filippo Menczer, Miriam Metzger, and their coauthors define fake news as a subgenre of the broader category of misinformation or incorrect information.

Some scholars describe fake news from the aspect of its intended purpose. For example, fake news can be completely made up or manipulated to attract maximum attention; can be intentionally false; or can be designed to deceive. Fake news may try to mislead audiences to obtain financial or political benefits, often with sensationalist or exaggerated headlines that capture attention. It consists of intentionally and verifi-
ably false information that intends to mislead readers. In summary, scholars believe the purpose of fake news is to make financial or political gains, to attract attention, to mislead readers, or any combination of the three.

Finally, fake news can be defined based on its source. For example, fake news is presented to resemble credible journalism. It includes intentionally false stories created for profit by dubious websites. It may spread through traditional print and broadcast news media or through online social media, and it could mimic the format of news media.

Fake News and Libraries

In an environment filled with fake news, many librarians take on the responsibility to fight against inaccurate information and promote critical thinking. Oliver Batchelor asserts that fake news is widespread and will undermine our political system, and library professionals should fight it. Brian Kenney contends, “The fake news trend is an opportunity for libraries,” and librarians should take the lead in providing reliable information sources to the community. Linda Jacobson declares, “Librarians have an opportunity to take leadership in the current crisis” and should “step up to the plate.” Notwithstanding librarians’ important role in fighting against fake news, few studies address the topic in scientific disciplines. Our research aims to fill the gap.

Methods

We used a mixed-method design to examine the impact of a news literacy program on 108 students participating in an introductory geography course at Purdue. To address our research questions, we collected written essays and questionnaire data during summer 2017.

Based on our literature review, we used the three themes of content, purpose, and source to encode data about students’ perceptions of fake news. By comparing their impressions with scholars’ definitions, we aimed to find out the students’ knowledge gaps so that educators could tailor news literacy programs to their needs.

Data Collection and Analysis

To answer the question of students’ perceptions of fake news, we designed and implemented prompts in the first Geography in the News assignment: “Fake news has been mentioned extensively in the media recently. How would you define fake news? Do you think fake news is an issue for the Geography in the News assignment?” Eighty-nine essays were collected and then entered and analyzed using NVivo 12 software. During the analysis, the researchers adopted the three themes discussed in the literature review as parent coding themes to categorize the data. Then the team encoded the data in steps of open coding, axial coding, and selective coding to develop child themes. Open coding
is the process of breaking down the data into discrete parts. Axial coding puts the pieces back together to make links, and selective coding identifies patterns and establishes links. The authors discussed and resolved any disagreements among themselves. At the end of the course, the students completed an anonymous nine-question self-assessment, which we used to investigate their news consumption.

Results

Undergraduates’ News Consumption

One hundred eight students enrolled in the course received the anonymous survey, and 91 completed it, for a response rate of 84 percent. No incentives were offered for participation.

Primary News Sources

Students were asked where they primarily obtained news, from a website or app or from a social networking site, while working on their research assignments for Geography in the News. The majority primarily sought news from well-known traditional media sources (n = 85, 93 percent), rather than from a social networking site, such as Facebook or Twitter.

Ninety students specified their major sources of news. Many named more than one source. The most frequently cited news sources were CNN (n = 18, 20 percent), the British Broadcasting Corporation (BBC) (n = 17, 19 percent), the New York Times (n = 14, 16 percent), Science Daily (n = 13, 14 percent), and National Geographic (n = 12, 13 percent). Other sources included The Guardian (n = 6, 7 percent), the Washington Post (n = 6, 7 percent), Fox (n = 4, 4 percent), and NPR (National Public Radio) (n = 3, 3 percent).

Forty-six students reported the social networking sites they used to complete their assignments. The sites included Facebook (n = 22, 48 percent), Twitter (n = 13, 28 percent), Instagram (n = 5, 11 percent), and Snapchat (n = 4, 9 percent).

Time Spent Reading News

Students were asked how many hours they spent reading, watching, or listening to news in general while taking the course. Students (n = 89) reported that, on average, they spent 7.01 hours per week, and the standard deviation was 4.14. The minimum was 1 hour per week, and the maximum was 20 hours per week.

Students were also asked how many hours they spent reading, watching, or listening to geography in the news while taking the course. Eighty-five students reported that, on average, they spent 4.00 hours per week, and the standard deviation was 2.84. The minimum was 0.50 hour per week, and the maximum was 16.30 hours per week.

Mobile Device Usage

Students were asked to assess how frequently they used mobile devices to locate and read news. From the 81 students who responded to the question, 5 students consulted only mobile devices to find news, and 43 students used mobile devices more than half the time to seek news (see Table 1).
Managing Multiple News Sources

When asked how they managed multiple news sources, students mentioned using RSS feeds, Internet technology that allows users to have custom content delivered to their computer or mobile device as soon as it is published. Students also used news reader apps such as Flipboard, Reddit, or News360 to view Internet content on their smartphones. For these tools, students choose the news sources in which they are interested, and the tools gather relevant items from the appropriate news feeds. Students also mentioned using Google advanced search filtering to retrieve relevant news.

When analyzing multiple news sources, some students simply opened multiple tabs on their computer to read all selected news articles and then wrote their paper. Others used such tools as Notepad or GoodNotes to organize content from different news articles. Highlighter tools, such as GistNote and Weava, were also reported useful to synthesize information.

To save and organize news sources at the time of discovery, some students used citation management tools such as Zotero. Others employed browser bookmarks to archive news sources and articles.

Undergraduates’ Perceptions of Fake News

We used the three major themes of content, purpose, and source to code student comments about how they conceptualize the term fake news. Table 2 summarizes the total number of references to each theme and the percentage of students mentioning each.
From our qualitative data analysis, the most commonly mentioned factor students associated with fake news is content (see Table 3). Seventy participants (78 percent) defined fake news by referring to its subject matter, for example, false information, unsourced data, opinionated rather than objective facts, and semi-truths. Most participants identified fake news as phony facts, false information, misinformation, fabricated news, both intentional and unintentional, or some combination of the three. This result aligns with most scholars’ definitions, which also emphasize the content aspect of fake news.

<table>
<thead>
<tr>
<th>Theme</th>
<th>Number of responses</th>
<th>Percentage referring to theme (n = 89)</th>
<th>Number of references to theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>70</td>
<td>78%</td>
<td>99</td>
</tr>
<tr>
<td>Purpose</td>
<td>42</td>
<td>47%</td>
<td>63</td>
</tr>
<tr>
<td>Source</td>
<td>22</td>
<td>24.7%</td>
<td>28</td>
</tr>
</tbody>
</table>

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Purpose

Students split about whether fake news must be intentional, mirroring differences in definitions offered by scholars. For example, Russell Frank called the “intentional dimension” essential to consider in defining fake news. Punjabi interprets fake news as deliberately false stories created for profit by dubious websites. Jeffrey Hunt, Eugene Volokh, and Paul Edwards define fake news as a type of journalism that consists of deliberate misinformation or hoaxes. But other scholars believe fake news need not be intentional. Victoria Rubin describes fake news as merely slanted reporting of real facts and contentious stories.

Forty-two students (47 percent) defined fake news from the aspect of intention. They believe fake news is fabricated mainly for the purposes of amusement, to draw attention, for financial gain, to mislead, or to advance a political or personal agenda (see Table...
4). Most believe that fake news is used to “draw attention and mislead people.” Some scholars believe that, in most of the cases, by drawing notice and misleading people to believe certain propaganda, the real intention behind fake news might be to seek either political or financial gain.  

We noticed that students also see advertisements and “pop-up links” with sponsored content as a kind of fake news. They appear to have problems discerning between news articles and commercials on news sites because they encounter both in the same context. This result aligns with what Rasmus Kleis Nielsen and Lucas Graves report in their article “News You Don’t Believe,” which found that readers struggle to differentiate between news reports and advertising on news sites.  

Source  

Twenty-two students (24.7 percent) indicated fake news comes from sources that are less known, have no peer review, have non-credible or untraceable authorship, or some combination of the three (see Table 5 for examples of student comments). Most student remarks associate fake news with online stories, especially on social media (some mentioned Facebook postings and online chat groups). Some undergraduates consider well-known traditional media, such as CNN or Fox, as credible sources and tended to believe that they do not report fake news. For example, one respondent wrote, “Check if the source is reliable. An article from an established media company is more factually correct than one from a relatively unknown news site.” These undergraduates rely on the legitimacy of the established media to decide whether to trust the content of a news item, even though budget cuts have compromised the traditional media’s ability to

Table 3.  
Examples of students’ perspectives on the content of fake news

<table>
<thead>
<tr>
<th>Subcoding</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>False information</td>
<td>“I would define fake news as big media outlets that give out false or twisted information that the media outlet wants them to hear.”</td>
</tr>
<tr>
<td>No sources</td>
<td>“I would define fake news as something that does not have considerable evidence behind it.”</td>
</tr>
<tr>
<td>Opinionated</td>
<td>“To me, fake news is news that tells its viewers opinions as facts, leaves out important information to skew the outlook of news.”</td>
</tr>
<tr>
<td>Semi-truth</td>
<td>“I would define fake news as information presented by a news team that has been manipulated (due to bias or other personal reasons) to a point that the story at hand is not fully truthful.”</td>
</tr>
<tr>
<td>Unbelievable</td>
<td>“Fake news are articles where someone saw this is what happened, and it seems to[o] strange or out of the ordinary to be true.”</td>
</tr>
</tbody>
</table>

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Table 4.
Examples of students’ perspectives on the purpose of fake news

<table>
<thead>
<tr>
<th>Subcoding</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entertainment</td>
<td>“Fake news is referred to as websites where the statements are fabricated to make them sound more exciting.”</td>
</tr>
<tr>
<td>To draw attention</td>
<td>“Fake news is always manipulated to make it look real and to appeal to wider range of readers of viewers.”</td>
</tr>
<tr>
<td>Financial gain</td>
<td>“I would define fake news as news that is biased or have no basis in fact which serve as a tool for profiting.”</td>
</tr>
<tr>
<td>To mislead</td>
<td>“I think that fake news is news (that contains false information) in order to mislead the audience or to damage the reputation of someone or some organizations.”</td>
</tr>
<tr>
<td>Political agenda</td>
<td>“I would define fake news as factual news that is greatly exaggerated or has had key information left out in order to further a political agenda.”</td>
</tr>
<tr>
<td>Personal agenda</td>
<td>“My definition of fake news would be any article or report from any news source (that intently denies, spins, or straight-up fabricates facts and stories) to suit their personal agenda.”</td>
</tr>
</tbody>
</table>

provide independent research and fact-checking. Therefore, those traditional sources may also be vulnerable to distributing fake news. Furthermore, students do not always discern the difference between opinion, or op-ed, columns and investigative pieces. They need to be cautious and may be misled by treating everything from a so-called reliable source as factual reporting.

One finding that undergraduates use traditional news sources for research assignments differs from other research that revealed teenagers tend to believe more in social media than in traditional print or media. According to Regina Marchi, they think mainstream media has been corrupted by either corporate or government influence and so does not report unbiased news, while social media allows individuals to voice the truth. Our results might differ because our population was different or because they studied news in a different field, that is, political rather than scientific news. In scientific fields, people may tend to believe the reports from established media rather than individual opinion, in contrast to political news.

One particularly interesting response states:

Students do not always discern the difference between opinion, or op-ed, columns and investigative pieces.
However, when you are talking about news as in information like climate change, you cannot just say it is a hoax because that’s what you think. Many times, people[sic] believe Trump facts, and they are unwilling to listen and read up on information. I think that climate change has and will be continued[sic] to be considered a hoax by many because they don’t see the effects right now. In our modern society, people expect things right away with all the technology we have. They expect news and other things right then and now. However, climate change is not something that happens overnight. It takes time and decades to show real data. The scientists today have worked harder than ever to prove that, as the technology world has made their job easier to display to the common eye.

That opinion argues that what we now believe to be fake news might be the result of limitations of our knowledge and technology. With the advance of time and science, different opinions may evolve about whether news is fake or not.

### Conclusion

Our analysis of students’ perceptions of fake news, which had previously been defined mostly by journalists, media critics, and academic scholars, sheds light on undergraduates’ attitudes and knowledge in the context of geography news, as well as the gaps in their skills and abilities. Looking through the filter of student cognitive development, our findings show indications of dualistic and multiphistic thinking, which is normal for first-year undergraduates. In William Perry’s definition of dualistic thinking, students believe that a right answer exists for everything, and learning is essentially a process of information exchange from an authority to a student.33 Introductory physics or calculus courses are frequently taught in this manner, where the theories covered have been established for hundreds of years and students see little opportunity to question that authority. In our study, reliance on the source of the material as the marker of authority reflects dualistic thinking. In Perry’s multiphistic phase, students encounter situations where no authoritative answer exists. When faced with that situation, they frequently

### Table 5.
Examples of students’ perspectives on the sources of fake news

<table>
<thead>
<tr>
<th>Subcoding</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less known or unknown</td>
<td>“News that [comes] from small news websites.”</td>
</tr>
<tr>
<td>No peer review</td>
<td>“News sites that are not peer-reviewed.”</td>
</tr>
<tr>
<td>Non-credible</td>
<td>“I define fake news as news that is not published by a credible and reliable source.”</td>
</tr>
<tr>
<td>Unjustified or untraceable authorship</td>
<td>“When we say fake news, we are saying news with unjustified authorities, unauthorized sources.”</td>
</tr>
</tbody>
</table>
believe that everyone has an opinion, no one’s opinion is better than anyone else’s, and no right answer exists. These multiplicity attitudes are reflected, for example, in students weighing evidence from social media or peers at the same level as that from more authoritative sources without questioning whether one source might be more reliable or tracking down confirming evidence.

That said, some of the comments we received reflect Perry’s relativistic stage of development, in which the person believes that, while a definite, authoritative answer might not exist, all opinions are not equally valid. Instead, weighing context and personal values, evaluating information, and making evidence-based decisions all factor into engaging with the information found. Indeed, the Association of College and Research Libraries (ACRL) Framework for Information Literacy for Higher Education “Authority Is Constructed and Contextual” frame is written at a relativistic level and is a good model for structuring instructional interventions to address gaps in students’ understanding of fake news.34

There are some gaps in students’ perceptions of fake news. For example, some believe established media will not broadcast fake news. In fact, the mainstream media might do so, and if students uncritically trust traditionally reliable sources for everything, they will run into trouble and may pass on fake news themselves.35

Given the fact that students spend, on average, 7 hours per week browsing news, it is important for information professionals to have a good understanding about students’ news consumption. Our results describe student habits and preferences for platforms, tools, and methods of locating and reading science news. These results can help librarians determine needs, identify the gaps, and design and develop effective news literacy educational programs. Most of the students consider fake news in geography an important issue. Some think that, as long as they have a list of credible sources, they can avoid fake news. Many students, however, find it difficult to identify fake news and need our help with the tools and strategies to critically engage with geography-related news. Connecting the ACRL frame “Authority Is Constructed and Contextual” to the teaching of fake news concepts will be critical for students to move beyond a dualistic approach to consuming news to attain a fully actualized, critical, relativistic approach.

This was an exploratory study of undergraduate students’ news consumption and perceptions of fake news in an introductory course in geography. The research assignments required scientific news information on geography-related topics. Further research is required to investigate how students consume and perceive of fake news in other STEM (science, technology, engineering, and mathematics) disciplines. This study is also limited in that we examined evi-
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dence from a relatively small number of students. Future studies with a larger number of students at multiple institutions and a longer study period across multiple semesters would help determine the generalizability of the results.

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Notes


25. Frank, “Caveat Lector.”


