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Mapping media and information literacy skills during and after COVID-19, with special reference to online education, and commerce and trade

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ABSTRACT

This paper examines literature from the COVID-19 period (2020-2022) to outline prevalent themes and essential competencies in the post-COVID era. Employing informetrics within a quantitative research approach, the study scrutinizes Scopus database data using COVID-19, e-learning, e-commerce, and media and information literacy terms. Results reveal a surge in scholarly focus on e-commerce, online learning, e-health, and ICTs, including social media. Identified were 355 media and information literacy terms, with digital, information, health, and media literacy at the forefront. Moreover, 244 corresponding competencies and skills were noted. The study emphasizes the necessity for comprehensive media and information literacy programs, diverse competencies, and stakeholder engagement in fostering a digitally literate society. Prioritizing skill development for navigating digital landscapes is vital amid the fourth industrial revolution, laying the groundwork for adept usage of media, information, and digital realms.

Keywords: *media and information literacy, competencies and skills, 21st-century skills, new literacies*.

INTRODUCTION

The COVID-19 pandemic has been referred to as one of the worst disrupters of human life, as it affected all sectors of human activity, including education, trade and commerce, health and social work, the hotel and catering industry, transportation and storage, family, information and communication, jobs, the environment and agriculture, real estate and renting, and small-scale business activities (Bhatti et al. 2020). The effects have been both negative and positive. The negative impacts of COVID-19 are widespread across all spheres of human life and include the loss of 6.6 million lives (World Health Organization [WHO] 2022); loss of jobs (WHO estimated that up to 3.3 billion were to lose their livelihoods), and, therefore, income, which led or would lead to increased poverty levels and, in turn, the undesirable effects of poverty such as crime (ILO-OECD 2020; ILO-FAO-IFAD-WHO 2020); and negative health-related effects such as suicides, food poisoning, stress, poor diets and overindulgence in unhealthy foods and alcoholism, and drug use/misuse, among others (Nelson 2020). On the flip side are the positive effects, which Nelson (2020: 1) outlines: "skies are bluer, fewer cars are crashing, crime is falling, and some other infectious diseases are fading from hospital emergency departments." Thomas (2021) opines that COVID-19 has positively impacted the world in many ways, including the introduction of new technological tools and software as well as innovations. Many of the positive effects of COVID-19 have been associated with the increased use of information and communication technologies (ICTs) due to pandemic prevention and control measures such as lockdowns, social distancing, and closure of malls and restaurants (Dey, Al-Karaghouli & Muhammad 2020; König & Seifert 2022; Zou & Cheshmehzangi 2022).

Indeed, there have been reports in the media and on the internet regarding increased human activities in many different sectors, including trade and commerce, and education, due to the COVID-19-induced deployment of ICTs. The Global Partnership to End Violence's Executive Director, Dr. Howard Taylor, is quoted observing that "school closures and strict containment measures mean more and more families are relying on technology and digital solutions to keep children learning, entertained and connected to the outside world, but not all children have the necessary knowledge, skills and resources to keep themselves safe online" (UNICEF, 2020). It has been reported that over 97% of EU enterprises increased the number of remote meetings and access to their ICT systems and e-mails in 2020 (Eurostat, 2022). The OECD (2020) observes that the COVID-19 crisis accelerated the expansion of e-commerce towards new firms, customers, and types of products and concluded that "some of these changes in the e-commerce landscape will likely be of a long-term nature." Consumer behavior patterns have tremendously changed during the COVID-19 pandemic and shifted to online shopping, click-and-collect, and contactless delivery options (Dey, Al-Karaghouli & Muhammad 2020; Figliozzi & Unnikrishnan 2021; OECD 2020; Poon & Tung 2022; Zou & Cheshmehzangi 2022). The challenges associated with unprecedented reliance, adoption, and use of ICTs during the COVID-19 pandemic were compounded by an upsurge in "fake news, rumors, myths, misinformation, disinformation, conspiracy theories, and even hatred" (Yang et al., 2020, p. 3). On the impact of COVID-19 on librarianship and library services, Costello et al (2021, p. 1) observe that "in addition to transitioning ILI [information literacy instruction] services online, librarians faced many challenges in evolving pedagogical practices, experimenting with and implementing new technologies, and organising digital ILI programs including managing changes in audience and volume." The need for media and information literacy (MIL) and MIL skills to thrive after COVID-19 cannot, therefore, be overemphasised. In that respect, UNESCO organised a feature conference labeled "Global Media and Information Literacy Week 2022", between 24 and 28 October 2022, in Abuja, Nigeria. The conference's theme was "Nurturing trust: A media and information literacy imperative." This paper was part of the presentations made at one of the conference's panel sessions under the sub-theme, "Post-pandemic ICTs adoption in homes: Media and information literate parents - what to trust?" This paper investigates the MIL competencies and skills required during and after COVID-19, with special reference to open and distance education, commerce, and trade. Investigating media and information literacy competencies and skills during and after the COVID-19 pandemic is crucial to addressing the challenges of the infodemic and digital transformation. The rapid spread of misinformation and disinformation during the pandemic has highlighted the need for individuals to develop critical thinking and evaluation skills to navigate the overwhelming amount of information. Moreover, the shift to remote learning and increased reliance on digital platforms necessitate investigating media and information literacy skills to ensure equiTable access to education and effective

participation in online environments. Understanding the competencies required for media and information literacy empowers individuals to discern reliable sources, critically analyse information, and make informed decisions. Additionally, investigating these skills contributes to addressing the digital divide and inequalities, promoting mental well-being, and fostering active citizenship in the post-pandemic era. By researching this area, we can develop targeted interventions and educational programs to equip individuals with the necessary competencies to navigate the media landscape, combat misinformation, and contribute to a more resilient and informed society.

The article comprises five sections. This section provides the background to the study, while the next section introduces the phenomenon investigated in this research and provides the conceptual setting for the study. Thereafter, the paper reviews related studies, after which a description of the research methodology is offered, followed by the results and a discussion of the findings. The findings focus on the thematic areas of research on COVID-19, with special reference to e-commerce and online/e-learning; the areas of research in the literature on COVID-19 and media and information (MI) literacies; the literacies most mentioned in the MIL literature; and the skills and competencies appearing in the MIL literature. Finally, the paper offers key conclusions, recommendations, and an outline of the study's implications for theory and practice.

Media and information literacy: Conceptual setting

Despite the widely acknowledged value and critical role of media and information literacy (MIL) as a key competence and skill in the 21st-century's heavily mediated societies (Carlsson 2019; UNESCO 2013a) and as an integral part of the jigsaw of sustainable development (Berger 2019; Grizzle et al. 2021), MIL's definition, depth, and scope continue to shape scientific discourses. It has been noted that the MIL concept originated in media education in the 1950s and information literacy in the 1970s (see Carlsson 2019; Leaning 2019). At the time, the understanding of the concept that later metamorphosed into MIL involved educators and scholars who recognised the need to teach people how to critically evaluate and interpret the messages (information) they were receiving from the media. The establishment of the Ontario-based Association for Media Literacy (AML) and the Center for Media Literacy (CML) in 1978 and 1984, respectively, was a major milestone in developing MIL education programs worldwide. Since then, the following key milestones, largely associated with UNESCO, have been achieved in the conceptualisation of MIL in terms of its scope and depth: UNESCO published a Declaration on Fundamental Principles Concerning the Contribution of the Media to Fostering Democracy and the Rule of Law in 1999; UNESCO published a Recommendation on Media and Information Literacy in 2007; the International Association for Media and Information Literacy (IAML) was founded in 2011; the United Nations General Assembly adopted a resolution on MIL in 2012; the UNESCO Institute for Information Technologies in Education (IITE) launched the Global MIL Week in 2013a; and UNESCO IITE launched the MIL Global Alliance in 2018 (Carlsson, 2019). In addition, major declarations have been adopted to shape the concept and its constituent terminologies.

MIL was first recognised as a composite concept in 2017, bringing together media literacy and information literacy, terms that were hitherto treated as separate and distinct fields (Lau & Grizzle 2019; UNESCO 2013b, 2018). UNESCO considered MIL an appropriate and all-encompassing term as it would cover "all forms of media and other information providers such as libraries, archives, museums, Internet, films irrespective of technologies used. MIL harmonises different forms of literacies (information literacy, media literacy, digital literacy, news literacy, Internet literacy, social media literacy, film literacy, etc.) and their links to social literacies such as intercultural competencies, global citizenship education, health literacy, financial literacy etc." (UNESCO, 2018, p. 1). MIL was, therefore, considered as the ability of individuals to access, critically evaluate, produce, and use media and information in all its forms. In its 2016 MIL week, UNESCO refined MIL's definition further to read thus:

> "Media and information literacy is an interrelated set of competencies that help people to maximise advantages and minimise harm in the new information, digital and communication landscapes. Media and information literacy covers competencies that enable people to critically and effectively engage with information, other forms of content, the institutions that facilitate information and diverse types of content, and the discerning use of digital technologies. Capacities in these areas are indispensable for all citizens regardless of their ages or backgrounds" (UNESCO, 2016).

In a closely related definition of MIL, UNESCO previously considered MIL as a "set of competencies that empowers citizens to access, retrieve, understand, evaluate and use, to create as well as share information

and media content in all formats, using various tools, in a critical, an ethical and effective way to participate and engage in personal, professional and societal activities" (UNESCO 2013b, p. 29). In recent publications, some authors (e.g., Grizzle et al., 2021) have followed in the footsteps of other scholars who defined information literacy and other related literacies using the skills and competencies required of media or information literate persons to describe MIL. It has been acknowledged that, just as with other literacies, it is hard to capture all the essentials of MIL in one short paragraph. As a result, UNESCO "prefers not to give a classic definition of MIL, focusing instead on delineating the key learning objectives, outcomes or competencies of MIL" (Lau & Grizzle 2019, p. 89). As a result, Grizzle et al (2021, p. 58) explain that "MIL enables the purposeful and creative use of digital technology and empowers all users through enhancing their knowledge of their online and digital rights, as well of the ethical issues surrounding access to and use of information. Media and information literate citizens are equipped to engage more effectively in dialogue, freedom of expression, access to information, gender equality, diversity, peace, and sustainable development." They further contend that MIL "refers to the essential competencies (knowledge, skills, and attitudes) that allow citizens to engage with content providers effectively and develop critical thinking and life-long learning skills for socialising and becoming active citizens" (Grizzle et al., 2021, p. 382).

In view of the above, we consider MIL as a multidimensional concept that refers to the ability to access, evaluate, analyse, interpret, and create media and information in various forms and that encompasses a set of skills, knowledge, and attitudes necessary to navigate, critically engage with, and contribute to the complex and ever-evolving media and information landscape. Media and information literate persons can understand the media and information landscape, analyse media and information messages, create media and information messages, and use media and information ethically and responsibly. Specifically, UNESCO (2013b, p. 59) outlines 12 MIL competencies under three broad MIL components and 12 subject areas (see Appendix). We aver that MIL is about individual competencies and fostering a participatory and informed society. It empowers individuals to be critical consumers and creators of media and information, enabling them to make informed decisions, engage in democratic processes, and contribute to the public discourse, which are critical in the current information and media environment. Indeed, several studies on MIL have pointed out the need for MIL skills in the digital age, especially among young people (see Livingstone, Mascheroni & Stoilova, 2023). This study delves into specific skills and competencies using author-supplied keywords in published research articles between 2020 and 2022, all years inclusive.

Related studies: Brief overview

The mapping of keywords to explain a phenomenon or subject domain has been introduced previously. However, only a handful of studies have been conducted to map the author keywords to study media and information literacy and its associated literacies. The mapping of author keywords to identify the most occurring themes and sub-themes in the MIL literature has been conducted in the subject domain of information literacy (Kappi & Biradar, 2022; Onyancha, 2020), digital literacy (Tinmaz 2022; Wang & He 2022), media literacy (Bapte, 2021; He, Liu & Zhao, 2021), and multiple literacies [i.e. digital literacy, ICT literacy, information literacy and media literacy] (Park, Kim & Park, 2021).

An elaborate study closest to the current study examined digital literacy and presented the data in different thematic areas using the most common keywords (Tinmaz et al., 2022). The study identified four key themes under which digital literacy research is confined, namely digital literacy, digital competencies, digital skills, and digital thinking, with each comprising a variety of keywords that defined their scope and breadth. For example, digital literacy was associated with a total of 38 other literacies, among them computer literacy, media literacy, cultural literacy, disciplinary literacy, data literacy, and technology literacy. Regarding skills and competencies, the authors came across information literacy, ICT, communication, and collaboration skills in the digital literacy literature. Onyancha (2020) conducted a study to map the information literacy knowledge using author keywords and noted that information literacy was associated with 73 other literacies, including digital literacy, computer literacy, media literacy, media and information literacy, health literacy, and health information literacy. Onyancha's (2020) study further revealed how information literacy has evolved by using the author keywords. The author concluded that information literacy has evolved from being associated with computer literacy and confined to academic libraries to encompass other literacies and be practiced in other information environments beyond academia. The spread

of information literacy beyond the traditional library environment was evidenced by distributing the literature in the 27 broad subject areas in the Scopus database. For their part, Wang and He (2022) noted that digital competence was the most mentioned keyword in the digital literacy literature in relation to higher education during the COVID-19 pandemic. In their study, which mapped the keywords among other variables, the authors concluded thus: "with the improvement of individual digital competence, teaching faculties and students are supposed to adjust their teaching and learning modes to make full use of digital technology and resources" (Wang & He, 2022, p. 54). A visual network developed by Kappi and Biradar (2022), using author keywords in the information literacy literature published between 1991 and 2021, revealed that information literacy was closely associated with health literacy, media literacies, and new literacies while the most visible 21st-century skills included critical thinking.

Using data extracted from the Web of Science (WoS), Bapte (2021) mapped media literacy literature and found, among others, that the most frequent keywords in the literature included media literacy, media education, media, prevention, children, information literacy, social media, and new literacies. In another study that relied on the WoS data, He, Liu and Zhao (2021) visualised keywords in 1779 papers published on media literacy and identified five hotspots of research in the subject domain, namely media literacy, new media, college students, self-media, and social media. Similar observations have been observed by Singh and Yumnam (2020), who, in their study titled "Scholarly Publications on Information Literacy" (1989-2020), noted that the main author keywords in the IL publications were information literacy, media literacy academic libraries, higher education, media education, and library instruction. The intersectional appearance of several author keywords in the literature on MIL literacies was visible in several bibliometric or scientometric studies reviewed in this section.

RESEARCH METHODOLOGY

The study adopted informetrics, which Onyancha (2020a) considers one of the most commonly used quantitative designs in library and information science. One of the strengths of this design is its applicability to studying patterns that appear in keywords such as in-text words, indexing keywords, and author-supplied keywords. This paper focused on author-supplied keywords, which have been used in various informetric studies to map knowledge in different fields (for example, Kolle, 2017; Massaoudi, 2021; Onyancha, 2020b; Peset, 2020). Elsevier's Scopus database was used to extract the relevant data that informed the presentation at the conference and the current paper. Scopus is one of the largest bibliographic and citation databases in the world. It indexes millions of research outputs in the form of journals, conference proceedings, books, book chapters, and trade journals. The document types include, but are not limited to, articles, conference papers, books, book chapters, reviews, notes, editorials, short surveys, and letters.

To identify the search terms used to extract data from the database, a preliminary search was conducted using 'media and information literacy' within the article title, abstract, and keywords fields and limiting the search to publications. The results were analysed using keyword analysis, and it was noted that keywords related to education (i.e., online and distance education, teaching and learning) and commerce and trade (e.g., online shopping) featured prominently in the data. Furthermore, a literature search, as reflected in the section on the background to the study, revealed that education and commerce were two of the key sectors that were heavily affected by COVID-19, hence the special reference to the two in this paper. The analysis of data obtained through the preliminary search helped us to identify and obtain relevant keywords that were later used to extract data for the current study.

Having identified the two COVID-19-affected areas and the search terms based on the preliminary search and data analysis, three separate searches, combining a variety of search terms, were performed to extract relevant data from the Scopus database. All searches were limited to journals (publication type) and articles (document types) that were published between 2020 (when COVID-19 intensified) and 2022 (current year). In the first search undertaken, we extracted data using the following search query for purposes of assessing the thematic areas of research on e-learning, e-commerce, and ICTs during the COVID-19 period, 2020 to 2022:

> (TITLE-ABS-KEY (COVID-19) AND TITLE-ABS-KEY (ICTS OR ICT OR "Information and communication technologies" OR "online learning" OR "e-learning" OR elearning OR ecommerce OR "E-commerce" OR "Online shopping" OR "virtual learning" OR "virtual shopping")) AND (LIMIT-TO (PUBYEAR , 2022) OR LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020)) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (SRCTYPE , "j"))

This search yielded a total of 7669 journal articles published between 2020 and 2022.

The second search involved extracting data on different media and information literacy terms AND COVID-19 to examine the thematic areas of research within the context of MIL in the COVID-19 period, 2020 to 2022. The list of the literacies related to MIL was obtained based on the preliminary search stage and from Onyancha (2020b) and Grizzle, et al. (2021). This search was meant to identify specific keywords that may describe the skills and competencies related to different literacies under the umbrella term MIL. The search query employed in this phase of data collection was as follows:

> (TITLE-ABS-KEY (COVID)) AND (TITLE-ABS-KEY ("information literacy" OR "Media Literacy" OR "Digital Literacy" OR "Computer literacy" OR "Technology Literacy" OR "digital information literacy" OR "business information literacy" OR "health information literacy" OR "visual literacy" OR metaliteracy OR "critical information literacy" OR "New literacies")) AND (LIMIT-TO (PUBYEAR , 2023) OR LIMIT-TO (PUBYEAR , 2022) OR LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020)) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (SRCTYPE , "j"))

This search yielded a total of 599 journal articles published between 2020 and 2022.

The last search was focused on research published on the main media and information literacies listed in the above search query without combining the search terms with 'COVID-19.' The search yielded 4300 journal articles published between 2020 and 2022. The data was extracted data that consisted of citation information (e.g., author, year of publication, and source title), bibliographic information (e.g., affiliations), abstracts and keywords (i.e., abstract, author keywords, and index keywords), and cited references, which were downloaded and saved in .csv format, which is compatible with Vosviewer software that was used to analyse the data. Vosviewer is increasingly becoming one of the most reliable computer-aided softwares to analyse bibliographic and citation data, including words in a text. The Vosviewer software was used to map and visualise the most common author-supplied keywords in the three datasets obtained from Scopus in response to the focus areas of this paper. The analysis was presented in network maps, represented in Figure 1 to Figure 5.

Limitations of the study

It is worth noting that the occurrence of words in a text or document can imply several things. The co-occurrence analysis of keywords or subject terms may reflect their central role in explaining the main theme addressed in the publication, besides demonstrating the semantic relationships between words (Bullinaria & Levy, 2007) or links between words and/or documents in which the words co-occur (Diodato, 1994). In the current study, it was assumed that certain author keywords that appeared in the MIL and COVID-19 literature reflect the skills and competencies required post-COVID-19. This assumption was based on similar studies that have mapped keywords to assess the most widely used topics in a field (Bruckner, Ebeling & Scharnhorst, 1990; Cohen & Lloyd, 2014; Pinto, Cordon & Diaz, 2010; Sedighi, 2016) where the most common keywords were considered the most influential words as far as the evolution of a field is concerned. One limitation of this assumption and, as such, the current study is that although the most common keywords found in the publications are important in MIL, the interpretation of their co-occurrence may go beyond the keywords reflecting the competencies and skills required by media and information literate persons post-COVID-19. Nevertheless, the keywords identified in this study have been identified in several studies, some of which have been cited in this paper as reflective of MIL competencies and/or skills.

RESULTS AND DISCUSSION

The first objective of this paper was to assess the areas of research revolving around e-learning and e-commerce, and ICTs during COVID-19, with the belief that the subject focus of research would provide insight into the type of skills that may be required post-COVID-19. The adoption and use of ICTs in learning, education, shopping, and medicine during the COVID-19 pandemic took centre stage in research revolving around COVID-19, as shown in Table 1 and Figure 1. Online teaching, e-learning, e-commerce, medical education, and telemedicine are some keywords that describe the research focus and, by extension, the issues associated with COVID-19 from 2020 to 2022. As explained in the introduction section of this paper, the COVID-19 pandemic pushed institutions in the education sector, such as primary and secondary schools, as well as universities that offered contact classes, to shift to offering their programs online; retail grocery shops also added online services to their offerings, while some traditional delivery services, such as Uber and other similar services, diversified their trade to include other businesses/services (e.g. food deliveries, transportation

of goods, etc.); and ICT companies developed or enhanced their software applications (otherwise referred to as apps) (König & Seifert, 2022; Zou & Cheshmehzangi, 2022). The changes meant that school-going children, parents, traders, and health workers, among others, were required to develop new skills or improve existing skills.

Table 1. *Top 60 author-supplied keywords in the literature on COVID-19, e-commerce, and e-learning, 2020-2022*

No	Keyword	Links	TLS	Freq.
1	Online learning	536	2467	1421
2	E-learning	417	1490	778
3	Higher education	327	1088	498
4	Pandemic	333	1002	457
5	Education	263	740	330
6	Distance learning	245	691	315
7	Online education	203	405	227
8	Medical education	167	519	216
9	Online teaching	167	377	199
10	E-commerce	106	208	171
11	Virtual learning	162	356	171
12	ICTs	184	349	164
13	Distance education	178	384	154
14	Blended learning	140	323	152
15	Students	143	382	147
16	Mental health	119	291	121
17	Remote learning	114	242	118
18	Emergency remote teaching	98	209	96
19	Technology	109	202	95
20	Anxiety	95	252	94
21	Learning	105	206	93
22	Lockdown	111	194	92
23	Medical students	82	181	87
24	Telemedicine	74	170	86
25	Social media	96	170	84
26	University students	73	151	76
27	Student engagement	98	165	70
28	Digital divide	84	137	65
29	Teaching	74	166	65
30	Stress	83	194	64
31	Online shopping	42	77	62
32	Pedagogy	76	148	62
33	Depression	59	163	57
34	Self-efficacy	67	105	56
35	Assessment	67	124	55
36	Machine learning	54	92	55
37	Teachers	66	133	53
38	Telehealth	69	131	53
39	Resilience	65	117	51
40	Dental education	44	110	49
41	University	55	103	49
42	E-learning	56	93	46
43	Student satisfaction	49	87	46
44	Digital transformation	68	97	45
45	Communication	78	110	44
46	Curriculum	62	113	43
47	Remote teaching	62	105	43
48	Active learning	60	108	42
49	Educational technology	62	97	42
50	Internet	65	97	41
51	Public health	57	90	41
52	Undergraduate	50	91	41
53	Academic performance	51	80	40
54	Sustainability	53	74	39
55	Digital learning	64	97	38
56	Gender	54	66	38
57	Innovation	60	88	38
58	Nursing students	52	80	38
59	Artificial intelligence	49	67	35
60	Children	41	71	35

The other aspect that was given attention by scholars was social media, which has inevitably become a key player and enabler in communication, but also a major source of information, especially during the COVID-19 pandemic. The keyword *social media* appeared as an author supplied keyword in 84 articles. Other technology-related terms that appeared among the 60 top keywords include the following: ICTs (184); technology (109); educational technology (62); and internet (65). Despite the positive developments, the appearance of such terms as mental health, anxiety, stress, and depression, reflects the negative effects associated with the adoption and use of ICTs during COVID-19. It is not surprising, therefore, to note the presence of medical education, medical students, telemedicine, telehealth, dental education, public health, and nursing students among the top 60 author supplied keywords in Figure 1 and Table 1. The medical ramifications associated with working from home are far-reaching (see de Oliveira et al., 2022; Hao, et al., 2022; Niebuhr, et al., 2022; MacDonald, 2022).

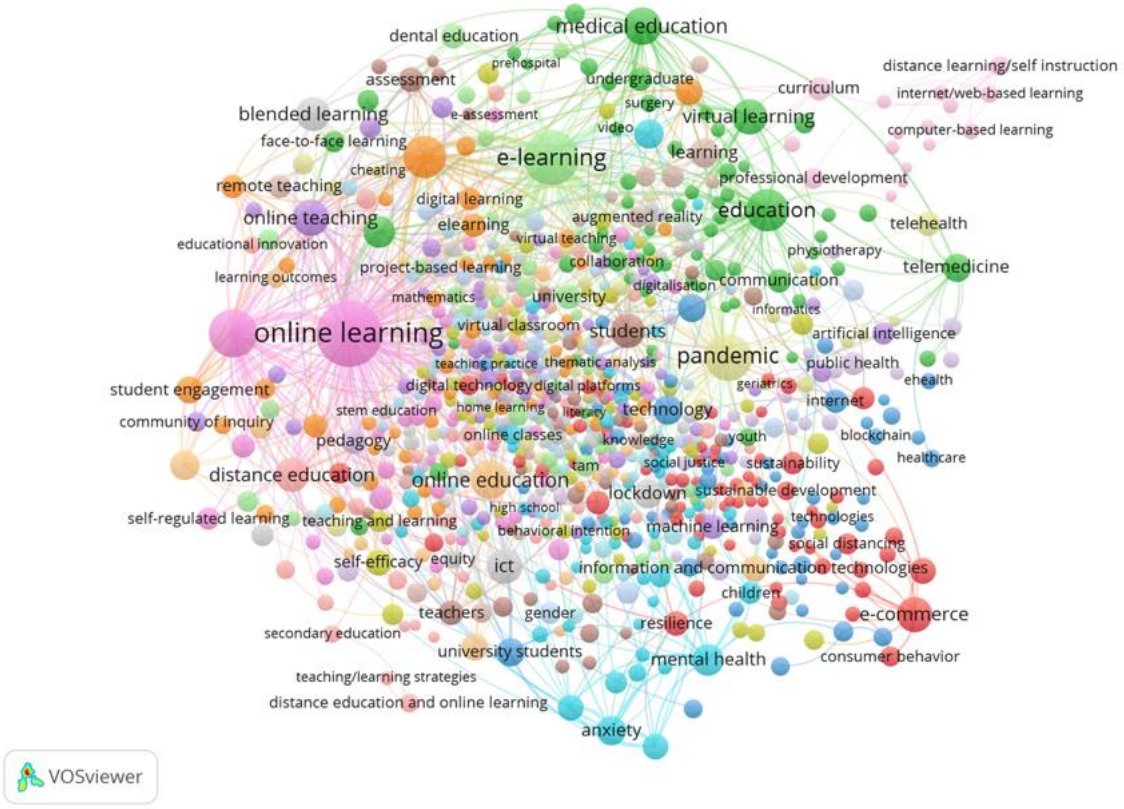

Figure 1. *Visual map of the most common author-supplied keywords in the literature of COVID-19, e-commerce and e-learning, 2020-2022*

A combination of COVID-19 and the main MI literacies in the search query was meant to identify specific literacy-related issues associated with COVID-19 from 2020 to 2022. However, the analysis of data about research on the literacies during COVID-19 yielded similar patterns as the data on ICTs, e-learning, and e-commerce (see Table 2 and Figure 2), with minor variations, particularly regarding the visibility of the MI literacies among the top keywords. The top research topics include the following: social media, online learning, higher education, digital divide, telemedicine and telehealth, e-learning, online education, blended learning, education, public health, and distance learning. These terms occurred frequently in the previous data analysis on COVID-19 versus e-commerce, e-learning, and ICTs. The overlap of terms in the two datasets reflects a consistent pattern of the areas of concern during COVID-19 and, perhaps, post-COVID-19, as explained by the OECD (2020). Particularly noTable is the prominence of online and e-learning and its variations among the top 60 author-supplied keywords in Table 1 and 115 keywords in Figure 2. Unlike in the previous analysis, e-commerce and/or its related terms are not the main occurrences in the current analysis, implying that, even if e-commerce and online shopping have been mentioned in the COVID-19 literature, the terms are not specifically linked to MIL. It is worth noting that, while analysing the COVID-19 and MIL data, a few terms that revealed the side effects associated with working from home and home-schooling during COVID-19 were also featured. These terms include misinformation, disinformation, fake news, mental health, fact-checking, information overload, and loneliness. Similar findings were reported in a study titled "*A bibliometric analysis of digital literacy research and emerging themes pre-during COVID-19 pandemic*" by Baber et al. (2022).

It was also noted that among the most common keywords, in terms of frequency of occurrence, in the data on COVID-19 and MI literacies were MIL terms, with digital literacy leading the pack (with appearances in 102 articles), followed by information literacy (61), media literacy (28), health literacy (15), and e-health literacy (5). These literacies co-appeared with the following topics of research: COVID-19 (242), social media (32), and online learning (31). Digital literacy is the most researched type of MIL, a situation that explains the presence of such terms as online teaching

and learning, and associated terms, namely digital divide, telemedicine and telehealth, digital competence, digital inclusion, digital citizenship, digital equity, and digital technology, among others.

Table 1. *Top 60 author keywords in the literature on COVID-19 and MIL, 2020-2022*

No	Keyword	Links	TLS	Freq.
1	COVID-19	204	599	242
2	Digital literacy	122	270	102
3	Information literacy	77	169	61
4	Pandemic	71	157	40
5	Social media	48	103	32
6	Online learning	53	85	31
7	Misinformation	38	100	30
8	Higher education	47	87	28
9	Media literacy	40	73	28
10	Fake news	37	78	23
11	Digital divide	50	83	20
12	Telemedicine	24	40	18
13	Telehealth	32	49	17
14	Infodemic	30	62	16
15	Health literacy	37	58	15
16	E-learning	32	46	14
17	Disinformation	26	54	13
18	Online education	22	34	13
19	Digital skills	21	32	12
20	Technology	22	31	12
21	Blended learning	19	24	11
22	Education	25	32	11
23	Public health	30	38	11
24	Distance learning	18	29	10
25	Older adults	20	28	10
26	Academic libraries	22	31	9
27	Digital competence	21	29	9
28	Internet	34	43	9
29	Digital inclusion	18	25	8
30	Distance education	17	20	8
31	Mental health	23	31	8
32	Online teaching	16	19	8
33	Media	21	29	7
34	Remote learning	10	13	7
35	Emergency remote teaching	11	18	6
36	Lockdown	15	18	6
37	Communication	24	27	5
38	E-health literacy	15	18	5
39	Elderly	16	21	5
40	Health information	13	16	5
41	Journalism	10	12	5
42	Library instruction	7	11	5
43	Pandemics	20	23	5
44	Professional development	11	11	5
45	Students	27	30	5
46	Adolescents	4	4	4
47	Digital	11	12	4
48	Digital citizenship	7	8	4
49	Digital competences	15	20	4
50	Digital equity	9	12	4
51	Digital health	20	24	4
52	Digital technology	12	12	4
53	Digital transformation	8	9	4
54	Fact-checking	12	20	4
55	Health communication	6	8	4
56	Health equity	13	16	4
57	Information overload	11	12	4
58	Librarians	6	6	4
59	Loneliness	17	21	4
60	M-health	15	17	4

So, which literacies are needed in the 21st century? To answer the main question about the required MIL skills, with special reference to e-commerce and e-learning, we delve into the types of MIL literacies. Besides the abovementioned literacies, Figure 3 provides 177 keywords, representing all the literacies mentioned in the MIL literature between 2020 and 2022. The variety of literacies reflects the complex media and information environment that characterises the 21st century. Digital literacy, information literacy, and media literacy, which appeared the most in the MIL literature, are key to navigating the 21st century. Unlike in Table 2 and Figure 2, where digital literacy led the other literacies in the frequency of occurrence in the COVID-19 and MI literacies, the analysis of the literacies in Figure 3 placed information literacy at the top of the 177 keywords, with 689 appearances, followed closely by digital literacy (639), while media literacy came a distant third, with 362 appearances. The other literacies performed as follows: visual literacy (102), health literacy (54), new literacies (44), digital/media literacies (41), computer literacy (34), media and information literacy (30), critical media literacy (29), critical literacy (27), e-health literacy (19), data literacy (18), news literacy (16), and new media literacy (15). A study by Onyancha (2020b), which visualised knowledge on information literacy, similarly identified over 75 literacies that appeared in the IL literature, with digital literacy, media literacy, computer literacy, health literacy, health information literacy, media and information literacy, visual literacy, and metaliteracy featuring the most in the literature.

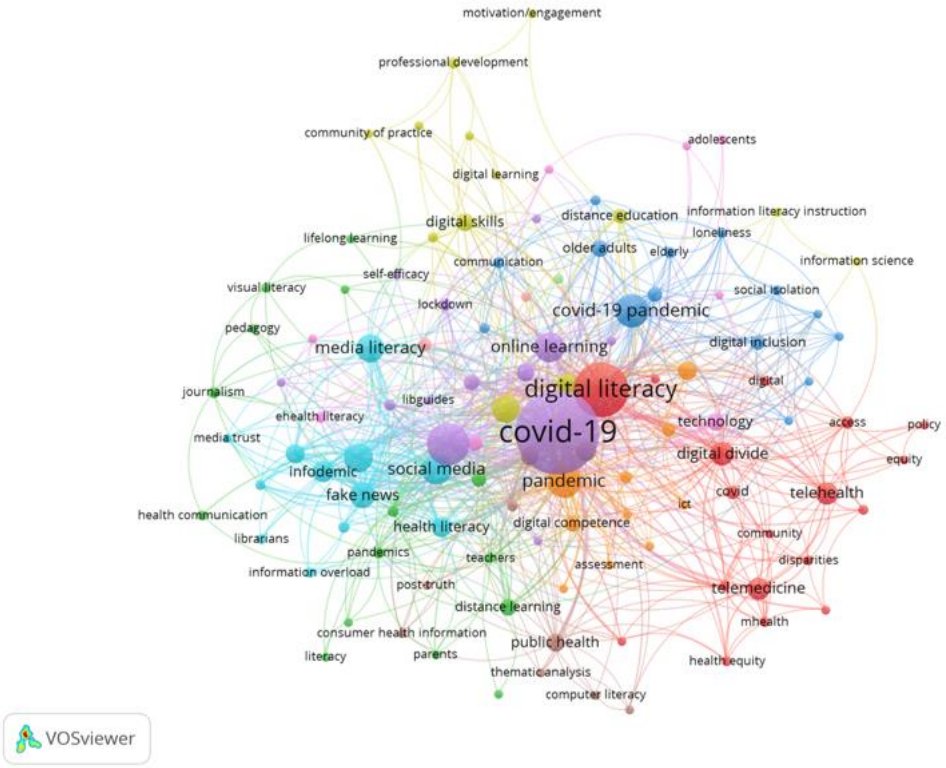

Figure 2. *Visual map of the most common author keywords in the literature on COVID-19 and MIL, 2020-2022*

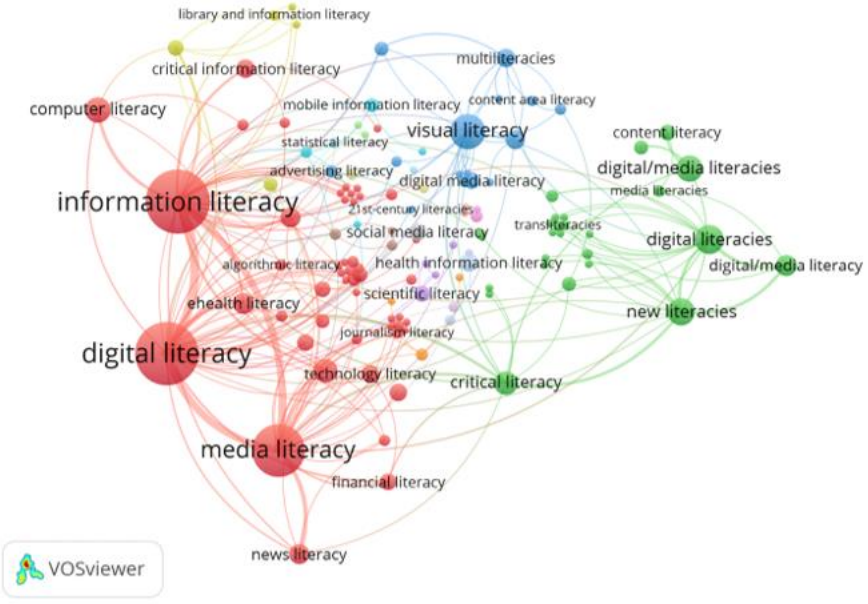

Figure 3. *Visual map of the author keywords representing MI literacies, 2020-2022*

Despite information literacy leading in terms of the number of appearances in the MIL literature between 2020 and 2022, digital literacy, which is a relatively new concept, is increasingly becoming a constant presence in the MIL literature (see Baber et al., 2022; Onyancha, 2020b; Park, Kim & Park, 2020). While Onyancha (2020b) reported that information literacy was the most researched literacy in his study on mapping the literature on information literacy, Park, Kim, and Park (2020), whose scientometric study focused on digital literacy,

ICT literacy, information literacy, and media literacy within the context of education, noted that media literacy was the most frequent author keyword, followed by digital literacy, while information literacy came in third position. The prominence of digital literacy in the MIL literature can be attributed to an 'increasingly digital world' (Filgueiras & Almeida, 2021; McDonald & Kebbell, 2004; Schwab, 2016;). The digital world was visible in the current study, as reflected in the number of keywords associated with digital information and technologies, as shown in Figure 4.

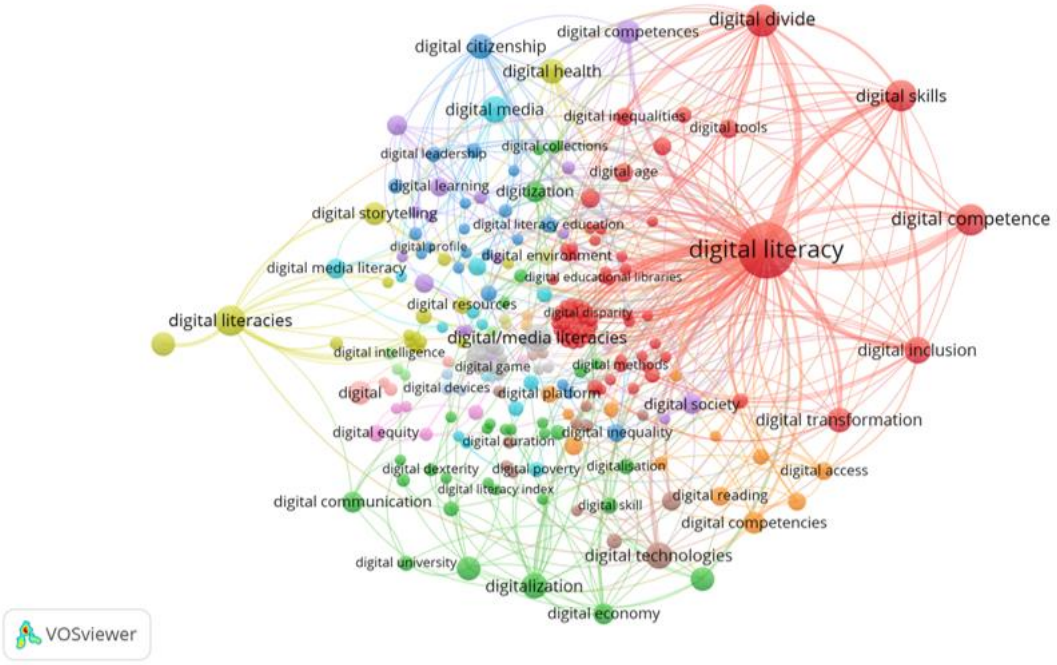

Figure 4. *Visual map of the author keywords describing the digital world in the MIL literature, 2020-2022*

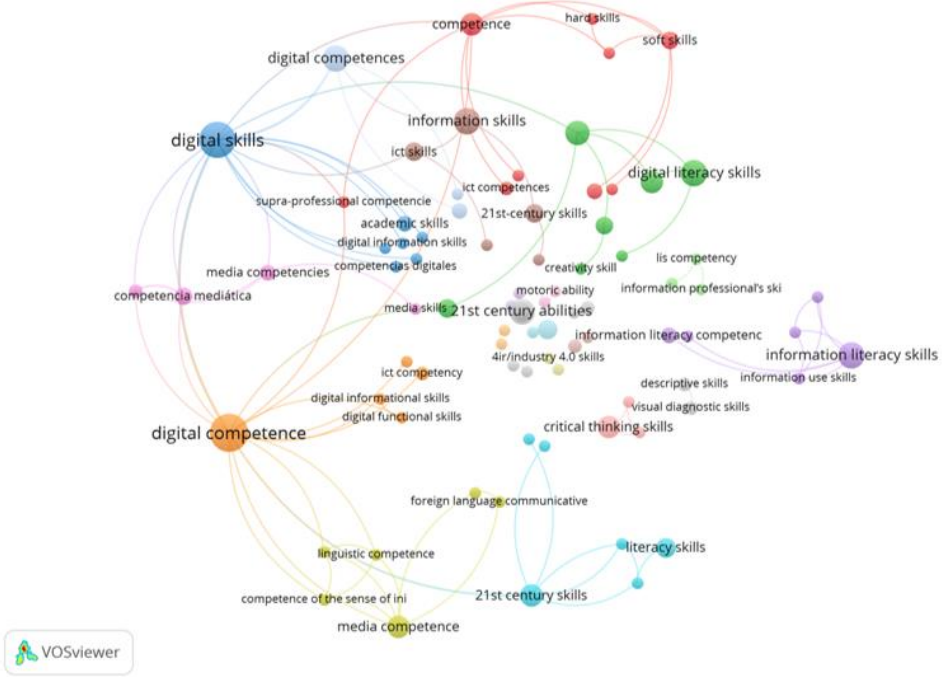

Figure 5. *Visual map of the author keywords describing the MIL skills and competencies in the MIL literature, 2020-2022*

Figure 4 shows a total of 355 author-supplied keywords that began with the word 'digital' in the MIL literature between 2020 and 2022. The network map comprised 120 clusters, 464 links, and 733 total link strength. The most prominent author keywords in the visual map (see Figure 4) included digital literacy, digital divide, digital competence, digital skills, digital literacies, digital inclusion, digital media, digital technologies, digitilisation, digital citizenship, digital transformation, digital health, digital storytelling, digital economy, and digital communication.

Finally, what MIL skills are required post-COVID-19? It has been argued that the current information and digital world, which was forced to adapt to the new normal caused by COVID-19, demands what have come to be known as 21st century skills. These skills are known by a variety of labels, such as generic skills, soft skills, graduate attributes, transversal skills, applied skills, cross-curricular skills, cross-disciplinary skills, interdisciplinary skills, transferable skills, non-cognitive skills, common cores, and core skills (Santosa, 2011). Mishra and Mehta (2017) define 21st century skills as a broad set of knowledge, skills, work habits, and character traits that are believed to be critically important for success in today's world, especially in future careers and workplaces. The skills can be classified into three categories: foundational literacies, competencies, and character qualities (see Santosa, 2022). According to Santosa (2017), the foundational literacies include literacy and numeracy, scientific literacy, financial literacy, cultural literacy, and civic literacy, while competencies include critical thinking, communication, and collaboration. The third category, labeled as character traits or qualities, includes creativity, initiative, persistence/grit, adaptability, curiosity, leadership, and social and cultural awareness. The World Economic Forum (2020) lists 15 skills that one needs to thrive in the 4IR. The skills have changed since 2015 and are projected to include the following top 15 by 2025: analytical thinking and innovation; active learning and learning strategies; complex problem solving; critical thinking and analysis; creativity, originality, and initiative; leadership and social influence; technology use, monitoring, and control; and technology design and programming. Others are resilience, stress tolerance, and flexibility; reasoning, problem-solving, and ideation; emotional intelligence; troubleshooting and use experience; service orientation; systems analysis and evaluation; and persuasion and negotiation. According to Fadel (2008), 21st-century skills can be broken down into three categories as follows:

- *Learning skills*: Also known as the "four Cs" of 21st-century learning, including critical thinking, communication, collaboration, and creativity.
- *Life skills*: Flexibility, initiative, social skills, productivity, leadership.
- *Literacy skills*: Information literacy, media literacy, technology literacy.

To identify the MIL skills required during and post-COVID-19, we isolated and mapped all the author keywords that contained skills, ability or abilities, or competence or competencies. The study did not delve into what Santosa (2017) referred to as character traits. Figure 5 maps the 214 author keywords that appeared in the MIL literature between 2020 and 2022. These keywords reflect the skills and competencies (and abilities) associated with MIL during the period and that, as such, will be required post-COVID-19.

The most common author keywords in Figure 5 were digital competence, which appeared in 63 articles, followed by digital skills (57), information literacy skills (19), digital competencies (18), digital literacy skills, (18), information skills (18), 21st century abilities (15), digital competencies (13), 21st century skills (11), competencies (11), critical thinking skills (11), and media competence (10). It is evident that the top author keywords, representing the types of skills required post-COVID-19, are aligned with the foundational literacies presented in Figure 3, whereby information literacy, digital literacy, and media literacy led the pack of literacies in the frequency of occurrence in the MIL literature. Apparently, the MIL skills required to navigate the post-COVID-19 environment are tied to the MI literacies, which are classified by some scholars as skills and competencies for the 4IR and/or 21st century (see Alhady & Ahmad, 2022; Fadel, 2008; Zacharia, Kennedy, Pavlova & Lee, 2023). It is therefore not surprising to note the presence of such keywords as digital literacy skills, information literacy skills, literacy skills, information literacy competence, media literacy skills, social media literacy skills, computer literacy skills, cultural heritage literacy skills, and media literacy competence. A closer examination of UNESCO's (2013) list of competencies for a media and information literate person (see Appendix) shows that the skills and competencies required of a media and information literate person would include those associated with all the literacies under the MIL umbrella or what Grizzle et al. (2021) call MIL notions, with some of the

competencies and skills being more prominent than others post-COVID-19 due to the ever-dynamic media and information environment. The presence of competencies and skills related to digital literacy is not surprising because, as shown in Figure 3 and Figure 4, digital literacy has become increasingly visible in the literature when compared to other related literacies. Digital competence, which was the most visible in the MIL literature, suggests the area of emphasis in terms of the competencies and skills required in the 21st century and post-COVID-19 era (Wang & He, 2012).

CONCLUSION

Electronic commerce (e-commerce) and electronic learning (e-learning) were two of the activities most affected by COVID-19, and this observation was visible in the conduct and publication of research, as revealed in the current study, hence the special attention given to the two areas. The main topics of research (see Table 1 and Figure 1) were associated with e-commerce and e-learning and included such terms as online teaching, e-learning, e-commerce, medical education, and telemedicine. The keywords stand for certain activities that can be said to be crucial in the discussions revolving around MIL skills post-COVID-19. In fact, they form the basis upon which we can nurture MIL skills going forward. Furthermore, Table 1 and Figure 1 revealed that the keyword ICTs and other specific keywords that stand for the names of specific ICTs featured prominently in the literature. It is acknowledged that the current technological era is characterised by disruptive technologies and, as a result, many ICTs, including artificial intelligence systems, require a society that can not only access and use the media and information but also develop responsible and active citizenship in the digital age. In addition, increased digitalisation or digitisation heralds the digital world we will continue to experience with the Fourth/Fifth Industrial Revolution; however, it has also resulted in an infodemic, post-COVID-19 world, where disinformation, mis-information, and abundant fake news thrive; hence, the need for a variety of literacies and skills presented in Figure 5 under the umbrella of MIL, with digital competence and skills leading the way. Accordingly, the study identified the following combination of literacies as crucial MI literacies to navigate the uncharted waters ushered in by COVID-19: digital literacy, information literacy, media literacy, and health literacy. These terms are interwoven but have distinct features as outlined in Grizzle et al. (2021). In terms of skills, most of the 21st-century skills were, generally, mentioned in the MIL literature, implying that there is no one skill that is sufficient – a variety of skills are required. The study identified 214 and 355 author keywords describing the skills and literacies required during and post-COVID-19, with digital skills, information literacy skills, digital competencies, digital literacy skills, information skills, 21st-century abilities, digital competencies, 21st-century skills, competencies, critical thinking skills, and media competence topping the list. Finally, it is worth noting that the skills, competencies, and literacies outlined in this study are not necessarily new, but their importance has been amplified during and post-COVID-19. We believe that MIL for all can be achieved, if these skills are imparted through well-coordinated and MIL-rich programmes and initiatives.

Implications of the study

Generally, the 21st-century and more particularly the post-COVID-19 society requires media and information literate persons, who possess appropriate skills and competencies to navigate the ever-dynamic and increasingly digital and infodemic world, prone to misinformation, disinformation, and fake news. The identification of MIL skills and competencies in the current study can inform curricula development, the development of models and framework for MIL delivery and outreach, the infusion of emerging concepts in current MIL programs, and the development of new forums for the diffusion of MIL programs, as well as the expansion of MIL stakeholder networks and alliances. Costello et al. (2021, p. 1) have summarised the implications of the COVID-19 pandemic on information literacy instruction thus: "The changes brought on by the shift to online ILI [during COVID-19] will continue to influence librarianship into the future and the discussion suggests areas of development for curricula in library education." The post-COVID-19 society requires resilient communities which can be realized through informed MIL education programs (see Singh, Widén, & Karim, 2021), and as such this study's findings may be impactful in the realisation of such communities.

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APPENDIX

Summary of MIL components, subject matters and competencies

MIL Component	MIL subject matters	MIL competency
		Media and information literate person is able to:
1. Recognising the demand for, being able to search for, being able to access and retrieve information and media content	1.1. Definition and articulation of a need for information	1. Determine and articulate the nature, role and scope of the information and media (content) through a variety of resources.
	1.2. Search and location of information and media content	2. Search and locate information and media content.
	1.3. Access to information, media content and media and information providers	3. Access needed information and media content effectively, efficiently and ethically as well as media and information providers.
	1.4. Retrieval and holding / storage / retention of information and media content	4. Retrieve and temporally hold information and media content using a variety of methods and tools.
2. Understanding, assessment and evaluation of information and media	2.1. Understanding of information and media	5. Understand necessity of media and information providers in society.
	2.2 Assessment of information and media content, and media and information providers	6. Assess, analyse, compare, articulate and apply initial criteria for assessment of the information retrieved and its sources, as well as evaluate media and information providers in society.
	2.3. Evaluation of information and media content, and media and information providers	7. Evaluate and authenticate information and media content gathered and its sources and media and information providers in society
	2.4. Organisation of information and media content	8. Synthesise and organise information and media content gathered.
3. Creation, utilisation and monitoring of information and media content	3.1. Creation of knowledge and creative expression	9. Create and produce new information, media content or knowledge for a specific purpose in an innovative, ethical and creative manner.
	3.2. Communication of information, media content and knowledge in ethical and effective manner	10. Communicate information, media content and knowledge in an ethical, legal and effective manner using appropriate channels and tools.
	3.3. Participating in societal-public activities as active citizen	11. Engaged with media and information providers for self-expression, intercultural dialogue and democratic participation through various means in ethical, effective and efficient manner.
	3.4. Monitoring influence of information, media content, knowledge production and use as well as media and information providers	12. Monitor the impact of created and distributed information, media content and knowledge as well as use existing media and other information providers.

(Source: UNESCO 2013b, p. 59)