Essay

Information and Media Literacy in the Age of AI: Options for the Future

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Abstract: The concepts of information and media literacy have been central components of digital literacy since the digitization of information began. However, the increasing influence of artificial intelligence on how individuals locate, evaluate, and create content has significant implications for what it means to be information and media literate. This paper begins by exploring the role artificial intelligence plays at the various stages of information retrieval and creation processes. Following this, the paper reviews existing digital literacy frameworks to ascertain their definitions of information and media literacy and the potential impact of artificial intelligence on them. We find that digital literacy frameworks have been slow to react to artificial intelligence and its repercussions, and we recommend a number of strategies for the future. These strategies center around a more agile, responsive, and participatory approach to digital literacy framework development and maintenance.

Keywords: information literacy; media literacy; digital literacy; artificial intelligence; digital competencies; digital literacy frameworks

1. Introduction

For decades, continuing technological progress has been transforming how we live, work, and learn [1]. Developments in hardware, software, digitization, and interconnectivity mean that individuals increasingly use online and digital tools to accomplish their work and a plethora of services and platforms for entertainment and communication purposes in their personal lives. It is within this context that information and media literacy feature prominently in policy documentation and educational literature, all of which recognize it as an essential skill for critical engagement with information in the 21st century [2,3]. However, recent developments in artificial intelligence (AI) pose a significant challenge to our understanding of what it means to be information literate and how to provide the tools and frameworks to help students and wider society learn about and deal with AI in this context. The purpose of this paper is to explore the potential impact of AI on information and media literacy competencies through the lens of existing digital literacy frameworks. We begin by providing the reader with an overview of the ways AI is impacting how individuals access, search for, select, and evaluate information and the potential implications of this. Following this, we review existing digital literacy frameworks to ascertain their current definitions of information and media literacy and the extent to which AI is considered. Finally, based on this, we offer options for the future, outlining different approaches that may better enable digital literacy frameworks to deal with the increasingly rapid developments in AI and related fields.

2. AI Is Everywhere

The emergence of ChatGPT has brought on a frenzy of educational research and media attention, much of which is focused on the impact tools such as ChatGPT may have on academic assessment, academic integrity, and teaching and learning more generally. Setting

aside these recent hyperbolic [4] discussions, it is important to consider the many practical ways in which AI is impacting how our students and wider society access, evaluate, and consume information and media.

Before individuals even begin looking for information, AI-enabled facial recognition software can grant or restrict access to phones, laptops, PCs, and even physical spaces [5]. Facial recognition uses AI algorithms to map and store the features of a user's face and compare these with the face of the user trying to access a device or location [6]. Once access has been granted, AI plays a significant role in how users search for and locate information. AI can influence this process through AI-powered searches and AI digital assistants. Using AI, search engines such as Google employ a number of strategies to predict, refine, and curate the information we are looking for [7]. Predictive search is an autocomplete feature that anticipates the search a user is trying to perform based on common searches, trending searches, the user's location, and the user's search history [8]. AI also plays a significant role in analyzing a user's search history and trends in order to offer personalized recommendations [6]. Digital assistants such as Siri, Cortana, Bixby, and Google Assistant have changed the way users interact with their devices and retrieve digital information. Increasingly, individuals use AI-powered assistants to perform daily tasks such as setting reminders, setting appointments, and accessing applications using voice commands. Using natural language processing, these assistants also allow users to perform searches using their voice [9].

Within the domain of natural language processing, text generation and summarization have been longstanding tasks. However, recent breakthroughs, such as transformer architectures [10], have enabled Large Language Models (LLMs) such as ChatGPT and Google BARD. LLMs are primarily targeted at text generation and summarization tasks. In addition, when trained on large corpora of text [11], such as web crawling, these models can aid in information retrieval tasks where users can quickly obtain summaries on various topics. Such tools have become widespread for aiding writing and comprehension tasks. Through continued use, these tools also benefit from in-context learning [12], where continued input from the user can aid in the refinement of results, where a user can ask to expand on points in more detail or rephrase the generated outputs to match a specific context (e.g., a letter or report). More recent advancements have seen the use of ChatGPT being adopted by Microsoft Bing to aid in web searches where generated text output is supplemented with annotations for further reading derived from a web search. Future integrations for such models seek to aid day-to-day tasks by integrating with office suite tools such as 365 CoPilot to aid in tasks such as text summarization and generation, benefiting from the large corpora of emails and documents created by a user.

AI also plays a significant role in influencing how users filter through information and select what is relevant to them. This is particularly relevant in digital marketing, e-commerce, digital content provision, and social media. Using AI to detect patterns in individuals' online behavior, digital marketers can deliver highly targeted and personalized ads that are tailored to anticipated wants and needs [5]. Companies such as Amazon use AI to learn what individuals like and what they are likely to purchase, using this information to recommend content through emails, on-site recommendations, and other notification mechanisms [6]. Using similar approaches, major content platforms such as Netflix and Spotify use viewer trends and historical data to recommend entertainment content to their users. In fact, 80% of content viewed on Netflix is driven by AI recommendations [13]. Perhaps most pervasive is the impact AI has on social media platforms. With over 4 billion users across platforms such as Facebook, Twitter, Instagram, and Snapchat, social media providers engage in a complicated dance involving the cultivation of content across their networks and gleaning the most value from the vast amounts of data produced by users every day. For example, based on a user's preferences and usage patterns, Twitter's algorithm directs them towards new accounts to follow, recommended tweets, and relevant news items. Meta uses similar algorithms to suggest friends and target content based on a user's history and interactions. Slack uses an AI data structure called "work graph" to

analyze conversations and create "highlights", moving the most relevant messages to the top [9].

The area of AI with perhaps the most revolutionary potential is the ability to generate content. As outlined above, developments in AI in recent years have meant that users can receive natural, human-like responses to questions and searches and engage in two-way conversations with chat clients such as ChatGPT, Google Bard, and others. AI diffusion models also power sophisticated image generation tools, such as Midjourney, which can create full-scale AI-generated images from simple text inputs—blurring the lines between computer and human-created art and imagery [14]. Sophisticated AI-powered image manipulation software is also swiftly becoming the norm, with popular programs such as Adobe Photoshop incorporating AI to allow users to automatically make changes and additions to their images using AI analysis and prediction. This technology can go so far as to train AI to generate full bodies in an infinite variety of poses, with companies such as DataGrid using these to replace real fashion models. AI is also being used to create music. Companies such as Soundraw, Soundful, and Boomy allow users to create original music using a series of text prompts and instructions. AI-powered video creation tools are also gaining traction, with companies like Deepbrain able to create a full-fledged video based on a user-uploaded script [15]. AI reads the script and not only creates the voice-over audio from this but also creates the video file based on analysis of the script. The ultimate level in AI-generated digital content is the production of "deep-fake" audio and video. An audio deepfake (also known as voice cloning) is a type of artificial intelligence used to create convincing speech sentences that sound like specific people saying things they did not say [16,17]. Similarly, deepfake videos are AI-generated videos in which images are combined to create new footage that depicts events, statements, or actions that never actually happened [18]. Deepfake videos have garnered widespread attention in recent years due to their use for mimicking celebrities and state leaders and spreading fake news videos.

Based on the above, it is therefore interesting to investigate the extent to which AI has radically changed the way individuals access information, search for and filter information, and has changed the very nature of what information is—due to AI-generated content. In the next section, we examine digital literacy frameworks and how they deal with information and media literacy, paying particular attention to their engagement with AI, if any.

3. Digital Literacy Frameworks: Information and Media Literacy in the Age of AI

Since the term digital literacy was first coined [19], academic discourse around the underlying digital competencies has included the ability to critically engage with the information and content found online. For example, Martin [20] spoke of digital literacy in terms of using digital tools to identify, evaluate, and analyze digital information; Ng [21] suggested it is the ability to search for, evaluate, understand, and integrate information found online; Kim [22] defined it as the ability to use digital technologies to collect, analyze, and evaluate information; and Churchill [23] asserts it is the ability to search for and evaluate information using digital tools. In tandem with academic debate and literature in this field, there has been a steady stream of digital literacy and digital competency frameworks that help academics and other users understand digital literacy and its component competencies. For the purposes of this piece, the authors conducted a detailed examination of eleven digital literacy frameworks (see Table 1) published since 2018, the year Open AI's generative pre-trained transformers (GPT) technology was launched. All these frameworks were accessed and are freely available on the UNESCO digital literacy information website. Frameworks were analyzed to ascertain (1) if information literacy was defined as a distinct digital competency and what this definition entailed; (2) if media literacy was defined as a distinct digital competency and what this definition entailed; and (3) the extent to which AI was dealt with, particularly in relation to information and media literacy.

Table 1. Digital Literacy Frameworks listed on the UNESCO Digital Literacy information website, published since 2018/.

Name	Publisher	Year	Information Literacy	Media Literacy	AI
DigiComp 2.2	European Union	2022	Yes	No	Yes—as it impacts information and media literacy
Global Framework of Reference on Digital Literacy Skill	UNESCO	2018	Yes	No	No
Digital Competence Framework for European Schools	European Union	2020	Yes	No	No
Digital Competence Framework for Austria	Austrian Federal Ministry for Digital and Economic Affairs	2021	Yes	No	No
Canadian Digital Competency Framework	Ministry of Education, Québec	2019	Yes	No	Yes—general awareness
Building Digital Capabilities Framework	JISC	2022	Yes	Yes	No
Digital Media Literacy Framework for Canadian Schools	MediaSmarts	2022	Yes	Yes	No
Digital Teaching Professional Framework	Education and Training Foundation	2019	Somewhat	No	Yes—as technical skill
Global Framework for Educational Competence in the Digital Age	ProFuturo	2022	Somewhat	No	No
Professional Development Framework for Digital Learning	Department of Education, South Africa	2019	Somewhat	No	No
Digital Competence Framework	Government of Wales	2022	Yes	No	No

An analysis of these frameworks reveals a multitude of perspectives when it comes to information and media literacy. Some frameworks define information literacy as a distinct digital competence and represent it as two separate areas: searching/browsing/filtering information, and evaluating information. DigiComp 2.2 (EU, 2022) [24], A Global Framework of Reference on Digital Literacy Skills (UNESCO 2018) [25], the Digital Competence Framework for European Schools (2020) [26], and the Digital Competence Framework for Austria (2021) [27] use the same definitions, where the first stage involves searching for data, information, and content and the ability to access this content while navigating between a variety of sources. The second stage, evaluation, involves the ability to analyze, compare, and critically evaluate the credibility and reliability of sources of data. It should be noted here that all the frameworks listed above, with the exception of DigiComp 2.2, take their definition of information literacy and the required competencies directly from DigiComp 2.1. The ways in which DigiComp 2.2 builds upon DigiComp 2.1 are discussed in a later section. Other frameworks represent information literacy as one competence area. For example, the Canadian Digital Competency Framework (2019) [28] supports "developing and mobilising information literacy" by selecting and using information appropriately, evaluating information, and making judgments about its credibility while adopting a reflective attitude towards information and its uses. The JISC Digital Capabilities Framework (2022) [29] says that information literacy is the ability to find, evaluate, organize, and share information for learning, research, or professional purposes. Some frameworks do not define information literacy as a specific digital competence; however,

they appear to implicitly call for its development in a nuanced way. For example, the Digital Media Literacy Framework for Canadian Schools (2022) [30] calls it "finding and verifying", where students need to search for information and then evaluate, authenticate, and critique sources and the information contained within them. The Digital Teaching Professional Framework (2019) [31] talks about "supporting digital capabilities", where learners should be able to use digital technologies to collect multi-media evidence. The Global Framework for Educational Competence in the Digital Age (2022) [32] advises that educators develop a "conceptual understanding" of educational content. The Professional Development Framework for Digital Learning (2019) [33] simply states that learners should be encouraged to develop their information skills and their digital literacy skills throughout the curriculum. Finally, the Welsh Digital Competence Framework (2022) [34] promotes sourcing, searching, and planning digital content, where learners are encouraged to search efficiently for information and evaluate the reliability of sources while being able to justify their choices.

Only two of the frameworks specifically define media literacy as a separate digital competence. The Digital Media Literacy Framework for Canadian Schools (2022) [30] defines "reading media" and "media representation". Reading media is concerned with developing individuals' understanding of how media is made and how media and genres are used to tell stories and communicate meaning. Media representation is concerned with understanding the different ways media can represent reality, how communities are represented, and how media messages can be shaped and manipulated. The JISC Digital Capabilities Framework (2022) [29] defines media literacy as understanding audience, accessibility, user design, and impact. It encourages individuals to ask why messages are designed as they are and how they affect us.

Artificial intelligence only appears in three of the frameworks and in only one as an impacting factor on information and media literacy. The Canadian Digital Competency Framework (2019) [28] references AI in area 2 "Developing and mobilising technological skills", where it states the aim to develop a general understanding of artificial intelligence and its impact on education, society, culture and politics. The Digital Teaching Professional Framework (2019) [31] references AI in the area of "raising learners' digital employability and self-employability skills" where AI is viewed as a digital tool alongside virtual and mixed realities, which can support the learning of industry-specific skills. The only framework that deals with the potential impact of AI on information and media literacy is DigiComp 2.2 (2022). DigiComp 2.2, which is an updated version of DigiComp 2.1 (2017) [35], addresses the potential impact of AI on information and data literacy in two core areas: (1) Browsing, searching, and filtering data, information and digital content, and (2) evaluating data, information, and digital content. In the area of browsing, searching, and filtering information, the framework acknowledges the role AI plays in powering search algorithms and in generating targeted content. It acknowledges that, on the one hand, users should learn how to use AI-powered digital assistants to successfully formulate queries and questions, while on the other, it can be difficult for users to decipher why certain recommendations have been made by AI. In the area of evaluating information, the framework acknowledges that AI datasets can contain inherent biases and misconceptions and that AI algorithms can recommend content that reinforces existing viewpoints by creating "echo chambers". It also argues that individuals need to be aware that AI can be used to skew information, misrepresent intended meaning, and, in the most extreme cases, generate "deepfake" audio and video that may purport to represent an individual or organization.

In the first instance, the purpose of this section is to provide a detailed overview of the existing digital literacy frameworks and to ascertain if and how they define information and media literacy, paying additional attention to their detailing of these competencies in the age of AI. This review prompts a number of observations and questions that warrant further exploration and discussion. First, most of the frameworks published since 2018 make no reference to AI, and those that do (with the exception of DigiComp 2.2) address the

issue in a general sense rather than specifically relating these developments to information literacy and/or media literacy. Second, while DigiComp 2.2 provides a comprehensive set of competencies addressing AI and information literacy, many of the other frameworks (e.g., A Global Framework of Reference on Digital Literacy Skills, 2018; the Digital Competence Framework for School 2020; and the Digital Competence Framework for Austria 2021) have been built upon DigiComp 2.1, which was published in 2017. This raises questions around the currency of these frameworks, some of which have been published as recently as 2021. Third, it appears that perspective, not time, is the issue. For example, frameworks such as the Canadian Digital Competency Framework (2019) and the Digital Teaching Professional Framework (2019) have been highlighting the potential impact of AI, while others, much later frameworks, have ignored the issue.

Furthermore, AI presents significant challenges to information and media literacy as competencies. First and foremost is the issue of explainability within AI systems. In classical systems, the response to a user prompt is somewhat understandable (for example, through a set of rules) [36]. However, modern AI systems represent decisions as a series of weights based on combinations of input parameters; as such, they cannot be understood in a simple manner by humans. This issue presents difficulties in adapting AI to domains where reasoning must be assured and transparent (e.g., healthcare, research, etc.). In the context of digital literacy, this manifests itself in that an AI cannot explain or confirm where it obtained data (unless in the context of a live web search) or why it chose to produce such an output. The issue of explainability is further compounded by hallucinations within the model. A hallucination within a large language model (such as ChatGPT) is when an AI generates an incorrect response to a given prompt [37]. This, in turn, means that if an AI model does generate an incorrect response, it cannot explain why the response is incorrect or hallucinate an explanation such as a fake academic reference [38]. Within the context of information and media literacy, this poses issues for tasks such as information search and evaluation. A standard information search on the web presents a user with multiple links ranked by relevance and supplemented with contextual metadata (dates, times, etc.). This supplementary information is utilized by a user in order to determine the veracity of sources. This is in contrast to the conversational nature of large language models, where the model presents a single output with little explanation. Users unaware of the capabilities of AI systems may fail to recognize hallucinations or know that sources external to the AI must be consulted in order to validate its outputs.

4. Discussion: Options for the Future

Based on the pace of AI development and its increasing ubiquity and on our review of existing digital literacy frameworks, we argue that the current digital literacy framework development and publication model presents opportunities for improvement. While acknowledging the innovative and rigorous work carried out by those framework contributors and developers, we believe energy could be better spent by adopting one or more of the following options.

Agile Digital Competencies Frameworks: In many areas of work, the concept of "agile development" has taken hold. Readers may be familiar with the "SCRUM" framework [39], an agile management framework that encourages lean thinking and fast-paced iterative development of products and services. Agile development frameworks such as "Kanban" and "Lean", have been used for many years in software development, allowing developers and designers to focus on iterative design and quickly respond to customer and business demands [40,41]. If recent developments in AI have taught us anything, it is that technology can change rapidly, and its implications can be felt right across the societal spectrum within a matter of days and weeks [42–44]. We need only look at the volume of debate, media attention, and scholarly output that has ensued following the realization that ChatGPT could have far-reaching implications for assessment at third-level institutions [45–47]. While AI is the current "hot topic", it certainly will not be the last, and while we are still busy trying to address the information and media literacy issues raised by AI, some other developments

may take us by surprise. Tinmaz et al. [48] recommend that framework developers gather, at least annually, to understand new technological trends and decide whether these should be addressed in their frameworks. It is for these reasons that we propose our first option: developing and maintaining "agile" digital competency frameworks. Rather than follow the current "report-style" nature of frameworks, we envisage living, breathing, online frameworks that are maintained rather than published. A "digital" web-based competency framework that would enable its stewards to update and annotate different competencies and sub-competencies as necessary. In this scenario, links could be added to relevant sections concerning the implications of AI (or the next technological innovation) and strategies to mitigate the negatives and take advantage of the opportunities it affords.

Learner and Teacher Sourced Approach to Digital Competencies: Much of the research on AI in education has been dominated by computer scientists [49,50]. There has been a conspicuous lack of teachers in the literature [51]. Moreover, AI is often touted as heralding the beginning of teacher-free zones [52], automated teaching machines, or augmented teachers [53]. In the spirit of agility and responsiveness outlined in option 1 above, we may ask, who gets to decide literacy competencies and how they are implemented? One thing the Emergency Remote Teaching (ERT) response to the COVID-19 pandemic showed us was that rapid, responsive, and agile responses to educational change were possible [54,55]. Corollaries of this can already be seen in the response to AI. An open-access crowdsourced book of 101 creative ideas for teaching with AI is one notable example from the CreativeHE collective [56]. This general type of response as an open educational practice is well described by Mills, Bali, and Eaton [57], whose educational response framework for AI involves turning toward online communities that cross institutional and disciplinary boundaries; using social media, email groups, and public annotation; and enabling online spaces for educators to sketch early, rough ideas and practices and reflect on them to facilitate crowdsourced curation of resources and learning materials. An important feature of their approach is collaboration with students to allow emergent, student-centered, and student-guided approaches to be developed so that educators and students learn together about AI and jointly participate in discussions about its future. Ultimately, students will need to be key partners in AI education futures, but we can also say that these will be "student, educator and machine partnerships" as we work together to figure out new content creation competencies [58].

Unified Digital Competencies Framework: In our review of the existing digital competency frameworks above, we highlight several issues that may be attributable to the volume of frameworks available. The first, and perhaps most pressing, issue is that many of the frameworks, even those published as late as 2021, have been built using DigiComp 2.1 as their base. The Global Framework of Reference on Digital Literacy Skills (UNESCO, 2018), the Digital Competence Framework for School (EU, 2020), and the Digital Competence Framework for Austria (2021) all include competencies on information and data literacy that are taken directly from DigiComp 2.1. This suggests that many of the frameworks in circulation are out of date and need further development [59]. The time lag of up to five years where frameworks are still being built using out-of-date information may have a detrimental impact on their users and users in certain jurisdictions [60]. Second, digital literacy and digital competencies are complicated concepts [61], and this complexity can be exacerbated by the sheer volume of terms, themes, subthemes, and alternative labeling of the skills through which individuals become literate in the digital age. This, coupled with the ever-increasing pace with which technology changes how we interact with content and information, suggests that a unified approach to digital literacy and digital competency may be preferable. Countries such as Singapore have already begun exploring this unified approach, bringing together various digital skills and competency initiatives under one umbrella [62]. Furthermore, a unified approach might adopt a principles-first methodology, moving away from constant interaction and the bloating of existing frameworks towards a thematic focus. Focusing on developing individuals' information and media literacy based on underlying principles would allow attention to be placed on helping individuals and

students learn about the implications in their context and how to manage these implications in their own lives [48].

5. Conclusions

Recent developments in AI have the potential to dramatically change what it means to be information and media literate, impacting every stage of the information retrieval and generation process, including accessing, searching, filtering, evaluating, and creating. The majority of the existing digital literacy frameworks have been slow to respond to the potential implications of AI and contain a lack of consistency as to its impact on information and media literacy. We argue that energy might be better spent adapting our approach to digital literacy frameworks so that they become more agile and responsive to technological and indeed philosophical developments relating to information and media. We also believe that more work could be conducted to bring additional voices and representation into these frameworks, not simply through consultation mechanisms but also through the "crowd" maintenance of living documents that can be annotated, commented upon, and expanded upon based on the experiences of educators, students, and other stakeholders.

6. Limitations

This article has some limitations that should be noted in relation to the discussion and conclusions presented above. The paper is based on digital literacy frameworks published since 2018 and listed on the UNESCO digital literacy information website. While this provided a robust and comprehensive set of frameworks for investigation, other frameworks may exist that provide alternative perspectives on information and media literacy in the age of AI and, as such, may lead to different areas for discussion. Second, AI is an emerging area of research. The technology and available literature on its implications for information and media literacy are relatively underexplored. As the technology develops and as research in this area becomes more widespread, alternative areas for discussion may present themselves that have not been explored in this paper. Finally, this paper is based solely on published digital literacy frameworks. Alternative sources of data could be used (e.g., empirical data), which may have yielded differing results.

7. Future Research

As AI is an emerging and rapidly changing technology, there are many areas that warrant further research in the future. First, future research could explore some of the discussion points named above, e.g., the development and implementation of agile, learner- and teacher-sourced, and unified digital literacy frameworks. This research could establish the viability and sustainability of these approaches. Second, future research could examine the extent to which individuals can accomplish the AI-related competencies listed in frameworks such as DigiComp 2.2. Research of this nature would help with our understanding of how policy translates into practice. Finally, further research could gather empirical data on individuals' experiences of the impact of AI on the various stages of the information and media journey, from accessing and evaluating through the consumption and creation of digital information and media.

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