Reclaiming Resilience: Fact-checking in the classroom with Wikipedia

By Mathieu O'Neil, Rachel Cunneen and Andrew Ross

Snapshot

Adapting a Civic Online Reasoning (COR) framework for analysing websites the authors, from the University of Canberra, explore how Wikipedia can play an important role in fact-checking within student research as it is non-partisan, quick, and displays transparent processes. Their work considers the important role of information literacy and media literacy.

Introduction: Why resilience?

In recent years the idea that people should be 'resilient' when it comes to misinformation has become increasingly popular. A paradigmatic example is a 2022 report by NATO's Center for Media Literacy entitled *Building Resiliency*, which argues that citizens must be equipped with the knowledge and skills to strategically use media literacy to counteract misinformation (Jolls, 2022). However, not everyone agrees that resilience is a useful concept, particularly in educational contexts. The reason for this is that tenacity is often considered to be a character trait or attribute, so encouraging children to be resilient can work to surreptitiously deflect responsibility for problems they may experience. Instead of recognising that adversities faced by children and young people in the family or at school often derive from unequal social structures, invoking resilience positions children themselves as problematic and needing to adapt (Lewis et al., 2021).

Is this critique of resilience as incorporating a quasi-Thatcherite negation of the social justified in the case of exposure to misinformation? Resilience means the capacity to recover from adversity or shocks. We could then define exposure to misinformation as causing cognitive adversity, which might take the form of an expectation about the world being challenged, leading us to wonder whether we are experiencing cognitive dissonance. Or, it could stem from our knowledge suddenly being tested, making us think that outlandish claims could be true. The shock comes from the cognitive uncertainty while the resilience lies in the ability to address it with information literacy techniques such as 'lateral reading' (Wineburg & McGrew 2017). Given the current prevalence of individualised means of accessing news and information media, it seems that information shocks mainly occur inwardly. Individual exposure to unverified claims logically requires a practical response whose implementation is also individual: this is why, when it comes to misinformation at least, resilience can be reclaimed.

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We contend that the Australian public education system has not adequately helped students become more informationally resilient for two main reasons. The first is systemic: there are wide variations between states and territories, and public and private schools, in terms of how – and how well – information literacy is taught. Australia's states and territories are responsible for implementing the curriculum and implementations vary greatly (Corser et al., 2022). Notley et al. (2020) surveyed 545 Australian school students aged 8-12 and 524 aged 13-16. They found that only 20% of these children and teenagers said they had received lessons at school in the past year to help them determine if news stories were true and trustworthy. The second reason is that when information or media literacy is taught, some of the methods used increase cognitive overload and actually hinder effective information processing. Commonly taught strategies use outmoded concepts about critical literacy that are ineffectual in an online environment, where attention is both precious and finite. Thus, we propose an alternative framework for information literacy school education which is adapted to the contemporary information environment. This framework is based on three key information resilience principles (IRPs): (1) non-partisanship, (2) speed of execution and (3) transparency. In this article, we explain how these principles led us to adopt innovative information literacy approaches such as lateral reading and using Wikipedia as a fact-checking resource, which we trialled in four ACT primary and secondary schools in 2022: Ainslie, Harrison, Kaleen, and Mt Stromlo [1]. This project was part of the ACT Education Directorate - UC Affiliated Schools Research program, in which university researchers collaborate with school teachers.

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Information Resilience Principle 1: Non-partisanship

At this point, it is necessary to distinguish 'information literacy' from 'media literacy'. We define information literacy as being concerned with the correctness of information items. In other words, information literacy seeks to answer a relatively simple question: Is this statement true or false? In contrast, media literacy has to do with the way media framings and representations operate, so the questions it poses are more numerous, and complex: Who created this message? What creative techniques are used to attract my attention? What lifestyles, values and points of view are represented in, or omitted from this message? Why is this message being sent? (Jolls, 2022). Whilst these terms are sometimes combined (e.g., 'Media and Information Literacy') we separate them here and focus on information literacy for reasons that will soon become clear.

To be accepted by students, teachers, parents, and other stakeholders, fact-checking strategies should not promote, or appear to promote, a partisan perspective. This first principle contradicts media literacy approaches; for example, Mihailidis (2018) suggests that media literacies need to prioritise 'civic intentionality' through the use of five constructs: agency, caring, critical consciousness, persistence, and emancipation. According to Mihailidis, people should acquire capacities to deconstruct and critically engage with media texts and to 'understand their impact on our ability to co-exist in communities, and leverage media to better support a common good' (p. 159).

Mihailidis' normative concept of civic media literacies builds on the work of Douglas Kellner, a pioneering media literacy scholar in the USA, who emphasised the role of 'critical media literacy' and media education more broadly in facilitating social change and democratisation (Kellner & Share, 2005, 2007). This goes beyond the development of technical skills and competencies or personal responses to texts to promote engagement with social, cultural, political and economic perspectives, values and ideas, including a critique of how these are created, circulated, used and consumed via media.

While we were sympathetic to this program, what one person defines as 'critical engagement' could very well be defined by another as 'propaganda'. If an educational fact-checking strategy is to be developed for young children, it must strive to have broad community acceptance: in other words, it should appeal to as wide a variety of people as possible. Non-partisanship is key. To be clear, perspectives that are critical of power are essential components of robust media literacy pedagogy. However, in the first stages of teaching information literacy and fact-checking in schools, the process needs to be uncontroversial

Information Resilience Principle 2: Speed

Disinformation aims to capture the reader's attention. To prevent this, information literacy and fact-checking must be fast. In this respect, current media and information literacy instruction is frequently ineffective. One commonly used information-checking methodology in US and Australian education uses the memorable acronym of C.R.A.A.P. ('Is it current, relevant, authoritative, accurate? What is its purpose?'). C.R.A.A.P. presents students with a checklist of website design clues, with some questions people might ask themselves when initially arriving at a webpage including: 'Does this webpage look professional? Are there ads? Is it a .com or a .org? Is there scientific language? Does it use footnotes?' In the UK, ***The Guardian's* NewsWise initiative**, which aims to equip children with the skills and knowledge to make sense of the world adopts a similar approach. For example, a 'NewsWise Navigator' enjoins children to ask themselves when reading the news questions such as 'Does the website address look unusual?' and 'Does the design of the page look unusual?'; it also suggests ascertaining whether there are 'lots of spelling mistakes' or 'quotes from real sources' in the story; and it recommends addressing potential bias, by asking children to consider whether 'The report is unbalanced: it only shows one side of the story' or whether 'The report uses only negative or only positive language to describe the people in the story' (in addition to these six questions, the Navigator poses nine additional questions).

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The C.R.A.A.P. / NewsWise 'checklist' approach is problematic on several fronts. Several of these questions no longer lead to proof of reliability. Anyone can design a professional-looking webpage or use spellcheck, and a '.org' URL no longer guarantees the credibility of the content. Further, compiling questions leads to cognitive overload, and students often latch onto the most visible signals, resulting in poor decisions – for example, that a URL ending with '.org' is inherently more reliable than one ending in '.com' (Caulfield, 2020). Finally, an extensive checklist approach is not suited for our information-rich world, in which a wealth of information creates a poverty of attention (Simon, 1971). In the 'attention economy' time is precious: deep engagement with dubious claims is a poor strategy, as it represents time better spent elsewhere. Instead, students must acquire the means to quickly decide which claims are worth their attention.

We implemented the non-partisanship and speed principles by co-creating a set of educational resources for children in Years 4, 5, and 6 with the participating school teachers-researchers. We adopted the Civic Online Reasoning (COR) framework, developed at the Stanford History Education Group (Wineburg et al., 2016). COR recognises the importance of the Internet as a source of political information and refers to the ability to effectively search for, evaluate, and verify social and political information online. What matters is not what students know, but the steps taken to verify claims. When confronted with a dubious claim, students should 'think like a fact-checker' (Wineburg & McGrew, 2018). In practical terms, this means that students should not engage 'vertically', either by scrolling down the page, or analysing a claim in depth. Instead, students should learn about a source of information by leaving the webpage, opening another tab on a browser, and searching elsewhere: a concept known as 'lateral reading' (Wineburg & McGrew, 2017). If the claim or source is found to be reliable, students can investigate in more depth, but if it is not, they should move on.

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A clear advantage of COR over other Media and Information Literacy frameworks is that its proponents have engaged in a systematic empirical verification of its effectiveness. In an early project, an assessment of online reasoning was administered to students six weeks prior to the intervention and again five weeks after (Wineburg et al., 2016). The results indicated that students in the treatment group were significantly more likely than students in the control group to have shown gains from pre-test to post-test. Having a gap of several weeks between testing was significant in that the students who underwent the training had retained those skills.

Since then, several studies have confirmed these results: lateral reading has been shown to augment the capacity to determine the credibility of digital news and social media posts (by investigating the source of a website, critiquing evidence, and locating reliable sources) of middle school students (McGrew & Breakstone, 2023), high school students (Axelsson et al., 2021; Mc Grew; 2020; Wineburg et al. ,2022), university students (Breakstone et al., 2021) and preservice teachers (Weisberg et al., 2022). Another study by Kohnen et al. (2020) found that introducing lateral reading skills meant students were more likely to prefer a more credible source of information over a less credible source when two sources were presented, whereas few students improved in their ability to assess a single deceptive website. This led the authors

to conclude that skills-based information literacy instruction, though highly effective, must be paired with foundational knowledge about how the Internet is structured and about the different kinds of online sources.

Information Resilience Principle 3: Transparency

Today people wishing to spread 'fake science', about climate change for example, reproduce the same wrong information, buttressed by references to fake 'scientific' journals, on multiple web sites, in order to dominate search engine results (Clarke, 2022). Under these circumstances, fact-checkers must identify a freely accessible site that can provide reliable information about any topic. Our research project promoted the idea that Wikipedia, the online encyclopedia that anyone can edit, is the world's best available resource for this purpose [2].

The notion that secret cabals are manipulating information is a foundational characteristic of the conspiratorial rejection of 'elite' politics, science and news media. Reliable, trustworthy information must therefore promote the opposite of conspiracy: complete transparency. This is not a novel idea. As members of the Demos British think tank wrote in 2010:

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> 'Conspiracy theories are a reaction to the lack of transparency and openness in many of our institutions. The more open our institutions, the less likely we are to believe we are living in a conspiring world' (Bartlett & Miller, 2010, p. 39).

Transparency has also been identified as a central component for establishing trust in news media. The former Director of the BBC's Global News Division, Richard Sambrook, argues that transparency has overcome objectivity as the means to deliver trust in the 'new media age'. For Sambrook, 'news today still has to be accurate and fair, but it is as important for the readers, listeners and viewers to see how the news is produced, where the information comes from, and how it works' (cited in Bunz, 2009). Other contemporary instances of the benefits of transparency include open source software, which forms the basis for the digital infrastructure of the global economy (O'Neil et al, 2022), and Open Source Intelligence (OSINT) which uses freely available data to verify claims about strategic and political issues (Higgins, 2021). From the government side, open data is said to not only augment transparency, but to have commercial benefits and to increase participatory governance (Attard et al., 2015).

Finally, a 'Wiki' is precisely a database in which every change is archived. The existence, the author and the date of all modifications to a Wikipedia article appear successively, line after line, in the article's 'History' page (it is recommended, but not mandatory, to add a comment: 'I modified this'). If a reader clicks on a line, the two versions of the article appear side by side. Every article also has a 'Talk' page where 'Wikipedians' collectively resolve disputes about the article's content. They are aided by a host of rules. Crucially, these include neutrality (no subjective opinion is allowed) and verifiability: all information must be supported by a reliable source, such as an

academic article or a book published by a legitimate publisher. In short, the editorial process is transparent, and auditable.

Using Wikipedia for fact checking?

News framings of Wikipedia have shifted over its 22-year history. After being derided, its epistemological model was gradually accepted. Later, biases resulting from gender imbalances were criticised. Finally, in the 'post-truth' era, Wikipedia has been portrayed as a 'good cop' or as the 'last bastion of shared reality' online (Benjakob & Harrison ,2020). In an article describing YouTube's aborted attempt to fact-check videos with content taken from Wikipedia, Zuckerman (2018) reflected on how things had changed since the early days: 'Wikipedia's pseudonymity, openness and mutability all became reasons why some teachers, librarians and scholars taught students not to rely on it as a primary source.'

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This sentiment – perceptions of Wikipedia's reliability have vastly improved in recent years – is far from being universally shared. Long-time Polish Wikimedian and researcher Dariusz Jemielniak (2019) remarked that 'Over time Wikipedia's quality has improved substantially, and yet it is still perceived in a static and dated way, as from the time of its inception.' This was one of the most consistent and persistent findings in our research: negative perceptions of Wikipedia's reliability are widespread in the school teaching community. Many schoolteachers are unaware of the Wikipedia community's strict enforcement of editorial policies: whilst 'anybody can edit' a Wikipedia article, countless trusted volunteers, administrators, and automated type-setting 'bots' ensure that these edits are based on reliable and neutral sources [3].

Wikipedia's auditability is not foolproof, and serious problems continue to exist in front of everyone, in complete transparency, on Wikipedia. An exhaustive list cannot be produced here, so we summarise two broad categories: firstly, the organised manipulation of content; secondly, systemic imbalances such as those relating to gender. Apart from two infamous exceptions, Wikipedia projects have remained neutral, and on the whole, reliable [4]. That being said, it can be hard to detect groups of organised individuals working together to manipulate content. Some early attempts were performed by 'trolls', for their personal amusement (O'Neil, 2009), by 'true believers', for ideological reasons (Brandom, 2018) or to advance the interests of corporate entities (Moyer, 2015; Lund & Venäläinen, 2016). More recently, the English Wikipedia's growing status has led manipulators to attempt to gain geopolitical advantage. In a recently uncovered sophisticated operation, perpetrators sought to become accepted as model editors, by working on a variety of articles, and then attempted to orient articles about the Russian-Ukrainian conflict towards pro-Russian positions, by citing governmental sources. These attempts failed, and eighty-nine individual accounts were banned (Miller et al., 2022).

Adherence to facts is not everything: information needs to be equitably and fairly qualified. Unfortunately, self-organisation on Wikipedia projects often perpetuates societal inequalities; Wikipedia resembles those who built it. In October 2014, only 15.53% of the English project's biographies were about women (Graells-Garrido et al., 2015). According to the **Humaniki statistical tool**, which maps the 'gender gap' in Wikimedia projects, the number was 19.28% on Jun. 13, 2022 (19.44% on Feb. 1, 2023). This means that out of 1,894,095 (1,924,864) biographies, only 365,133 (374,321) are about women [5]. This deleterious situation is even more dire than these statistics suggest: when women are featured, they are represented differently, and more negatively, than men. According to a 2015 study, the word 'divorced' appears four times as often in women's biographies on English Wikipedia as it does in comparable men's biographies. Statistically, this is specious, but it emphasises the prevailing societal focus on women's private lives (Wagner et al., 2015). In these respects, and others, Wikipedia is a mirror of a male-dominated world [6]. The same could be said for indigenous and Global South perspectives, which tend to be under-represented. In the next iteration of our research, which aims to investigate best educational practices for teaching fact-checking in secondary schools, the built-in biases in Wikipedia must be made explicit by teachers to their adolescent students.

Conclusion

We argued in our introduction that the act of responding to misinformation was a personal event. Information literacy is accordingly always framed in terms of individual responsibility. Yet 'a shared sense of truth (…) requires societal trust, especially institutional trust, at least as an anticipated ideal' (Haider & Sundin, 2022, p. 30). Where could this ideal lie? Where can information resilience be collectively experienced? In our view Wikipedia, an auditable project where encyclopaedic knowledge is communally created and verified, is a useful place to start. As summarised here, Wikipedia is not flawless, but its practical and epistemological benefits are clear. In our project, the embrace of Wikipedia for information literacy and fact-checking rests on its satisfaction of our three principles of non-partisanship, speed, and transparency. The challenge now is to continue to consider how best to develop information literacy and media literacy programs which are non-partisan, fast, and transparent.

Wikipedia is not flawless, but its practical and epistemological benefits are clear.

References

Attard, J., Orlandi, F., Scerri, S., & Auer, S. (2015) A systematic review of open government data initiatives. *Government Information Quarterly, 32*(4)s 399-418. **https://doi.org/10.1016/j.giq.2015.07.006**.

Axelsson C.-A.W., Guath M., Nygren T (2021) Learning how to separate fake from real news: Scalable digital tutorials promoting students' Civic Online Reasoning, Future Internet 13, 60. **https://doi.org/10.3390/fi13030060**

Bartlett J., Miller C. (2010). The power of unreason: Conspiracy theories, extremism and counter-terrorism. *Demos*. **http://www.demos.co.uk/publications/thepowerofunreason**

Benjakob, O. & Harrison, S. (2020) From anarchy to wikiality, glaring bias to good cop: Press coverage of Wikipedia's first two decades. In J. Reagle & J. Koerner (Eds.) Wikipedia @ 20: *Stories of an Incomplete Revolution*. The MIT Press.

Brandom, R. (2018, Mar.) How gun buffs took over Wikipedia's AR-15 page. *The Verge*.

Breakstone, J., Smith, M., Connors, P., Ortega, T., Kerr, D., & Wineburg, S. (2021). Lateral reading: College students learn to critically evaluate internet sources in an online course. *The Harvard Kennedy School Misinformation Review*.

Buchbinder, R. & Bourne, A. (2018). Content analysis of consumer information about knee arthroscopy in Australia. *ANZ Journal of Surgery,* 88: 346-353. **https://doi.org/10.1111/ans.14412**.

Bunz, M. (2009, Sept. 18). How social networking is changing journalism. *The Guardian*.

Clarke, I. (2022, Sept. 13) How fake science websites hijack our trust in experts to misinform and confuse. *The Conversation*.

Caulfield, M. (2020, Dec. 1) The truth is in the network email interview by B. Fister, Project Information Literacy, Smart Talk Interview, no. 31. **https://projectinfolit.org/smart-talk-interviews/truth-is-in-the-network/**

Corser, K., Dezuanni, M. & Notley, T. (2022). How news media literacy is taught in Australian classrooms. *Aust. Educ. Res. 49*, 761–777 **https://doi.org/10.1007/s13384-021-00457-5**

Cunneen, R. & O'Neil, M. (2021, Nov. 4) Students are told not to use Wikipedia for research. But it's a trustworthy source. *The Conversation*.

Cunneen, R. & O'Neil, M. (2023) Co-developing a new approach to media literacy in the attention economy. *Affiliated Schools Research Program final report*. Faculty of Education, University of Canberra.

Digital Commons Policy Council (2022) *Report on the production of digital commons and on the conditions of the organisation and action of the Digital Commons Policy Council*. DCPC/NMRC, University of Canberra. **https://apo.org.au/node/320864**

Dittus, M. & Graham, M. (2018). To reduce inequality, Wikipedia should consider paying editors. *Wired*.

Graells-Garrido, E., Lalmas, M., Menczer, F. (2015). First women, Second sex: Gender Bias in Wikipedia. *Proceedings of the 26th ACM Conference on Hypertext & Social Media - HT '15*: 165–174.

Haidder, J. & Sundin, O. (2022) *Paradoxes of media and information literacy. The crisis of information*. Routledge.

Higgins, E. (2021). *We are Bellingcat: An intelligence agency for the people*. Bloomsbury Publishing.

Jemielniak, D. (2019). Wikipedia: Why is the common knowledge resource still neglected by academics? *GigaScience, 8*, 1-2.

Jolls, T. (2022) *Building resiliency: Media literacy as a strategic defense strategy for the Transatlantic*. Center for Media Literacy.

Kellner, D., & Share, J. (2005). Toward critical media literacy: Core concepts, debates, organizations, and policy. *Discourse: Studies in the cultural politics of education, 26*(3), 369-386.

Kellner, D., & Share, J. (2007). Critical media literacy: Crucial policy choices for a twenty-first century democracy. *Policy Futures in Education, 5*(1), 59-69.

Kohnen, A. M., Mertens, G. E., & Boehm, S. M. (2020). Can Middle Schoolers Learn to Read the Web Like Experts? Possibilities and Limits of a Strategy-Based Intervention. *Journal of Media Literacy Education, 12*(2), 64-79.

Kräenbring J, Monzon Penza T, Gutmann J, Muehlich S, Zolk O, Wojnowski L, et al. (2014). Accuracy and completeness of drug Information in Wikipedia: A comparison with standard textbooks of pharmacology. *PLoS ONE, 9*(9): e106930. **https://doi.org/10.1371/journal.pone.0106930**.

Lantian, A. et al. (2017). 'I know things they don't know!' The role of need for uniqueness in belief in conspiracy theories. *Social Psychology, 48*(3), 160–173.

Lewis, L., Ormerod, E., & Ecclestone, K. (2021) The concept of resilience and implications for interventions in schools. In Z. Williams-Brown & S. Mander (Eds.), *Childhood well-being and resilience: Influences on educational outcomes*. Routledge.

Lund, A., & Venäläinen, J. (2016). Monetary materialities of peer-produced knowledge : the case of Wikipedia and its tensions with paid labour. *tripleC, 14*(1), 78–98.

McGrew, S. (2020). Learning to evaluate: An intervention in civic online reasoning. *Computers & Education*, 145, 103711.

McGrew, S., & Breakstone, J. (2023). Civic Online Reasoning Across the Curriculum: Developing and Testing the Efficacy of Digital Literacy Lessons. *AERA Open, 9*, 23328584231176451.

Mihailidis, P. (2018). Civic media literacies: Re-imagining engagement for civic intentionality. *Learning, Media & Technology, 43*(2), 152-164.

Miller, C. et al (2022) *Information Warfare and Wikipedia*. ISD.

Morgan, J. (2019). Research:Patrolling on Wikipedia/Report - Meta, Sept. 2019. **https://meta.wikimedia.org/wiki/Research:Patrolling_on_Wikipedia**

Moyer, J.M. (2015, Sep. 3) Wikipedia sting snares hundreds of accounts used for paid editing. Washington Post. **https://www.washingtonpost.com/news/morning-mix/wp/2015/09/02/wikipedia-sting-snares-hundreds-of-accounts-used-for-paid-editing/**

Notley, T., Dezuanni, M., Zhong, H.F. & Chambers, C. (2020). News and young Australians in 2020: How young people access, perceive and are affected by news media, Research Report, Sydney, Western Sydney University and Queensland University of Technology.

O'Neil, M. (2009). *Cyberchiefs. Authority and Autonomy in Online Tribes*. Pluto Press.

O'Neil M., Toupin S. and Pentzold C. (2021a). The duality of peer production: Infrastructure for the digital commons, free labor for free-riding firms. In: O'Neil M, Pentzold C and Toupin S (eds), *The Handbook of Peer Production*. Malden, MA: Wiley-Blackwell, pp. 3-17.

O'Neil M., Cai X., Muselli L. and Zacchiroli S. (2022) Co-producing industrial public goods on GitHub: Selective firm cooperation, volunteer-employee labour and participation inequality. *New Media & Society*. DOI: 10.1177/14614448221090474

Rajagopalan MS, Khanna VK, Leiter Y, Stott M, Showalter TN, Dicker AP, Lawrence YR (2011). Patient-oriented cancer information on the internet: A comparison of Wikipedia and a professionally maintained database. *J Oncol Pract, 7*(5): 319-23. **https://doi.org/10.1200/JOP.2010.000209**.

Sampson, T. (2015, Dec.). How pro-fascist ideologues are rewriting Croatia's history. *Daily Dot*. **https://www.dailydot.com/debug/croatian-wikipedia-fascist-takeover-controversy-right-wing/**

Simon, H. A. (1971). *Designing organizations for an information-rich worl*d. Johns Hopkins University Press.

Smith, N., & Southerton, C. (2022). #FreeBritney and the Pleasures of Conspiracy. *M/C Journal, 25*(1). **https://doi.org/10.5204/mcj.2871**

Thomas, G.R., Eng. L., de Wolff, J.F., Grover, S.C. (2013) An evaluation of Wikipedia as a resource for patient education in nephrology. *Semin Dial, 26*(2): 159-63. **https://doi.org/10.1111/sdi.12059**

Wagner, C., Garcia, D., Jadidi, M., & Strohmaier, M. (2015). It's a man's Wikipedia? Assessing gender inequality in an online encyclopedia. In *Proceedings of the 9th International AAAI Conference on Weblogs and Social Media* (pp. 454-463). Palo Alto, CA: Association for the Advancement of Artificial Intelligence (AAAI).

Weisberg, L., Kohnen, A., & Dawson, K. (2022). Impacts of a digital literacy intervention on preservice teachers' civic online reasoning abilities, strategies, and perceptions. *Journal of Technology and Teacher Education, 30*(1), 73-98.

Wikipedia (2019) Requests for comment/Do something about azwiki – Meta. **https://meta.wikimedia.org/wiki/Requests_for_comment/Do_something_about_azwiki#Misuse_of_administrative_tools_by_azwiki_admins**

Wikimedia Foundation (2021). Croatian Wikipedia disinformation assessment-202. **https://meta.wikimedia.org/wiki/Croatian_Wikipedia_Disinformation_Assessment-2021**

Wineburg, S., McGrew, S., Breakstone, J., & Ortega, T. (2016). Evaluating information: The cornerstone of Civic Online Reasoning. Stanford History Education Group. **https://purl.stanford.edu/fv751yt5934**

Wineburg, S. & McGrew, S. (2017) Lateral reading: Reading less and learning more when evaluating digital information. Stanford History Education Group Working Paper No. 2017-A1.

Wineburg, S. & McGrew, S. (2018, Dec. 18). To avoid getting duped by fake news, think like a fact checker. *Huffington Post*.

Wineburg, S., Breakstone, J., McGrew, S., Smith, M. D., & Ortega, T. (2022). Lateral reading on the open Internet: A district-wide field study in high school government classes. *Journal of Educational Psychology, 114*(5), 893.

Zuckerman, E. (2018) How Wikipedia gets to define what's true online. *Prospect*.

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Footnotes

1. ACT citizens have a higher level of education and income than other states and territories. In addition, the ACT schooling system stands out owing to its higher percentage of students in private education, and because it is the only jurisdiction to have secondary schools divided into high schools and college - the best comparison is the US model of a 'middle school'. It is also significant that Harrison is a 'super' school – with greater communication and cross-over between Year 6s and 7s in this case. **Navigate back to article**

2. Our educational resources actively engaged students by using vivid language and imagery. The first two resources established the foundations: 'Is the Earth flat?' defined reliable sources of scientific knowledge; 'Is Wikipedia reliable?' explored ways to answer this question. The next four resources presented scenarios intended to trigger a 'fact-checking reflex': 'Street Sandwich' taught students to quickly decide whether a claim should be investigated using lateral reading. 'Why You So Mad' taught students to question information attacking people rather than ideas (e.g., 'ad hominems') and to be careful of sharing information that is emotionally manipulative. 'Red Cars' taught students to be aware of 'The Frequency Illusion': that is, ubiquity does not make information factual. Finally, 'Garage Dragon' taught students to be skeptical of hypotheses that cannot be proven. Each lesson had a learning intention (what students were expected to learn). 'Street Sandwich', for instance, uses the metaphor of a sandwich found on the street to discuss what kind of new information students should question. Its learning intention was: 'I know when I should check if a claim or person is reliable'. Early results are encouraging: the lessons were popular and fact-checking behaviour has improved (Cunneen & O'Neil, 2023). We intend to refine our methods and expand our reach in 2024. **Navigate back to article**

3. Numerous studies have shown that medical science articles on Wikipedia, which mainly attract expert contributors, are as correct as scientific publications (Buchbinder & Bourne 2018, Kräenbring et al 2014, Rajagopalan et al 2011, Thomas et al 2014). For non-scientific articles, and particularly in the case of topics which attract a lot of attention, Wikipedia relies on distributed peer review, on the 'wisdom of the crowd'. In the English version of Wikipedia, there could be hundreds of contributors for a popular article. Some of these contributors will be particularly invested and will include articles of interest on their 'Watch List'; they will then be alerted every time the article is modified, and unverifiable modifications will be eliminated (Morgan 2019). If manipulators persist, Wikipedians with additional administrative privileges, will block the article, or the manipulators. Wikipedians can become an 'administrator' by demonstrating good work for the project and by running for election: all editors can vote, but the decision must be consensual, and validated by a 'bureaucrat', which is a higher role in the Wikipedia hierarchy. According to the 'wisdom of the crowd', hoaxes are possible, but typically for obscure topics that do not attract popular interest. **Navigate back to article**

4. One exception involved the Azerbaijani Wikipedia, where some admins were charged with adopting an overly nationalistic stance and coordinating off-wiki to exclude dissenters, leading to a proposal to revoke all of the project's administrators (Wikipedia 2019). The other exception originated in 2003, when Wikipedia's Serbo-Croatian community was divided into local language communities, who then sorted themselves into projects, often falling along political party lines. This deprived these communities of the diversity that normally orients editorial consensus in other pluri-centric language projects. Far-right activists coordinated to take over the Croatian Wikipedia, resulting in project capture (Sampson 2015). They promoted fascist opinions and excluded dissenters. The Wikimedia Foundation eventually broke its longstanding rule of not interfering in local Wikipedia projects (Wikimedia Foundation 2021). It commissioned an investigation, and is attempting to correct the Croatian project's course. These exceptions prove the rule: in most other Wikipedia project, the diversity of participants has ensured the core scientific practices of peer review and verifying sources were respected.

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5. The Wiki Education project, financed by the Wikimedia Foundation, seeks to correct this imbalance by encouraging the creation of content about women. See **https://wikiedu.org/**

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6. Similarly to what occurs in free and open source software, the cause of this gender bias lies in the economic sphere, namely in the fact the work of volunteer authors is unpaid. The rejection of financial rewards within digital commons projects such as free and open source software and Wikipedia reproduces class and gender inequalities: contributing to digital commons is only accessible to a minority with the necessary disposable income, cultural capital or family support (Digital Commons Policy Council 2022). To reduce inequality, should Wikipedia consider paying editors (Dittus & Graham 2018)? **Navigate back to article**